M0013 GMT 14:22:13 DATE 11/12/81

I have 642

DTS verify

DCME 623

Verify

and COI 624

(garble) verify

(garble) 638 639 complete

copy

OTC: DTS OTC

DTS

645

verify and 646

copy

Okay, all personal after the transisiton to ops 101 discontinue all LEV CMU reads for the remainder of the count.

LTC: CDMC LTC

PTC and 2 and 2

you verified 649, right?

Negative sir, we got four minutes to go.

Four minutes to go, copy that.

EPD: OTC EPD

Go ahead EPD

Could I get a QC lined up on 151 for the transfer at T-15?

(garble) TC you copy that?

copy

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PAO This is Shuttle Launch Control at T-20 minutes and holding. Approximately five minutes remaining in this second last built in hold. The test team is briefed on recycle options during this period in case of an unplanned hold. And the landing convoy status is again verified and the landing sites are verified ready for launch. Just prior to coming out of this hold at the T-20 minute point, all of the managers who are monitoring this launch this morning will be polled to give a go to come out of the hold. In just a few minutes we should have completion of the alignmnet of the inertial measurement unit as well. Everything going smoothly as we move toward a lift-off at 10:00 am of the second Space Shuttle. This is Shuttle Launch Control

ETLS OTC

go ahead

you verify 648

That's affirmed

OTC QC

Go ahead QC

(garble)

repeat please

DOLS (garble)

(garble)

that was performed

copy

OTC PTC

go ahead

I need (garble) complete ready for transition to ops one (garble) is complete also

copy

PAO This is Shuttle Launch Control at T-20 minutes and holding, we have just about one minute remaining in this ten minute built in hold. The NASA test conductor has conducted a check of the major managers responsible for tonights launch and have determined that they are ready to resume the countdown. The orbiter test conductor, booster test conducter, external tank

test conductor the flight controllers and other engineers have all indicated that they're ready to go this morning. The NASA convoy conductor is verified that the convoy at the KSC shuttle landing facility is ready, he's been informed that in case of return to launch site abort, the landing will be on runway 33. Approximately 20 seconds remaining before release of this built in hold. One other built in hold remains in our countdown this morning, a ten minute built in hold at the T-9 minutes point. The countdown clock about to pick up in five seconds. T-20 minutes and counting, the purge of the fuel cells which provide both electricity for the Orbiter and drinking water for the crew is being performed. At this point , the computer is being changed to a program known as major mode 101, which is the terminal countdown configuration. The, also at this point, the primary computer is compared with the proper on board computer to ensure that they are also ready for launch. The countdown going smoothly, T-19 minutes, 25 seconds, and counting. This is Shuttle Launch Control.

FS GPC stand by

AFS can be taken to 101

OTC: Okay, CDR, PLT perform manual transition of BFS to 101

SPACECRAFT Okay it's in one

(garble) QC

go ahead

Verify 668

okay

OTC CNTL

go ahead

Verify 676

copy

OTC DTS ops transitions complete

Copy PLT in progress

PLT OTC

SPACECRAFT go ahead

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OTC Configure PASS BFS horizontal sit display

PLT Wilco, it's in work

OTC (garble) verify 675

copy

OTC CGLS 212

go ahead

you verify the 656

copy

662 663, 664 are not performed

verified

completed the dev at step 670

copy

PAO This is Shuttle Launch Control at T-17 minutes 15 seconds and counting. The Shuttle crew, Joe Engle and Dick Truly have configured the back up computers for the compared test. And at the present time, a check of the gimbal system for moving the main engines on the Orbiter is being conducted. Just a minute from now the pilot and commmander will be configuring the main propulsion helium subsystem cockpit switches for launch, and the helium tank isolation valves will be opened. Just a few seconds after that another check of the abort advisory system will be conducted. Everything going smoothly in our count T-16 minutes 30 seconds and counting. This is Shuttle Launch Control.

OTC CGLS

go ahead

verify 709 per the dev

copy

LT OTC

Roger go ahead

perform MPS helium reconfiguration

Wilco it's in work

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(garble) 212

ADCR (garble) switch on 3 2 1 mark. On

(garble)

Flight (garble)

verify

A&B off mark it

verified off

OTC C00S

END OF TAPE

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SPACECRAFT (GARBLED)

FLIGHT DIRECTOR A&B off, mark it

SPACECRAFT verified off

COOS OTC, COOS, flight (GARBLED)

COOS OTC, permission to close crossfeeds

OTC You've got a go

COOS Roger, (garbled)

PAO This is Shuttle Launch Control T-15 minutes and counting. We have just had word that the launch safty area is clear. The booster test conductor has ordered the gaseous nitrogen purge of the solid rocket booster aft skirts to begin and the chase aircraft presently at Patrick Air Force Base have been ordered to start their engines. A check of all test support team members have verified that they are go for launch. Abort advisory checks are being performed again once again on the Orbiter. The countdown continuing as we come up on the T-14 minute point and ten seconds at the Shuttle Launch Control.

COOS OTC, COOS

OTC .....Go ahead

COOS Crossfeeds now closed for flight.

OTC Copy, PLT, OTC

SPACECRAFT Go ahead.

OTC Do you want to report RCS quantities, please.

SPACECRAFT Ok, forward RCS .....oxidizer is 95, fuel is 97. Left oxidizer is 107 fuel is 106. Right oxidizer 107, fuel 107.

OTC Copy

STP OTC STP

OTC Go ahead

STP Fuel cell purge is complete. I'd like to go to thermal conditioning , please.

OTC Ok to go.

STP At PPD

OTC PPD

PPD PPD, copy, inwork

CASC OTC CASC

OTC Go ahead

CASC (garble) moderation step 666 complete.

OTC Copy

DPS OTC DPS

OTC go ahead DPS

DPS T-20 minutes dump tape complete. Miscompares are 0. DPS is go.

OTC Copy

CAPCOM CDR, PLT, MPD in approximately 3 minutes we will go into the plan hold at T-9 for the duration of ten minutes.

SPACECRAFT Copy that on board.

PAO This is Shuttle Launch Control at T-11 minutes 40 seconds and counting. We've had word that the abort advisory checks were satisfactory . All of the department of defense contingency support group are also ready for launch. Emergency aircraft and personnel are on station. We're coming up on the final built in hold that comes just a couple of minutes from now at the T-9 minute point in the countdown. At the T-11 minute point the ground launch sequencer will take a quick look at all of the parameters and monitors to insure that all systems are go for the final T-9 terminal countdown. We've had word from the crew that the check the data dump into the support computer onboard the spacecraft has been satisfactory. The countdown moving smoothly as we come up on T-10 minutes 40 seconds and counting. This is Shuttle Launch Control.

OTC CAF, OTC.

CAF Go ahead.

OTC You verify 772.

CAF Negative, that's been moved by D1454 to after they run the slew test and during hold at -9.

OTC OK. .....

END OF TAPE

FCP OTC FCP

OTC Go ahead

PAO This is Shuttle Launch Control at T-9 minutes 27 seconds and counting. The onboard computer programs have been read out on the Orbiter, been compared with the standard programs and have been verified to be proper for a launch. All personnel in the firing room have been asked to remain seated and the no smoking rule has gone into effect through the launch. Just 7 seconds away from the final built in hold. A ten minute built in hold that starts at T-9 minutes. T-9 minutes and holding. During this particular hold period the launch team is briefed on the way in which a halt can be called to the countdown. During the final 9 minutes of the count a countdown clock hold can be requested by the NASA Test Conductor, the Orbiter test conductor, Tank Test Director, Booster Test Conductor, Flight Crew, Flight Director, and various safety officers as well as the tracking stations. At the present time we know of no constraints towards the ontime launch at 10 a.m. this morning. The countdown clock at T-9 minutes and holding. This is Shuttle Launch Control.

SPACECRAFT We shall see you in about a week.

OTC Roger

SPACECRAFT Thank you guys. We know how you fought for us. We appreciate it.

PAO This is Shuttle Launch Control at T-9 minutes and holding. We have a little bit over 5 minutes remaining in this built in hold before coming out of it at exactly 9 minutes before 10 a.m.. Chief-test conductor, Norm Carlson has wished the crew a good flight from the launch team and Joe Engle said, right that they'll see us in about a week. When we pick up the count at the T-9 minute mark several important milestones will remain. As we come out of the hold the ground launch sequencer will take over command of the remaining events as well as monitoring the shuttle systems response. At T-7 minutes the Orbiter access arm will retract, at T-5 minutes the auxillary power units will be started. At T-4 minutes a purge of the main engines will start. AT T-2 minutes and 55 seconds liquid oxygen pressurization will be begin. At 1 minute and 57 seconds liquid hydrogen pressurization will start and at T-31 seconds the redundant set sequencer will take over. At that point events happen far too quickly and readings on the system must be done too fast for humans to perform. The redundant set sequencer is located in the Orbiter and utilizes the four flight computers. It has been monitoring the work of the Earth-bound ground launch sequencer up to that point but now command changes to the Orbiter from the ground launch sequencer with it acting as the backup. However,

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PAO But now command changes for the Orbiter from the ground launch sequencer with it acting as the backup. However, it must send a GO indication to the Orbiter prior to the time the main engine start command is to be given at T-6.68 seconds otherwise the count will stop and be recycled to the T-9 minute point. After additional recycle events, the clock will recycle to the T-20 minute point. We have just had a discussion between our NASA Launch Director George Page and his counterparts at the Johnson Space Center in Houston, he has been told there are no constraints to the launch at the present time. Just about two minutes away from picking up the count at the T-9 minute point. This is Shuttle Launch Control.

PAO This is Shuttle Launch Control T-9 minutes and holding. Launch Director George Page asked for a slight delay in picking up the countdown at this point while he checks a couple of things which he heard during the countdown. He has just checked with the range safety officer to determine that a dropout of the main carrier wave that is used by the range safety people is not serious and that a backup carrier signal is satisfactory. He is also checking on several other things and we will get back to you as soon as the determination has been made to pickup the countdown. This is Shuttle Launch Control.

SPACECRAFT Loud and clear George, thank you George and we concur with everything you said located off right. (Garbled) a one up there George.

PAO This is Shuttle Launch Control at T-9 minutes and holding. Launch Director George Page has checked on a number of problems which has come up during the countdown to determine that there are no constraints at the present time. He has spoken to the launch crew and says let's take our time. It's been a hard one watch all your data but we're going to do it right. He has spoken to the crew and he to Joe Engle and to Dick Truly and said we're going to give you a good one. We are in the process now of the test conductor going over the whole criteria with the launch team to let them know what point holds can be called and what the proper procedure is to call that hold. Launch Director George Page has told the launch team to take their time and do it right. We are standing by now to get word of the point at which we will be picking up at the T-9 minute point. This is Shuttle Launch Control.

PAO This is Shuttle Launch Control at T-9 minutes and holding. Launch Director George Page has just ordered that the clock will be picked up at one minute after 10:00 Eastern Standard Time this morning. We have just had a check of the various major managers for this mornings launch. Norm Carlson has conducted that check and all of the managers have said that they are ready to pickup at the proper time. The Launch Director George Page has just asked Deke Slaton the OFT Launch Manager if

he is go and Deke Slaton has said he is go for launch. We are about two minutes away from picking up the countdown at the T-9 minute point which would result in a launch at 10:10 am this morning. This is Shuttle Launch Control.

PAO This is Shuttle Launch Control at T-9 minutes and holding just 15 seconds away from picking up the clock at the T-9 minute point. All of the major managers have indicated they are ready to go and we are at T-9 minutes and counting. The launch sequencer now being controlled by the ground launch sequencer from now up to the T-31 second point when they will switch to the onboard redundant set launch sequencer. The ground launch sequencer is part of the launch processing system and operates by relaying commands for the Orbiter's onboard computers which then reports 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 are being met. Such as propellant loads, temperatures, pressures and other measurements. The chase aircraft have been launched from Patrick Air Force Base to take part in the activities of this mornings launch. T-8 minutes 10 seconds and counting. T-8 minutes and counting.

SPACECRAFT Okay, sensors on monitor.

PAO The next major event we have coming up is the crew access arm retraction which comes at the T-7 minute point. T-7 minutes 30 seconds and counting. Everything going smoothly in these last few minutes of the countdown leading toward a liftoff at 10:10 am Eastern Standard Time this morning. 5 seconds away from retraction of the crew access arm. T-7 minutes and there goes retraction of the crew access arm. This is the walkway attached to the service structure and used by the crew to walk across to the Orbiter. The crew has been advised to lower their helmet visors and at T-6 minutes we'll begin preparations for starting of the auxillary power unit. The APU's are turbine devices fueled by decomposing hydrazine liquid which provides hydraulic power to change the angle of the engines, to operate the aerodynamic surfaces, engine valves and during landing operate the landing gear. Coming up on the T-6 minute point in our countdown.

SPACECRAFT That's in work.

PAO T-6 minutes and counting. The Pilot Dick Truly has begun the APU prestart activity.

SPACECRAFT APU prestart is complete.

PAO And it is complete. The development flight instrumentation which measures stresses on the Orbiter during flight have been turned on and recorders stopped ...playback....

END OF TAPE

PAO ...too much garbled stress is on the Orbiter during flight have been turned on, recorders stopped for playback after landing. T-5 minutes 40 seconds and counting. T-5 minutes 30 seconds and Pilot Dick Truly has signified the auxilliary power units are ready to be started. T-5 minutes 15 seconds and counting. We're coming up on the T-5 minute point two, one, T-5 minutes. We have a go for APU start and the start sequence has begun. T-4 minutes 44 seconds and counting.

garbled

PAO T-4 minutes 30 seconds and counting. We have a total of 16 minutes of hydrazine supply for running the APU's prior to a liftoff.

.....APU start is complete. Looks good on board.

PAO APU start is complete. T-4 minutes 10 seconds and counting. T-4 minutes we have begun nitrogen purge of the main engines on the Orbiter. T-3 minutes 50 seconds and counting. T-3 minutes 45 seconds. The elevon speed brake and rudder are being moved through a preprogrammed pattern to assure that they will be ready to be used in flight. A little exhaust from the APU's coming out the tail of the Orbiter indicating that all is well. T-3 minutes 28 seconds and counting. The Shuttle is now on internal power. However, the fuel cells are still receiving their fuels from the ground support system through the tail service mask for one more minute. T-3 minutes 15 seconds. The profile checks of the aerosurfaces have been completed an checked. T-3 minutes 5 seconds. The engine gimbal or movement check is underway to assure that they are ready for flight control. T-2 minutes 55 seconds and counting. The lox cells on the external tank has been closed and pressurization begun. After the tank is pressurized the hold capability is limited. T-2 minutes 40 seconds. We have cleared the caution and warning memory. The gaseous oxygen vent arm is being retracted. T-2 minutes 30 seconds and counting. The fuel cell ground supply of oxygen and hydrogen has been terminated and the vehicle is on it's onboard supply. T-2 minutes 15 seconds. The main engines have been gimbaled for their start position and the pressure on the liquid oxygen tank is at flight pressure. Coming up on the two minute point. T-2 minutes and counting. The liquid hydrogen vent valve has been closed and flight pressurization underway. T-1 minute 50 seconds and counting. The gaseous oxygen vent arm is almost fully retracted. T-1 minute 40 seconds and counting. T-1 minute and 30 seconds-90 seconds away from launch of STS-2. T-1 minute 15 seconds and counting. The liquid hydrogen tank is at flight pressure. Coming up on the one minute point in our countdown. Everything going smoothly. T-1 minute and counting. T-50 seconds the firing system for the ground suppression water is armed. T-40 seconds development flight instrument recorders are on. T-37 seconds we're about just a few

seconds away from switching control of launch to the computer sequencer. We have control of the countdown now being conducted by the launch sequencers/onboard the Orbiter. T-20 seconds and counting. The SRB hydraulic power units have started. The SRB nozzles have been moved to start position coming up on 10. T-10, 9 we have Go for main engine start. We have main engine start. Minus 3, 2, 1 we have ignition-we have ignition of the solid rocket boosters and liftoff. Liftoff of America's Space Shuttle and the Space Shuttle has cleared the tower.

PAO Houston now controlling. Mission control confirms roll maneuvers started. 20 seconds. Thrust looks good. 25 seconds roll maneuver completed. 30 seconds Columbia now one nautical mile in altitude. 35 seconds status check to Mission Control by Flight Director Neil Hutchinson given a go at 40 seconds.

CAPCOM Columbia, Houston. You're go at 40.

SPACECRAFT Roger, go at 40. garbled.

CAPCOM 48 seconds throttling engines down from....

CAPCOM ...go to the natural arm Columbia.

SPACECRAFT Okey doke.

PAO Coming up on maximum aerodynamic pressure on the vehicle. Mark one minute Columbia now 5 nautical miles in altitude 3 nautical miles down range. Velocity now reading 2300 feet per second. One minute 8 seconds pass through Max Q Columbia still looking good. Throttling engines back to 100 percent. Mark 1 minute 20 seconds Columbia now 9 nautical miles in altitude 6 nautical miles down range. Velocity now reading 3000 feet per second. Mark 1 minute 35 seconds Columbia now 14 nautical miles in altitude 10 nautical miles down range.

CAPCOM Columbia, Houston. You can expect an evap C&W.

PAO One minute 45 seconds coming up on negative sea swells it's too high for ejection seat...

CAPCOM Negative seats.

SPACECRAFT Roger, negative seats.

PAO Mark one minute 55 seconds Columbia now 21 nautical miles in altitude 18 nautical miles down range. Velocity now reading 5000 feet per second. Standing by now for solid rocket booster separation confirmation.

SPACECRAFT ...at 205.

CAPCOM Roger, copy. PC less than 50.

SPACECRAFT Okay it looks like we got a good (garble).

PAO Confirmed good solid rocket booster separation.

SPACECRAFT Smooth as glass Houston.

PAO Two minutes 25 seconds onboard guidance is converging as programmed. Columbia is now steering for it's precise window in space for main engine cutoff. Columbia now 35 nautical miles in altitude 40 nautical miles down range.

SPACECRAFT Okay Houston, out temps are coming down and looking good.

END OF TAPE

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CAPCOM Okay it looks like we got a good (garble)

PAO Confirmed good solid rocket boosters separation.

SPACECRAFT Smoothe and clear Houston

CAPCOM T-25 seconds, onboard guidance systems is programmed, Columbia is now (garble) window and space for main engine cut off. Columbia now 35 nautical miles out, altitude 40 nautical miles downrange.

SPACECRAFT Houston, Our temps are coming down and looking good

CAPCOM Roger Columbia, thank you.

PAO Mark, two minutes 45 seconds, Columbia now has two engine landing capability at Rota Naval Air Station, Spain. Two minutes 54 seconds status check in Mission Control given a go for three minutes.

CAPCOM Columbia, Houston your looking good at three.

SPACECRAFT Roger, Dan looking good at three.

PAO Mark 3 minutes 8 seconds, Columbia now 46 nautical miles in altitude, 66 nautical miles downrange, Columbia's three main engines continue to run smoothly, Engle and Truly really moving out now. Velocity now reading 6700 feet per second.

PAO Mark 3 minutes 30 seconds, Columbia now 52 nautical miles in altitude 85 nautical miles downrange. Velocity now reading 7000 feet per second. Return status check in Mission Control by Flight Director Neil Hutchinson, Engle and Truly giving a go to continue.

PAO Mark 3 minutes 55 seconds, Columbia now 58 nautical miles altitude, 112 nautical miles downrange. Velocity now reading 7900 feet per second. Four minutes 8 seconds standing by for negative return in pressed ATO call ups by CAPCOM Brandenstien.

CAPCOM Mark data return

SPACECRAFT Roger that. Sounds good

PAO Will that call up Engle and Truly now committed to space travel, they can no longer turn around and return to launch site. Four minutes 35 seconds Columbia now 6

CAPCOM Columbia, Houston your press to ATO

SPACECRAFT Columbia pressed to ATO looking good here.

PAO Four minutes 44 seconds, for the first time Columbia has forward abort to orbit capabilities on two engines, by throttling engines up to a 107 percent. Five minutes, Columbia now 68 nautical miles in altitude, 189 nautical miles downrange. Velocity now reading 10,300 feet per second.

CAPCOM Columbia, Houston your normal throttles

SPACECRAFT Copy that, normal throttles

PAO Five minutes 14 seconds at call up by CAPCOM Brandenstien says that Engle and Truly now capable of abort to orbit on two engines without throttling up Columbia's engines. Five minutes 25 seconds Columbia now 68 nautical miles in altitude, 228 nautical miles downrange. Mark five minutes 40 seconds, standing by for press to MECO.

CAPCOM Columbia, Houston your pressed to MECO

SPACECRAFT Roger, pressed to MECO

PAO Five minutes

SPACECRAFT This is really smoothe

PAO Five minutes 55 seconds, pressed to MECO call from CAPCOM Brandenstien says should Columbia lose but one engine, press on keep flying forward. Columbia's engines have enough energy to achieve normal attitude

CAPCOM Single engine Rota and everything is looking good.

SPACECRAFT Okay (garble) single engine Rota and everything is looking good here.

PAO Mark 6 minutes 18 seconds report from CAPCOM Brandenstein indicates that if the two engine failure occurs, Columbia is capable of an emergency landing at Rota Air Naval Station, Spain. Mark 6 minutes 30 seconds, Columbia now 68 nautical miles in altitude 346 nautical miles downrange. Velocity now reading 14,900 feet per second. Mark 6 minutes 50 seconds, Columbia now 67 nautical miles in altitude 397 nautical miles downrange. Columbia pitching over now, diving over to increase velocity, decrease altitude, giving Columbia her most favorable attitude. Seven minutes 5 seconds standing by now for single engine press to MECO .

CAPCOM Columbia Houston your single engine, press to MECO

SPACECRAFT Roger that, single engine press. Looking good Dan.

PAO Seven minutes 20 seconds, that report says that Engle and Truly can achieve normal engine cut off targets even if two engines go out. Mark seven minutes 30 seconds, Columbia now 64 nautical miles in altitude 511 nautical miles downrange. Velocity now reading 20,000 feet per second.

PAO Seven minutes 43 seconds, g forces building for Engle and Truly

and now coming up to 3 g's. Columbia now 63 nautical miles in altitude, 562 nautical miles downrange. Mark, 8 minutes.

CAPCOM Columbia, Houston your go at 8.

SPACECRAFT Roger, go at 8

PAO Columbia's main engines slowly being throttled back now, should be throttle at 65 percent, six seconds before main engine cut off. Columbia now 63 nautical miles in altitude, 645 nautical miles downrange. Velocity now reading 24,000 feet per second. 8 minutes 28 seconds, standing by for main engine cutoff.

SPACECRAFT Okay, Houston were got a good MECO.

CAPCOM Roger, we copy Columbia.

PAO Confirmed shutdown. Columbia now returned to Space not yet returned to orbit. Standing by now for external tank separation.

CAPCOM Columbia, Houston you can acknowledge the IMU Bites.

SPACECRAFT Roger Houston, we got ET set

CAPCOM Roger on the set.

PAO Eight minutes 58 seconds confirm external tank separation.

SPACECRAFT (garble)

PAO Columbia

CAPCOM We copy

PAO Columbia now performing evasive maneuver, moving below and beyond the external tank. Nine minutes 15 seconds,(garble) status check at Mission Control for the first OMS burn.

SPACECRAFT (garble)

CAPCOM Roger Columbia, we're looking at them.

CAPCOM Columbia, Houston your go for nominal OMS 1 for APU shutdown on time.

SPACECRAFT Okay, Dan and we're maneuvering to attitude now.

CAPCOM Roger

PAO Nine minutes 44 seconds Columbia now maneuvering OMS-1 burn attitude, using the two six thousand pound thrust engines. OMS-1 will be posigrade moving Columbia forward and higher all over the flight path, placing

Columbia in Orbit.

CAPCOM Columbia, Houston we're convinced those IMU were software bites right at MECO and no problem.

SPACECRAFT Okay, and we got three on loop,

END OF TAPE

SPACECRAFT Okay and we've got freon loop evap out temp but we'll catch it perhaps as soon as we get the OMS burned off.

CAPCOM Roger and the evap is shutdown we'll need it cycled off and then back to primary on.

SPACECRAFT Okay, we've got a good OMS ignition and the guidance looks good.

CAPCOM Roger.

SPACECRAFT And I understand you want the freon loop cycled off and back on?

CAPCOM Negative, that's the evap.

SPACECRAFT Roger, evap got you.

PAO 10 minutes 48 seconds burn status check of the control center.

CAPCOM Columbia, Houston. We are about 40 seconds from LOS both OMS engines look good going over the hill. Configure LOS. We'll see you at Madrid.

SPACECRAFT Okay, Dan. We'll see you there. Burn looks good today.

PAO Shuttle Control Houston. 11 minutes....

SPACECRAFT Flash evaps are coming down.

CAPCOM Roger, thank you.

SPACECRAFT Dan we just got an APU 3 temp and I'm on B on the (garbled)

CAPCOM Roger, we see that Columbia.

PAO 11 minutes 30 seconds. 11 minutes 50 seconds loss of signal now with Columbia through Bermuda. The next station will to acquire will be Madrid. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston. 12 minutes 12 seconds. We had an extended time of coverage and saw the OMS engine cutoff for the first OMS burn. 12 minutes 25 seconds this is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 14 minutes 18 seconds. Flight dynamics also reports on the status of the first OMS burn. Time of ignition was at 10 minutes 40 seconds. The delta V for the burn was 139.8 feet per second. The burn

duration one minute 19 seconds and the OMS 1 burn resulted in a apogee of 120 nautical miles and a perigee of 53 nautical miles. We are now about 4 minutes away from reacquiring Columbia through Madrid. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston. 18 minutes 30 seccnds standing by now for reacquisition of Columbia through Madrid. We'll standby as the conversation picks up between CAPCOM Brandenstein and Columbia's flight crew Joe Engle and Dick Truly.

PAO Now receiving data through Madrid.

CAPCOM Hello Columbia, this is Houston talking to you through Madrid. We have you for 4 minutes. Configure AOS.

SPACECRAFT Okay Dan we'll do it. We have good OMS burn good shutdown and everything is looking good aboard.

CAPCOM Roger, we saw the OMS cutoff. It looked good to us. And one point of interest, we noticed that the right OMS oxidizer guage hung up and it's indicating about 14 percent high.

SPACECRAFT Roger Dan, right OMS oxidizer 14 percent high.

CAPCOM Roger and we're standing by to watch the gimbal drive check.

SPACECRAFT Okay.

SPACECRAFT Roger and while Joe is doing that let me tell you about APU 3. Dan?

CAPCOM Okay go ahead.

SPACECRAFT Okay somewhere I think shortly after the OMS 1 burn but I'm sure you saw it, we got our APU temp message it was the APU 3 oil temp. It was indicating about 300 degrees. We went to Bravo with the power heater and it got up to about the limit just before the MPS dump was complete, so actually shut it down prior to of the dump being complete and did the rest of the procedure normally.

CAPCOM Roger, we copy that thank you.

SPACECRAFT Okay. Secondary actuator check is coming, mark.

CAPCOM Roger.

SPACECRAFT Houston, secondary is complete primary is getting set up

CAPCOM Roger.

SPACECRAFT Okay primary check coming, mark.

CAPCOM Roger, copy.

CAPCOM Columbia, Houston. We'll give you a gimbal status at Indy. Meanwhile you're go for OMS 2.

SPACECRAFT Okay, go for OMS 2 thank you. Dan.

PAO That was CAPCOM Brandenstein speaking to Commander Joe Engle giving a go for the second OMS burn. 21 minutes 50 seconds.

SPACECRAFT And Houston PLT, have completed MPS powerdown and the vacuum inerting activation one thing that you may notice MPS may notice on his data was the MPS H2 (garbled) put it to open and then bumped it back to GPC after a few seconds, put it back to open and then completed the procedure as written.

CAPCOM Roger, Columbia. We see that it looks good to us.

SPACECRAFT Okay. Okay Houston and now if you concur we'll go ahead and start the (garbled) OMS 2 attitude now.

CAPCOM Roger, we concur. We're 30 seconds from LOS configure LOS. We'll be talking with you over Indy at 36+00.

SPACECRAFT Okay. We'll see you there. Roger and one more thing Dan. The ET embilical doors closed no problems.

CAPCOM Roger, thank you.

PAO This is Shuttle Control Houston. 23 minutes 25 seconds Mission Elapsed Time. We've had loss of signal now with Columbia through Madrid. The next station to acquire will be Indian Ocean Station in 12 minutes 35 seconds. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 29 minutes Mission Elapsed time. Flight dynamics officer Jay Greene reports on his predictions for the second OMS burn. OMS 2 would have a time of ignition of 41 minutes 58 seconds a delta V of 121 feet per second. The burn duration should be 1 minute 13 seconds and would result in an apogee of 120 nautical miles and a parigee of 120 nautical miles for Columbia. Away from (garbled)

END OF TAPE

PAO 20 nautical miles and a paragee of 120 nautical miles for Columbia. Meanwhile, we are about 6 1/2 minutes away from reacquiring Columbia through Indian Ocean Station. Three major events must occur in the next few hours for Engle and Truly aboard Columbia to stay on orbit. First the onboard computer system must be reloaded from OPS 1 to OPS 2. This is needed to align 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 hyrdogen and oxygen to rid the impurities. The fuel cells can survive only so many hours without purging. In the mission they will be purged about every 8 hours. We'll follow these three key activities as they occur. At 31 minutes Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control Houston, at 36 minutes Mission Elapsed Time. Standing by now for reacquisition of signal with Columbia through Indian Ocean Station. Processing data now thrcugh Indian Ocean.

CAPCOM Columbia, Houston talking to you through Indian Ocean Station. Configure AOS. We have you for 6 minutes.

SPACECRAFT Okay. Dan we hear you, we have an echo.

CAPCOM Roger, we've got an echo on you also. And Columbia I have an OMS propellant pad the crossfeed cue for you when you are ready to copy for your OMS 2.

SPACECRAFT garbled.

PAO We have about 6 minutes remaining on this pass.

CAPCOM Okay its for your cue card. It's the crossfeed cue it's 45 percent on the left and 50 percent on the right.

SPACECRAFT Okay. 45 on left and 50 on right.

CAPCOM Roger.

SPACECRAFT And Houston, PLT we've a couple of APU thermal through the first block garbled under APU number one.

CAPCOM Roger, Columbia. We'll take a look.

SPACECRAFT And also, MPS system (garbled) we're reading a low pressure on the left and center helium system. Looks to me like it's the garbled.....understand this increase in pressures. garbled.

CAPCOM Roger thank you.

SPACECRAFT Okay Houston, PLT. We are waiting on TIG-2 now to turn the recorders on. We configured for the burn.

CAPCOM Roger.

PAO Shuttle Control Houston. 40 minutes Mission Elapsed Time. About 2 minutes away now from the ignition of the second OMS burn.

CAPCOM Columbia, Houston. For your APU we would like that APU pump valve cooling to Bravo, Bravo to Auto for that problem.

SPACECRAFT Okay. Okay Bravo is in auto. Do you want to leave A in auto or turn it off?

CAPCOM We'd like alpha off. And we're standing by to watch the burn the gimbal check looked good.

SPACECRAFT Okay Dan thank you. We're configured for the burn.

PAO Columbia now in attitude now proper attitude for the second OMS burn.

SPACECRAFT Okay we've got two good engines on the OMS 2 burn.

CAPCOM Roger.

PAO Burn in...the status check in the control center. Joe Engle reports two good engines.

CAPCOM Columbia, Houston. OMS 2 is looking good to us. We're 40 seconds from LOS. You can configure LOS we'll see you at Madrid, correction, at Yarragadee at 52+00.

SPACECRAFT Okay Daniel, we'll see you at Yarragadee. And the OMS engines are looking good here. Guidance is stable as a rock.

PAO This is Shuttle Control Houston. 43 minutes Mission Elapsed Time. Loss of signal now with Columbia through Indian Ocean next station to acquire is Yarragadee in 9 minutes. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 45 minutes Mission Elapsed Time. The flight surgeon reports the following heart rates for the crew of Columbia. At launch Commander Joe Engle's rates read 110 with a high of 120. The Pilot Dick Truly's rates read at launch 86 with a high of 94. At 45 minutes 34 seconds, this is Mission Control Houston.

PAO This is Shuttle Control Houston 52 minutes Mission

Elapsed Time standing by now for reacquisition of Columbia through Yarragadee. Discussion should center here on the GO NO GO status for payload bay door operations.

CAPCOM Hello Columbia, this is Houston talking to you UHF through Yarragadee. We have you for 6 minutes and 30 seconds.

SPACECRAFT Roger.

CAPCOM Columbia, Houston. Coming to you through Yarragadee. We have you for 6 minutes on UHF.

CAPCOM Columbia, Columbia, this is Houston talking to you through Yarragadee. We have you for 5 minutes and 30 seconds over?

SPACECRAFT Okay Dan, we read you loud and clear how do you read?

END OF TAPE

PAO targets, and the right hand and left hand port longeron targets. Truly is operating the keyboard and switches for the latch and the door opening. The sequence goes .....

END OF TAPE

PAO ...radiators which are inside the door panels are deployed away from the doors. We're at one hour 20 minutes Mission Elapsed Time, less than 10 minutes away now from reacquiring Columbia. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston, one hour 30 minutes Mission Elapsed Time, standing by now for reacquisition of Columbia on her first stateside pass.

CAPCOM Hello Columbia, talking to you through the states. We have you for 15 minutes and 30 seconds.

SPACECRAFT Roger Dan, we have the Theodolight set up. We are running a couple of minutes behind and just now bringing up the TV cameras.

CAPCOM Roger Columbia and you are go for verniers. The temps look good. And for the CDR we would like to verify that TV is aimed and ready for downlink.

SPACECRAFT Not yet Dan, but we'll get her. It's the inwork Dan.

CAPCOM Roger and when you get it if you would give us a call we'd appreciate it.

SPACECRAFT You bet your life.

PAO This is Shuttle Control Houston, 1 hour 32 minutes Mission Elapsed Time. We have observed no movement of the payload bay door latches at the present time.

CAPCOM Columbia, Houston. We have a configuration we'd like a couple of switches checked and thrown here.

SPACECRAFT Okay, Dan. What panel are they on?

CAPCOM Roger, they are on A12 and we'd like all three APU heater gas generator/fuel pump switches off.

SPACECRAFT Okay, Dan. All three of them are off.

CAPCOM Roger, thank you.

PAO Shuttle Control Houston. 1 hour 34 minutes Mission Elapsed Time. Still no movement on the payload bay door latches.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead Columbia.

SPACECRAFT Okay, Dan. We're not able to get any picture on the

monitor from camera delta. All the others seem to be working okay and we're going to run alpha around and take a look at it and see if we can see anything wrong.

CAPCOM Roger, we copy.

PAO Shuttle Control Houston now 1 hour 36 minutes Mission Elapsed Time. That was Commander Joe Engle reporting that he couldn't get a picture on camera delta at the present time. That's the color camera onboard.

CAPCOM Columbia, Houston. On camera delta, we're going to try and command it on and see if we can get it working for you.

SPACECRAFT Okay, mighty fine Dan. I can't swing alpha around far enough to see it.

CAPCOM Roger, we're going to give it a twirl and we'll let you know.

SPACECRAFT Okay, and correction on that, I can swing it around but there's some stuff in the way.

CAPCOM Roger, copy.

CAPCOM Columbia, Houston. We'd like you to configure for the verniers as soon as you can get to it.

SPACECRAFT Okay we'll do that.

SPACECRAFT Houston, Columbia. We're configured V on the vernier now and would you like the would you like the verniers off on the primaries?

CAPCOM Roger Columbia. We see the verniers on now and we'd like the configuration on PG1-6.

SPACECRAFT Okay. Thank you sir.

PAO 1 hour 39 minutes Mission Elapsed Time. This is Shuttle Control Houston as Columbia continues on this stateside pass approximately 7 minutes remaining.

CAPCOM Columbia, Houston. We have no joy on turning delta on either. We did turn on one of the aft ones and it looks good and we're going to give you the cameras for your payload bay door work.

SPACECRAFT Okay Dan. Well, hope we can get it working here before long.

CAPCOM Roger.

PAO Shuttle Control Houston. 1 hour 40 minutes Mission Elapsed Time. That was CAPCOM Dan Brandenstein reporting that Mission Control was only able to command the aft camera onboard. Therefore, we will have no color television of the payload bay door operations.

PAO Shuttle Control Houston now 1 hour 41 minutes Mission Elapsed Time.

CAPCOM Columbia, Houston. Be advised we have camera A on the flag and it is looking great.

SPACECRAFT Okay.

SPACECRAFT Dan, Houston, PLT be advised I've done the Theodolight stuff but boy it is so dark that you can barely pickup the targets and it's going to take me a little while.

CAPCOM Roger we copy.

PAO That report from Columbia the Theodolight markings are difficult to see. Shuttle Control Houston 1 hour 42 minutes Mission Elapsed Time. We have approximately 4 minutes and 20 seconds remaining on this stateside pass.

CAPCOM Columbia, Houston. I have a flight note for you.

SPACECRAFT Okay go ahead Dan.

CAPCOM Roger, on that panel A12 that APU heater tanks/fuel lines/water system 1 Bravo that you took off a few minutes ago. We'd like it back to auto.

SPACECRAFT You cut out a little bit there Dan. You say you want water loop Bravo off for a moment then, I mean water loop 2 off and then back to Bravo?

CAPCOM Negative, negative. That on panel A12 the APU heater tank/fuel line/water system 1 Bravo you turned it off a few minutes ago, we'd like it back to auto now.

SPACECRAFT Okay Dan. 1 Bravo is off now.

CAPCOM Roger, thank you.

SPACECRAFT Correction on that, it's in auto.

CAPCOM Roger.

CAPCOM Columbia, Houston. We have a state vector coming your way.

SPACECRAFT Okay.

END OF TAPE

CAPCOM A Columbia, the state vector and the REFSMMAT are onboard now.

SPACECRAFT Thank you,

CAPCOM Columbia, Houston, we're 30 seconds from LOS. We'll be talking to you through Dekar at 1 + 54

SPACECRAFT Ok, we'll see you then

PAO This is Shuttle Control, Houston, one hour 46 minutes mission elapsed time about to loose signal with Columbia through state side pass. The next station to acquire will be Dekar and approximately 8 minutes. That will be a UHF station only. Meanwhile, the crew aboard the Columbia appears to be having a tough time with the Theodolite sightings. We saw no movement of the latches, payload bay door latches during the state side pass. At 1 hour 47 minutes mission elapsed time this is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 1 hour 54 minutes mission elapsed time. Standing by for reacquisition of Columbia through Dekar. Dekar is UHF voice only. We'll standby for the call.

CAPCOM Hello, Columbia, this is Houston. Coming to you through Dekar. We have you for a minute thirty.

CAPCOM Columbia, Houston, talking to you through Dekar. We have you for a minute four.

CAPCOM Columbia, Houston, in the blind we got about 40 seconds till LOS. We'll be talking to you through Yarragadee at 2 hours and 26 minutes.

PAO This is Shuttle Control Houston. Now 1 hour 56 minutes mission elapsed time. We've passed out of acquisition range through Yarragadee. The calls to the crew were unsuccessful in receiving a response. This was a low elevation UHF pass. The next station to acquire will be orroral in approximately 30 minutes.

PAO This is Shuttle Control Houston at 2 hours 26 minutes mission elapsed time. Less than a minute away now from reacquiring Columbia through Yarragadee. We'll standby .

CAPCOM Hello, Columbia, talking to you through Yarragadee. We have you for about 6 minutes.

SPACECRAFT finishing up 1 and 2. Houston, PLT, how do you read me.

CAPCOM PLT, this is Houston, I read you weak but readable and we didn't copy the CDR's I think.

SPACECRAFT Houston, Columbia, how do you read.

PAO Yarragadee is a UHF station only.

CAPCOM Columbia, Houston, I read you loud and clear. How me?

SPACECRAFT Houston, PLT, understand you read me loud and clear. We can barely hear you. Can you hear me?

CAPCOM Columbia, Houston, Roger, we read you weak but readable.

SPACECRAFT Ok, Dan, I've got two or three things to tell you about. First, on SPEC 68 fuel cell.

CAPCOM Go ahead.

SPACECRAFT Houston, Columbia, do you read?

CAPCOM Roger, Columbia, we read. Go ahead.

SPACECRAFT Houston, Columbia, do you read?

CAPCOM Columbia, Columbia, Houston, we read you very weak but readable. Go ahead. Over.

SPACECRAFT Ok, Houston, PLT, if you read me. 68 fuel cell (garbled) O2 flow about sixteen point five.

END OF TAPE

SPACECRAFT (garbled) ...looks to me like .....but I have no real way of telling diameters, (garbled) looked okay on fuel cell 2 (garbled). Also, on the PH column at the bottom under fuel cell one, we have a PH indication with a down arrow.

PLT Houston, PLT do you read?

CAPCOM Columbia, Houston. This is we are reading you very weak. We did we'd like to have you go over the fuel cell our readings again please.

CAPCOM Columbia, Columbia, Houston. We didn't copy all on the fuel cells would you repeat that please? The COM is very weak. Over.

SPACECRAFT Roger Dan. I will repeat it very slowly. On Spec 68, standby one Houston. Okay Houston, on Spec 68 fuel cell two, O2 flow reads 16.5 high. Also, under fuel cell 1 column we have a indica... a P that's Papa Hotel indication with a down arrow. Over.

CAPCOM Columbia, Columbia, Houston. Roger we copy all. Thank you.

SPACECRAFT And, Houston, PLT. Also, need to tell you about our Spec 86 APU problem. Over.

CAPCOM Columbia, Columbia, Houston. Roger go ahead.

SPACECRAFT Roger. Standby till the Spec comes up Dan. How do you read me now?

CAPCOM Columbia, Columbia, Houston. We're reading you somewhat better now. Still weak and scratchy. Over.

SPACECRAFT Okay Dan I'll read this one slow also. Fuel pardon me. APU number 1 under pump valve 2 pump temperature, it's got a it's indicating high especially 219 degrees with an up arrow I have turned both that is alpha and bravo from valve 2 switches to auto and on the tank fuel line heater you had told me to take 1 bravo to auto and after that was when the first indication of the high temp came on and I put that switch to off. Would you like me to change it, over?

CAPCOM Columbia, Columbia, this is Houston. Roger, we copied all that. And, we will give you the answer at Orroral.

SPACECRAFT Roger, Houston. That's all I had Dan.

CAPCOM Columbia, Columbia, Houston. Roger, if you could give us a quick door status. We're 30 seconds to LOS. We'll talk to you at Orroral in about 2 and a half minutes.

SPACECRAFT Yes sir. The doors are open, the Rads are open. There's no problems at all with them.

CAPCOM Columbia, Columbia, Houston. Roger that's super and we'll take a look at this and have some words for you over Orroral.

PAO This is Shuttle Control Houston. 2 hours 33 minutes Mission Elapsed Time. Loss of signal with Columbia. Next station to acquire will be Orroral in approximately 1 minute. The final transmission on that pass from Pilot Dick Truly indicated the payload bay doors were open and the radiators were out. We're at 2 hours 33 minutes Mission Elapsed Time. This is Shuttle Control Houston.

CAPCOM Columbia, Houston. We're talking to you through Orroral. We have you for 3 minutes and 30 seconds.

SPACECRAFT Okay Dan. You're coming through Orroral okay. How do you read us?

CAPCOM Roger, we're reading you much better.

SPACECRAFT Okay Dan and I've gone into the COAS channel and seem to be having a problem with the light on the COAS but I think we'll be using the flashlight coming in through the back end of it okay?

CAPCOM Roger, we copy that Columbia.

PAO Shuttle Control...

SPACECRAFT PLT and I have completed bubbles 1 and 2 on page 1-12.

PAO Shuttle Control Houston. 2 hours 35 minutes Mission Elapsed Time. Ground data in Mission Control confirms the payload bay doors open.

CAPCOM ...we copied all that over Yarragadee and we're looking at it.

SPACECRAFT Okay Dan. Thank's a lot. That was that COM was kind of bad there. And while Joe messes around with the COAS Dan I'm going to be bubble one on page 314 powering up the RMS to the temp mode.

CAPCOM Roger, and we are wondering if you're on the wireless headsets. We didn't get it.

SPACECRAFT Negative. We have not had time. I'm presently on

the HIU plugged into the MS station. Joe is also on his HIU we haven't had time to get that on the wireless yet.

CAPCOM Okay, fine we were just a little curious. Thank you.

SPACECRAFT Roger that.

CAPCOM Columbia, Houston. We are about 10 seconds from LOS. On fuel cell 1 for the PH problem, we'd like you to do a mal 7.3 hotel on page 7-25 and on fuel cell 2 it looks good to us and we just want to watch it for a little while.

SPACECRAFT Dan say again the mal number.

CAPCOM Roger, mal 7.3 hotel. It's on page 7-25 in the mal book.

SPACECRAFT Okay we've got it 7.3 hotel.

CAPCOM Roger Columbia and we're going LOS here. We'll be talking to you at Hawaii at 2+54.

SPACECRAFT Okay Dan we'll be there.

PAO Shuttle Control Houston. 2 hours 39 minutes Mission Elapsed Time. We've had loss of signal now with Columbia.

PAO This is Shuttle Control Houston 2 hours 53 minutes Mission Elapsed Time. Standing by for reacquisition of signal with Columbia through Hawaii.

PAO Now processing data through Hawaii.

CAPCOM Columbia, this is Houston talking to you through Hawaii we have you for 2 1/2 minutes.

SPACECRAFT Okay, Houston. Columbia read you loud and clear and we're getting into the IMU alignment. COAS alignment went okay although we never got a call.

CAPCOM Roger and ...

END OF TAPE

PAO Now processing data through Hawaii.

CAPCOM Columbia this is Houston talking to you through Hawaii. We have you two and a half minutes.

SPACECRAFT Okay Houston, Columbia reads you loud and clear, and we're getting into the IMU alignment KOS alignment went okay, although we never got a fall button.

CAPCOM Roger, and we didn't pass your qualifier on that MAL for the PH we'd like you to stop we're not going into step four, in other words just do up to the tank ISOL.

SPACECRAFT Good, because that's how far I had gone and I stopped there anyway Dan.

CAPCOM That's nice of you to cover for us. Okay, on the, at 250 in the timeline your supposed to switch APU coolant systems and from there we would like you to turn APU fuel pump valve cooling bravo to off.

SPACECRAFT I understand, turn bravo to off at 2 plus 50 and then leave alpha in auto, is that right?

CAPCOM That is correct, and also in relation to that you mentioned that APU tank or heater tank fuel line water system one bravo you turned that back off because of the, you tied it in with APU 1 cooling temp going up. And that is not a problem.

SPACECRAFT (garbled) break, break stand by

CAPCOM Go ahead.

SPACECRAFT I'm sorry Dan, start over again you were cut out.

CAPCOM Roger Columbia, on A12 we would like that APU heater tank fuel line water system one bravo back to auto, that was something we were going to try to use to help troubleshoot that GGBM cooling problem and we were unable to, it has no affect on that APU 1 temp problem.

SPACECRAFT Okay Dan, One bravo is back in auto.

CAPCOM Roger.

SPACECRAFT Dan, since you don't have anything else to do, I'm having a little problem with one of RMS panels and I wonder if I can tell you a little bit about that. This is like a long SIM isn't it?

CAPCOM Yes it sure is. Okay go ahead.

SPACECRAFT Okay, if you'll turn to one dash 14 in the PDP bubble one.

CAPCOM Roger, we have it and we're 30 seconds LOS, so hurry.

SPACECRAFT Okay real quick, I think I have pushed in the circuit breakers downstairs, when I turned to RMS power to primary I got master alarm button, did not get any lights on the panel here, and also when I well essentially got no lights, got no temperature lights or annunicator lights on the panel, and I have checked the switches, but I'll be glad for you to think about it and give me suggestions for other things to check.

CAPCOM Roger Columbia we're about 5 seconds away from LOS we'll look at it and think it over, we'll talk to you at the states at three hours and one minute.

SPACECRAFT See you then Dan.

PAO This is Shuttle Control Houston, two hours 57 minutes mission elapsed time we've had loss of signal with Columbia through Hawaii. We will next acquire over the states in approximately three and a half minutes.

PAO This is Shuttle Control Houston, at three hours mission elapsed time we're a little over a minute away now from reacquiring Columbia over the states to start the third revolution. Regarding the APU status, APU number one fuel pump exhibited high fuel pump temprerature on the output side this was due to a heater configuration, the present confusion is over why the water spray cooler did not immediately bring the temperature down. The problem is not considered serious, however analysis is still underway. We're less than a minute away now from reacquiring Columbia this is Shuttle Control Houston.

PAO Shuttle Control Houston processing data.

CAPCOM Talking to you through the states, we have you for about 18 minutes.

SPACECRAFT Okay Dan, we're reading you loud and clear.

CAPCOM Roger, and on your RMS lights recommend try on panel apha eight upper, rotary switches under lighting, the annunicator numerics clockwise and also the panel instruments to bright.

SPACECRAFT Okay Dan, under lighting the bright variable switch is in bright, the annunicator, the rotary the center annunicator rotary is in full clockwise in medium and the panel initialization is full clockwise and bright.

CAPCOM Roger copy.

SPACECRAFT Also, one minor thing Dan, when Joe and I got back here after launch there were a couple of the little

END OF TAPE

CAPCOM Columbia, Houston we were in a Handover, that's probably why the comm was bad we see a target supress bit on both the star trackers, we'd like you to cycle the shutters.

SPACECRAFT Roger Dan understand cycle the shutters and the on target present in both star trackers.

SPACECRAFT Houston, Columbia the -Y star trackers picked up Star 47 and I believe we're pointing down toward the earth with them -Z right now.

CAPCOM Roger

CAPCOM Columbia, Houston we'd like to you to do a manual fuel cell purge on fuel cells two and three and stand by on fuel cell one, we're still thinking and working on that one.

SPACECRAFT Will do Dan, and you want me to go ahead and do that now?

CAPCOM Roger, that's affirmative. Temps look good and your cleared to do the manual fuel cell purge on two and three.

SPACECRAFT You bet (garble) that's in the works.

PAO Shuttle Control Houston, three hours 15 minutes mission elapsed time, that was CAPCOM Dan Brandenstein giving a go to manually purge

SPACECRAFT Fuel cell two in progress parden me, the H2 flow rate indicated properly.

CAPCOM Roger.

PAO The crew manually purging fuel cells two and three at the present time. They're holding fuel cell one in abeyance, because of a PH high rating.

CAPCOM Columbia, Houston, panel R2 we need APU fuel pump/valve cool bravo to off.

SPACECRAFT Roger Dan, sorry about that, it is off.

CAPCOM Thank you.

PAO The EGIL flight controller reports the fuel cell purge is looking good. They are presently purging fuel cell number two.

SPACECRAFT Houston PLT the purge on fuel cell two is complete and on fuel cell three it is in works.

CAPCOM Roger we copy, thank you.

SPACECRAFT And we just got a star tracker message, Dan and I believe (garble) just closed and not sure whether that's good or not.

CAPCOM Roger. Columbia that star tracker is no problem, you can open it up and proceed.

SPACECRAFT Okay fine, and as soon as we can get the -Z shutters stay open (garble) get the IMU alignments.

CAPCOM Roger.

PAO Shuttle Control Houston, three hours 19 minutes mission elapsed time. Flight Director Neil Hutchinson is going around the room at the present time a go no go to stay on orbit.

SPACECRAFT And Dan we got about another 25 seconds to go on fuel cell three, so I'm waiting on your instructions about fuel cell one.

PAO Astronauts Engle and Truly given a go to stay on orbit.

CAPCOM Say again the bit on fuel cell one two and three are looking good to us.

SPACECRAFT Roger I understand. I just said we are about through on the purge on fuel cell three and I'm waiting on your instructions whether to purge fuel cell one or not.

CAPCOM Roger, we still don't have an answer on that, do not purge that, we'll talk to you at Dekar concerning it.

SPACECRAFT Okay, want me to leave the purge heater on, or

CAPCOM Yes, we'd like the purge heater left on.

SPACECRAFT Okay. The purge is complete on fuel cell three and it looks good on top.

CAPCOM Roger, it looks good to us, we're 25 seconds from LOS and your go for orbit OPS and everything is looking good and We'll have an answer for you on fuel cell one at Dekar, and we'll see you there at 3:25.

SPACECRAFT Okay we'll see you there, Dan, thank you much Understand we're go for orbit.

CAPCOM That is affirmative, your go for orbit.

PAO This is Shuttle Control Houston, at three hours 20 minutes mission elapsed time. Loss of signal now with Columbia. The crew of Columbia given a go to stay on orbit, which means they can get out of their suits. We're at three hours 20 minutes mission elapsed time, the next station to acquire will be Dekar and

END OF TAPE

CAPCOM Roger, copy.

SPACECRAFT Also, one minor thing, Dan, when Joe and I got back here after launch there were a couple of the little annunciator lights in the center of alpha 8 upper that had popped out about a 1/4 of an inch and we needed to reset them.

CAPCOM Roger, we copy. Columbia, Houston, we'd like you to go and check those circuit breakers again on MA73 Charlie. It's AC1 RMS primary phase alpha and backup phase alpha that they're in and we show that the RMS did go into the temp mode.

SPACECRAFT You say you showed that it did not go into the ... mode?

CAPCOM No, we showed that it did go in the temp mode

SPACECRAFT Ok, hang on just a second, Dan. Ok, Dan, I'm down looking at whatever this MA73 Charlie upset down, but the RMS primary and backup circuit breakers which I did push in have been remain close. And I didn't tell you the whole story. Even though I didn't get the lights I went ahead and did an I/O reset on that spec and so I think the RMS did go into the temp mode also but the only problem is the readouts on panel alpha 8 upper.

CAPCOM Roger, thanks for the info and we'll keep working it.

SPACECRAFT Okay. Hey, we're right over the Sultan Sea right now, aren't we?

CAPCOM Roger. Columbia, and we'd like the fuel cell purge heaters to on.

SPACECRAFT Roger, Dan, the purge heaters are on.

CAPCOM Roger, thank you.

SPACECRAFT And Houston PLT, just for your information the C&W has all been retest per page 114.

CAPCOM Roger, thank you.

PAO Shuttle Control Houston, three hours eight minutes mission elapsed time about 12 minutes remaining on this state side pass. We're standing by now for the start of the fuel cell purge.

SPACECRAFT Houston, PLT, you're gonna want me to do a manual fuel cell purge all the way with these extra problems or not?

CAPCOM Standby, one we're gonna get an answer for you, Dick.

SPACECRAFT Houston, CDR

CAPCOM Go ahead, CDR this is Houston.

SPACECRAFT It's ok, Daniel, it looks like for the timeline we may need to alter the IMU alignment here and possibly stick another couple of stars better wait till they get a little farther around on the dark side here that may delay the ZLV wipeout attitude and if you concur we'll just delay the alignment for awhile and then go to ZLV after the alignment.

CAPCOM Roger, standby, I'll get back with you on that. And Columbia, that sounds like a good plan to us, we concur with that.

SPACECRAFT Understand, you said that it sounds like a good plan to you, Dan.

CAPCOM That's affirmative.

SPACECRAFT Ok.

CAPCOM And Columbia, Houston, we see targets suppressed bit on IMU'S pressures on the star tracker's so you'll have to cycle shutters.

SPACECRAFT Dan, I'm sorry. I can't quite read you. I think you are coming up on UHF only and I can't hardly read you on that.

CAPCOM Roger, Columbia, we see a target suppressed bit on the star tracker we'd like you to cycle the shutter. That's both trackers, Columbia.

SPACECRAFT Houston, CDR..., Dan, you're unreadable on UHF.

CAPCOM Columbia, Houston, now we were in a hand over S that's probably why the comm was bad. We see a target suppressed bit on both star trackers, we'd like you to cycle the shutters.

SPACECRAFT Roger, Dan, understand cycle the shutters and there are targets present in both star trackers.

END OF TAPE

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PAO The crew manually purging fuel cells two and three at the present time. They're holding fuel cell one in abeyance, because of a PH high rating.

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SPACECRAFT Roger Dan, sorry about that, it is off.

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SPACECRAFT Roger I understand. I just said we are about through on the purge on fuel cell three and I'm waiting on your instructions whether to purge fuel cell one or not.

CAPCOM Roger, we still don't have an answer on that, do not purge that, we'll talk to you at Dekar concerning it.

SPACECRAFT Okay, want me to leave the purge heater on, or

CAPCOM Yes, we'd like the purge heater left on.

SPACECRAFT Okay. The purge is complete on fuel cell three and it looks good on top.

CAPCOM Roger, it looks good to us, we're 25 seconds from LOS and your go for orbit OPS and everything is looking good and We'll have an answer for you on fuel cell one at Dekar, and we'll see you there at 3:25.

SPACECRAFT Okay we'll see you there, Dan, thank you much Understand we're go for orbit.

CAPCOM That is affirmative, your go for orbit.

PAO This is Shuttle Control Houston, at three hours 20 minutes mission elapsed time. Loss of signal now with Columbia. The crew of Columbia given a go to stay on orbit, which means they can get out of their suits. We're at three hours 20 minutes mission elapsed time, the next station to acquire will be Dekar and

END OF TAPE

PAO Shuttle Control Houston at 3 hours 20 minutes Mission Elapsed Time. Loss of signal now with Columbia. The crew of Columbia given a go to stay on orbit which means they can get out of their suits. We're at 3 hours 20 minutes Mission Elapsed Time. The next station to acquire will be Dakar in a little over 4 minutes.

CAPCOM Columbia, Houston talking to you through Dakar. We have you for 7 minutes.

SPACECRAFT Okay Dan read you loud and clear.

CAPCOM Roger, Roger. We're reading you pretty good also. Okay a couple of things on page 1-17 in the PDP bubble 2. Second to the bottom step that supply water crossover valve. We would like that, we would like you not to close it. We would like it to remain open. Over.

SPACECRAFT Okay Dan. I did close it about a minute ago but it's open now.

CAPCOM Roger, thank you.

SPACECRAFT Roger.

PAO This is Shuttle Control Houston. 3 hours 26 minutes Mission Elapsed Time. In contact with the crew of Columbia through UHF and Dakar is the station.

CAPCOM Columbia, Houston. On that PH thing, after you get out of the suits, for fuel cell 1 the PH problem we would like you to proceed on with the mal and go down and do get a water sample and test it and the chem strips which you test it with are in the urine test kit.

SPACECRAFT I understand Dan. Dan you do want us to test the water and the sticks are in the urine test kit is that right?

CAPCOM That's affirmative. And we I'm not sure but we cannot prove that it is not a PH problem and we would like that verified before we try and do our fuel cell purge.

SPACECRAFT Roger Dan. Understand.

PAO Shuttle Control Houston. 3 hours 27 minutes Mission Elapsed Time to get the water sample from fuel cell 1 requires the crew to go down to the middeck and pull a panel. Meanwhile, we are holding in advance the purge of fuel cell 1. We have two good fuel cells in operation which qualifies Columbia to stay on orbit.

CAPCOM Columbia, Houston. Go ahead.

SPACECRAFT We might be thinking. Do you want us to just stay in this attitude and wait for this other star to come up or do you want us to go to another attitude for a pair of stars for the alignment?

CAPCOM Columbia, Houston. We would like to get that alignment but we need as little maneuvering as possible we're a little bit below our redline on RCS usage and so you can maintain that until you can come up with we're a little bit below nominal excuse me.

END OF TAPE

CAPCOM Columbia, Houston. We would like to get that alignment but we need as little maneuvering as possible. We're a little bit below our redline on RCS usage and so you can maintain that until you can come up with we're a little bit below nominal, excuse me.

SPACECRAFT And Houston, how long do we have in this pass?

CAPCOM Roger, we have you for 3 minutes and 30 more seconds. Did you copy my answer to Joe's question you were right overhead site, you may have missed it.

SPACECRAFT You bet, sure did Dan. We'll stay in this attitude get the star and then go to the (garbled) attitude.

CAPCOM Okay, thank you.

CAPCOM Columbia, Houston we'd like on the RMS for a little trouble shooting we'd like to verify that you got the shoulder brace loose and you got the talk back to signify that.

SPACECRAFT Negative, I stopped in that bubble when I talked to you about the lights, but hang on I'll go back to it if you'd like me to get it right now. I'll let you know how it turns out.

CAPCOM Roger Columbia, we would like that information if we can get it.

SPACECRAFT Okay.

SPACECRAFT Okay Houston PLT I've got RMS power in primary, the RMS select to port did not get any lights I did get a master alarm and which I punched out even with no lights, and I've (garble) the shoulder brace relief switch to port for over five seconds and I do not have a gray.

CAPCOM Roger Columbia be advised you have to hold it in that position for about 12 seconds.

SPACECRAFT Okay, mark.

CAPCOM Roger that is at least two seconds past turning the talk back turning gray.

SPACECRAFT Okay Houston, I'm still holding it and it still barberpole.

CAPCOM Roger Columbia you can discontinue that, and we're 30 seconds to LOS. We were wondering if you had any comments on the tape during the launch, that we could get off and we'll be talking to you at Botswana at 3:43.

PAO Shuttle Control Houston, three hours 33 minutes mission elapsed time. Loss of signal now through Dekar, the next station scheduled to acquire is Botswana in a little less than 10 minutes. This is Shuttle Control Houston.

END OF TAPE

PAO Shuttle Control Houston.

CAPCOM Columbia this is Houston, talking to you through Botswana we have you for four minutes.

SPACECRAFT Roger Dan loud and clear. And I have some good news on the RMS, you got anything for us?

CAPCOM Roger, we'll take good news first.

SPACECRAFT Hey, I knew you would. Apparently, when we went down to close the circuit breakers downstairs which was kinda dark Joe was doing some coed stuff, one of the circuit breakers for the just above the RMS breakers had gotten thrown and not the two RMS breakers they had never been pushed in, I pushed them in we did get lights and did get the shoulder brace released, and so you can forget the RMS problems, they were switch configurations.

CAPCOM Well that makes us very happy, thank you.

PAO Shuttle Control

SPACECRAFT (garble) few words on you on the star tracker and if you got something go ahead.

CAPCOM We'll take star tracker words.

SPACECRAFT Okay, it looks to me like the delta angle on the -Z star tracker is pretty large, it was three and a half, it was running two point five, now getting a false track. And it is, the shutter is staying open it is seeing star 31 but it will not take it into the table.

CAPCOM Roger, we copy that Columbia. And Columbia, Houston, could you confirm which star tracker that was on please?

SPACECRAFT Yes, that is the -Z star tracker, -Zebra.

CAPCOM Roger copy, -Z. And also a question on if you had any comments on the tape during launch you could let us know, so we can track them down and if you hadn't, didn't get any during the launch you could put them on and let us know when you do it so we can get a playback on that.

SPACECRAFT Okay, we haven't put anything on there yet, we will and we'll let you know when and where it is Dan.

CAPCOM Roger, thank you.

SPACECRAFT And Dan I guess a question for you to think about is, if you'd like us to go to the one star tracker to get the procedures to get the IMU alignment, or do you want us to go ahead to the ZLV?

CAPCOM Roger, stand by on that Joe, we'll get an answer for you.

SPACECRAFT Okay.

CAPCOM Columbia, Houston we believe that star will be in view again at 3 plus 50 and we'd like to try it again then we do not want you to use single star tracker procedure yet, we'd like to get some TM and look at it first.

SPACECRAFT Okay, mighty fine, we'll do it.

CAPCOM And Columbia Houston, will you verify that the cell test on the star trackers were both good?

SPACECRAFT Yes sir, the both did a good cell test Dan.

CAPCOM Roger, thank you and we're 30 seconds away from LOS we'll be talking to you through Yarragadee at four plus 00.

SPACECRAFT Okay.

END OF TAPE

CAPCOM Columbia, Houston, would you verify that the self test on the star trackers were both good?

SPACECRAFT Yes, sir. They both did a good self test, Dan.

CAPCOM Roger, thank you, and we're 30 seconds from LOS and we'll be talking to you through Yarragadee at the 4 + 00.

SPACECRAFT Ok. We'll see you there. And, Dan, once again the minus Z star tracker is picking up star 31 at the present time, it just has a very large delta angle in minus Z.

CAPCOM Roger, we copy that. Thank you.

PAO Shuttle Control Houston. Three hours 47 minutes mission elapsed time. Loss of signal now with Columbia. The next station to acquire will be Yarragadee in approximately 13 minutes. Meanwhile, pilot Dick Truly had some good news to report during this last pass. He reported that the RMS shoulder brase had released. This was a requirement for RMS operations tomorrow. We're at 3 hours 47 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 4 hours mission elapsed time. Standing by now for reacquisition of Columbia through Yarragadee. We expect the crew will be asked to repeat the IMU alignment star marks over Yarragadee. We'll standby for CAPCOM Dan Brandensteine's call.

CAPCOM Hello, Columbia, this is Houston, we're talking to you through Yarragadee. We have you for six minutes.

CAPCOM Columbia, Houston, we're talking to you through Yarragadee. We have you for five minutes. over

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

CAPCOM Columbia, slightly weak and scratchy, but we copied all. I do have a couple flight notes for you if you are ready.

SPACECRAFT Ok, Dan, we're, Richard will get on the headset here in just a second and in the meantime we did get. You were right about that star, it was ..... we have a few stars in the table and a good IMU alignment and we ..... and we're gonna start the maneuvers here the ZLV.

CAPCOM Roger, Columbia, we copy that and that takes care of one of our flight notes. The other one is for your camera delta on panel R15 row echo we would like to verify that the circuit breaker for the camera pan and tilt is closed.

PAO Commander Joe Engle reporting that they had a good

IMU alignment, so the repeat will not be required.

CAPCOM And Columbia, Houston, I don't know if you copied my last but we would like to verify the position of the camera/pan tilt circuit breaker on panel R15 row echo.

SPACECRAFT Ok, ... we'll check that .....we're gonna go ahead and maneuver to the ZLV wipeout attitude.

END OF TAPE

CAPCOM And Columbia Houston, I don't know if you copied my last, but we'd like to verify the position of the camera/pan tilt circuit breaker on panel R15 row echo.

SPACECRAFT Okay stand by we'll check that Dan, and standing byfor your go to go ahead maneuver to the ZLV wipeout attitude.

CAPCOM And roger Columbia, you do have a go to maneuver.

SPACECRAFT Houston, PLT on row echo all of the camera circuit breakers are still open, it looks to me like that we might of missed them reconfiguring panel R15.

CAPCOM Roger Columbia, we copy that, stand by one.

SPACECRAFT Okay looks like it's not just one of them is open there is a whole line of them. So looks like the best thing to do is to close them all.

CAPCOM And Columbia Houston, we wonder if you remember closing those or do you believe they've been open all along, when you went through page 1-6 of the PDP.

SPACECRAFT Stand by Houston, PLT I believe they've never been closed.

CAPCOM Roger stand by one Dick.

SPACECRAFT Okay.

CAPCOM And Columbia Houston, you're go to close those circuit breakers.

SPACECRAFT Okay we got that Dan, and Dan also if you copied we did get a good IMU alignment, it looked good onboard anyway, and I can read the numbers down to you and if your satisifed with it we'll go ahead and maneuver it to the ZLV attitude.

CAPCOM Roger Columbia we're happy as can be with them and your cleared to maneuver to ZLV.

CAPCOM And Columbia Houston, we'd like to verify that you both are comfortable now and out of the suits.

SPACECRAFT Dan I've got my suit off, Joe has not gotten his off yet, since we ran a little behind on these various problems.

CAPCOM Roger we copy that Dick, and we're about 35 seconds from LOS we'll be talking to you through Hawaii at 4 plus 26.

SPACECRAFT Okay Dan, thanks a million.

PAO This is Shuttle Control Houston, four hours 7 minutes mission elapsed time the next, we've had loss of signal with Columbia. The next station to acquire will be Hawaii in approximately 18 minutes. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston, four hours 25 minutes mission elapsed time, standing by now for reaquisiton of Columbia through Hawaii tracking

CAPCOM Hello Columbia this is Houston we're talking to you through Hawaii we have you for six and a half minutes.

SPACECRAFT Roger Dan, how do you read me?

CAPCOM Read you loud and clear, and we have a few words for you if you have a few seconds.

SPACECRAFT Okay and your hearing the first transmission from the wireless comm this makes all the difference in the world.

CAPCOM The, it sounds great to us. And Dick one thing, couple things, no need to worry about that VTR playback we're going to try and give you a little time to catch up here and in place of that playing back the VTR we're going to take cameras and command them from down here during your Hawaii pass.

SPACECRAFT Okay, if there is anything you'd like for us to help you with, we'll be glad to, but I think that is a good idea. We're going to catch up here in a few seconds.

CAPCOM Okay fine, and what were going to do is to let you clean up the PDP and catch up and we would like a note on how your PH what your status is on that procedure.

SPACECRAFT Dan we have not, we just got the suits off and have not progressed into taking a sample.

CAPCOM Okay, I do

END OF TAPE

SPACECRAFT Ok, if there's anything you'd like for us to help you with we'll be glad to but I think that's a good idea. We're gonna catch up here just a second.

CAPCOM Ok, fine, and yea what we're gonna do is to let you clean up the PDP and catch up and we would like a note on how your PH what the status is of that procedure.

SPACECRAFT Dan, we have not, we've just had gotten our suits off and have not progressed into taking a sample.

CAPCOM Ok, I could give you a little help there. The medical kit's in locker MF14M and the urine test package is in the red kit pocket bravo 2-2.

SPACECRAFT Thank you, Mike, fox trot 14M red kit bravo 2-2.

CAPCOM Roger, and if you need a picture for where the microbial filter is, that's inflight maintenance book on page 88 there's a picture.

SPACECRAFT Thank you, Dan.

PAO That discussion

CAPCOM I gave you that wrong, Dick, it's page 80 instead of 88.

SPACECRAFT Ok, page 80, go ahead.

PAO That discussion centers around the water sample from fuel cell one.

CAPCOM where the microbial filter is to give you a little map in case you needed it.

SPACECRAFT Roger, understand. And Houston CDR how do you read on the waters.

CAPCOM Roger, Joe, I read you loud and clear.

SPACECRAFT Ok, Dan, we're presently going through the reconfiguration here. We're getting PCS reconfigured and both Dick and I are feeling real well. We're certainly feeling the effects of zero g, the fullness in the head and all that but we're feeling real good.

CAPCOM Good, glad to hear it. Columbia, Houston, the evaporator kicked off so we'd like you to go to primary correction we'd like you to go to off and then back to primary A.

SPACECRAFT Ok, off and back to primary A on the .....

CAPCOM Roger

SPACECRAFT Ok, that's it.

CAPCOM Thank you. Columbia, Houston, we're looking at some pictures comirg from camera delta and they're looking great.

SPACECRAFT Ok, Dan, good.

PAO The television pictures that we're seeing are ground operated.

CAPCOM We're 30 seconds from LOS. We're be talking with you over the states at 4 hours and 35 minutes.

SPACECRAFT Ok, Dan, we'll see you then.

CAPCOM And as you go over the hill we're seeing some fabulous pictures of the back end of the bus and the earth's

SPACECRAFT Hey, great, so are we.

PAO Shuttle Control Houston. We're four hours 32 minutes mission elapsed time. Loss of signal now with Columbia. We will next acquire over the states and in a little less than three minutes. Shuttle Control Houston. Four hours and 35 minutes mission elapsed time. We're now receiving data through Buckhorn.

CAPCOM Columbia, this is Houston. We're talking to you over the states and we have you for eighteen minutes.

SPACECRAFT Ok, Dan, we're reading you loud and clear and we're just marching along through the timeline here.

CAPCOM Roger, and we did see the flash evaporator kick off again and we're gonna do some looking at it over the states here and no action required at this time.

SPACECRAFT Ok, mighty fine. We'll standby to bring the other one up if necessary.

CAPCOM Roger. Columbia, Houston, when both of you are satisfied that you are done with everything in the PDP, if you'd let us know and that way we can do our switch scan and make sure that everything got accomplished.

SPACECRAFT Mighty fine, Dan, we'll do that. We'll let you know in just a minute.

CAPCOM And Columbia we're no rush on that just whenever you get it finished.

SPACECRAFT Ok, thank you Dan.

CAPCOM And Columbia, Houston, when you get to it on page 4-2 of the CAP you go to shut down the APU fuel pump coolant valves and do that procedure there.

END OF TAPE

CAPCOM Your go to shut down the APU fuel pump coolant valves and do that procedure then.

PAO Shuttle Control Houston, four hours 39 minutes mission elapsed time a very quiet state side pass Joe Engle and Dick Truly are going through various activities, clean up work to put them in position to go to the crew activity plan.

SPACECRAFT (garble) we're presently over Albequerque at this time and we're at flight level 370 (garble)

SPACECRAFT Houston, Columbia

CAPCOM Go ahead Columbia.

SPACECRAFT Okay Dan, we had a chance to review and scan through I believe we're completed with the PDP if you want to take a quick scan and tell us if there is anything you see on the configuration. We're satisifed with it with the exception of the teleprinter and we're going to activate that pretty quick.

CAPCOM Roger, thank you.

PAO Shuttle Control Houston, four hours 42 minutes mission elapsed time. Flight director Neil Hutchinson asking member of his flight control team to scan their displays and make sure all systems are in order for on-orbit operations. The payloads flight controller reports the SMIR A data take went well. We're at four hours 44 minutes mission elapsed time.

CAPCOM Columbia, Houston, we've been watching IMU 3 and we've been getting some drifts that we kinda expected it's in attitude should it fail RM just leave it out do not do an IMU to IMU align on it, we're going to babysit and keep an eye on it for awhile and see if we can get some compensations worked out.

SPACECRAFT Okay Dan we sure will do that, thank you.

SPACECRAFT Houston, PLT

CAPCOM Go ahead Columbia.

SPACECRAFT Roger Dan, two things, first on spec 89 and SM the OMS Xfeed right, under the right column on (garble) mid temps indicating 49 with a down arrow.

CAPCOM Roger, we copy that

SPACECRAFT And in the last few minutes as the DPS guy can see we have gotten a number of poll figures on CRT 2 every time we either try to reassign or put it down to SM and it is also generated CRT BITE message four times in a row on a (garble).

CAPCOM Roger, we copy that Dick and we'll take a look.

SPACECRAFT Okay.

CAPCOM And Columbia, Houston we've noticed a shift in the load sharing on fuel cell one, it is down to about 28 percent, voltage looks good and we're keeping an eye on it.

SPACECRAFT Roger Dan.

SPACECRAFT Houston, Columbia, do you read?

CAPCOM Say again, Columbia

SPACECRAFT Yes Dan we're getting a master alarm, we were getting a few master alarms I think there was a cabin atmosphere caution and fuel warning light that was flickering on intermittently here and I know show just a little over 15 PSI we'll look at the backup cabin pressure see what we got up here.

CAPCOM Roger.

CAPCOM Columbia, Houston we got about two minutes left on this pass. With that fuel cell one going down as load sharing we would like to bus tie it and then open fuel cell number one, and we're going to think about it and hope we come up with an answer for you.

END OF TAPE

CAPCOM Columbia, Houston. We have about 2 minutes left in this pass. With that fuel cell 1 going down as load sharing, we would like to bus tie it and then open circuit fuel cell number 1 and then we're going to think about it and hopefully come up with an answer for you.

SPACECRAFT Okay Dan. We understand, you want to bus tie and open circuits at fuel cell and see it work.

CAPCOM Roger, thank you Columbia and we will take a good look at it and get some answers to you.

SPACECRAFT Okay.

SPACECRAFT And Houston, PLT. A and B are tied down. We have taken fuel cell 1 off of Main A and the essential 1BC.

CAPCOM Roger, we see that thank you.

CAPCOM Columbia, Houston. We're 30 seconds from LOS we'll be talking with you over Dakar at 5 hours straight up.

SPACECRAFT Okay we'll see you at Dakar then.

PAO This is Shuttle Control Houston. 4 hours 54 minutes Mission Elapsed Time. Loss of signal now with Columbia. The next station to acquire will be Dakar in approximately 6 minutes. Meanwhile the end of that stateside pass there was a report that the load sharing on fuel cell 1 had dropped to approximately 26 percent. The other two fuel cells read in the range of 35 to 38 percent. As a consequence CAPCOM Brandenstein did pass along the word to Bus tie and main bus A was tied to main bus B. In doing this this removes the load on fuel cell 1. We are at 4 hours 55 minutes Mission Elapsed Time. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 5 hours Mission Elapsed Time. Standing by now for reacquisition with Columbia through ...Dakar.

CAPCOM ...Dakar we have you for a few minutes then we'll pick you right up in ascention we got about 9 minutes total here.

SPACECRAFT Roger Dan. Loud and clear. We have just gotten a couple of Spec 68 fuel cell messages probably caused by open circuiting that fuel cell. The volts are indicating a 35.7 with an up arrow amps are reading 0 with a low arrow and the O2 flow is reading .5 low and a H2 flow is reading -.1 low.

CAPCOM Roger Columbia we copy that.

PAO Shuttle Control Houston. 5 hours 3 minutes Mission

Elapsed Time.

CAPCOM Columbia, Houston.

SPACECRAFT Houston we're reading you okay Dan and we just had a master alarm which we unable to find out what it was that tripped it off.

CAPCOM Roger Columbia, we'll take a look at that and what we'd like to do now is we'd like to do a fuel cell number 1 shutdown...

END OF TAPE

CAPCOM Columbia, Houston.

SPACECRAFT Houston, we're reading you okay Dan, and we just had a master alarm and we're unable to find out what it was that tripped it off.

CAPCOM Roger Columbia, we'll take a look at that, and what we'd like to do now is we'd like to do a fuel cell number one shutdown, they'll be no power down required (garble) between the 02 and the H2 and that procedure is on page 5-7 of the orbit pocket checklist. And we still plan to do an OMS 3 and 4 going up hill we just want to shut this fuel cell down while we think about it.

SPACECRAFT Okay, stand by just a second Dan

PAO That call up from CAPCOM Dan Brandenstein telling the crew of Columbia to take (garble)

SPACECRAFT (garble) number

CAPCOM Roger Richard it is page 5-7 on orbit pocket checklist.

PAO Telling the crew aboard Columbia to shut down fuel cell number one. The concern is the mix of possible mix of oxygen and hy

SPACECRAFT We've done everything through step 3 except stop the fuel cell and so I'll do that now. Fuel cell number one.

CAPCOM Roger, fuel cell one.

PAO We repeat, fuel cell number one is being shut down.

SPACECRAFT Okay Dan we got the master alarm again, and the cabin atmosphere is flicking on intermittently.

CAPCOM Roger Columbia, we copy that.

CAPCOM Roger Columbia, on that cabin atmosphere we believe it's the temperature probably getting a little warmer in there and its bumping the pressure high. If you are uncomfortable as far as temperature goes, you can go flash evap primary B.

SPACECRAFT Okay understand that. We are not uncomfortable Dan so we'll just live with it for now.

CAPCOM Okay, and you know then probabaly what is causing the C&W.

SPACECRAFT I know, thank you

CAPCOM And Columbia Houston, on fuel cell one we'd like the react valves closed. It is not in the procedure, but we'd like the react valves closed on the fuel cell one.

SPACECRAFT Okay, fuel cell one is shutdown, and the reactant valves are closed Main A is tied to Main B.

CAPCOM Roger, we see that, looks good to us thank you.

SPACECRAFT And Dan, now that we have done that do you still want to continue with that sampling of the water.

CAPCOM That's a negative Columbia.

SPACECRAFT Okay.

SPACECRAFT And Houston PLT just to keep three CRTs with all this going on we have reassigned CRT 2 momentarily have not had a chance to change it in the MAL book, we are using CRTs 1 and 3 and 4.

CAPCOM Roger, we copy that Columbia. And Columbia Houston we have the rest of this pass and Botswana are our only two chances to get the pads up for three alpha and bravo for your cue cards, so if your ready to copy those here, we'd like to give them a try at Ascension, we have a minute thirty left yet.

SPACECRAFT Okay we'll get the cards out Dan

CAPCOM Columbia, Houston we're thirty seconds from LOS we won't get the pad up this time but if you have those cards ready we'll catch you at Botswana with it and we'll pick you up there at five hours and 15 minutes.

SPACECRAFT Okay, roger out, and we're ready, we'll be ready when we come AOS.

CAPCOM Roger, thank you

PAO This is Shuttle Control Houston, at five hours 10 minutes mission elapsed time. A loss of signal now with Columbia, the next station to acquire will be Botswana approximately in four and a half minutes. Fuel cell number one has been shutdown during the last pass over Ascension, the reason being, there was a concern about a seepage which could bring about a mixture of oxygen and hydrogen. Per the flight plan we still expect OMS 3A and B as well as OMS 4 to occur, and it also is possible to restart fuel cell number one if desirable later in the mission. We're at five hours 11 minutes mission elapsed time this is Shuttle Control Houston.

END OF TAPE

PAO ...per the flight plan. We still expect OMS 3 A and B as well as OMS 4 burns to occur. And it is also possible to restart fuel cell number 1 if desirable later in the mission. We're at 5 hours 11 minutes Mission Elapsed Time this is Shuttle Control Houston.

PAO This is Shuttle Control Houston. 5 hours 15 minutes Mission Elapsed Time. Standing by now for contact with the crew through Botswana.

CAPCOM Hello Columbia, this is Houston. We have you through Botswana we're 5 minutes and you can we're going to delay OMS 3 apha in Bravo and OMS 4 for a rev here. We want to understand the power loads and with the fuel cells out and stuff before we try and pull off this burn.

SPACECRAFT Okay Dan we understand that.

PAO Shuttle Control Houston, 5 hours 16 minutes Mission Elapsed Time. That was CAPCOM Brandenstein reporting to Engle and Truly that the remaining OMS burns will be delayed by one revolution until a better understanding takes place regarding the power levels required for the burns. We're at 5 hours 16 minutes Mission Elapsed Time. This is Shuttle Control Houston.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead Columbia.

SPACECRAFT Roger, Dan. We just got three consecutive messages S86 APU hydraulic APU I do not see an additional down arrow. The for number 1 the valve temp pump valve cool valve temp reads 129. I thought I saw a momentary down arrow in that part of the display and that might of been it over.

CAPCOM Roger Columbia.

CAPCOM Columbia, Houston. For your information we don't want any of these TACAN tests done we'd like the don't want to change the power level. We'd like to keep the power level pretty much as it is right now until we get all this fuel cell stuff sorted out. So, those TV those TACAN navigation tests where you turn them on you can.....

END OF TAPE

CAPCOM Roger, Columbia. And Columbia, Houston, for your information, we don't want any of these TACAN tests done, we'd like the water change the power level. We'd like to keep the power level pretty much as it is right now until we get all of this fuel cell stuff sorted out so those TACAN navigation tests where you turn them on, you can hold off on until we get this sorted out.

SPACECRAFT Ok, Dan. Houston, Columbia.

CAPCOM Go ahead, Columbia.

SPACECRAFT Houston, Columbia, do you read?

CAPCOM Roger, Columbia, this is Houston, we read you loud and clear.

SPACECRAFT Ok, Dan, I believe we're about caught up with you now. We're on page 4-3 of the CAP. I think Richard had gotten out of his suit and into his onorbit togs and I have not gotten out of the suit but I need to get into my togs .... You agree I think what we will do is go ahead and get our meal going here and just get caught up here with you.

CAPCOM Roger, that's a good idea. That's what we intended. We'll just lay low here and let you get comfortable. We're going LOS here in about 50 seconds. And Columbia, Houston, we're 30 seconds from LOS, we'll be talking to you through Yarragadee at 5 hours and 34 minutes.

SPACECRAFT We'll see you at Yarragadee.

PAO This is Shuttle Control Houston. Five hours 20 minutes mission elapsed time. Loss of signal now with Columbia on her fourth revolution. The next station to acquire will be Yarragadee. Meanwhile, a call was made to Joe Engle and Dick Truly to that we would defer the remaining OMS burns by one revolution allowing mission control an additional time to better understand the power loads with fuel cell one off line. We're a five hours 21 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston. At five hours 33 minutes mission elapsed time. Standing by now for reacquisition with Columbia through Yarragadee. This is a UHF station only. Columbia now on her fourth revolution.

CAPCOM Hello, Columbia, this is Houston talking to you through Yarragadee. We have you for seven minutes.

SPACECRAFT Roger, standby a second Houston, let me go upstairs.

CAPCOM Roger, Columbia.

PAO That was Dick Truly responding to CAPCOM Dan Brandenstein.

SPACECRAFT Ok, Houston, if you don't have anything for us I got a couple things for you.

CAPCOM Roger, Columbia, we don't have anything for you so we're standing by.

SPACECRAFT Ok, the system won't seem to leave us alone here to get time to get squared away downstairs. We have had several fuel stack temp messages since fuel cell one is cooling down. We've also had some S66 water messages and cannot find anything on that spec to that we see is wrong and we also kept getting cabin pressure warnings so I went to restbook and I bumped the hardware C&W limit up to 15.4 psi cabin pressure just so that we could turn the caution and warning off.

END OF TAPE

SPACECRAFT ...system won't seem to leave us alone here to get time to get squared away downstairs. We have had several fuel stack temp messages since fuel cell 1 is cooling down. We've also had some S66 water messages and cannot find anything on that Spec to that we see is wrong. The we also kept getting cabin pressure warnings and so I went to the ref book and bumped the hardware C&W limit up to 15.4 psi on cabin pressure just so that we can turn the caution and warning off.

CAPCOM Roger we copy that Dick.

SPACECRAFT And we just while I was talking we got a couple of propellant thermal OMS messages on Spec 89 and it's the same parameter. It's the right bulkhead mid temp is indicating 49 degrees with a low arrow.

CAPCOM Roger we copy.

SPACECRAFT And Dan, I'm sure you'll be interested to know since I guess you haven't seen much TV or maybe you have the OMS pods and the tail looks real clean.

CAPCOM Roger, glad to hear it. We did see a little bit of it it looked good to us too.

SPACECRAFT Everything in the payload bay looks real good. There may be a little bit of frizzy out on the starboard side of the tail toward the bottom it's in the shadow now, so I'm not sure about that, but the payload bay looks in excellent condition and we have seen very little debris floating around either in the payload bay or in the cabin. A couple of little washers in the cabin but generally everything is real ship shape.

CAPCOM Roger, glad to hear it.

SPACECRAFT You bet.

CAPCOM And Columbia, Houston. Couple of things for you. We'd like the fuel cell 1 stack temp caution and warning inhibited and to get rid of that other message on for the OMS crossfeed on panel alpha 14, we would like the RCS/OMS heater crossfeed lines alpha to off and bravo to auto.

SPACECRAFT Okay. The OMS switch has been done and I will inhibit the fuel cell stack temp.

CAPCOM Roger thank you.

SPACECRAFT But if DPS likes we can do a air log reset for GPC 3.

CAPCOM Roger Columbia you are cleared for that.

SPACECRAFT Okay.

CAPCOM And for the CDR if he's available, when he does become available we'd like a report on the COAS cal delta bias the star line torquing angles and the star alignment time. No rush on that but when you get around to it we'll take those.

SPACECRAFT Okay. Okay Dan I'll be right up and get them for you.

CAPCOM There's no rush Joe we have 2 minutes and 50 seconds on this pass and we can always catch it on a later pass.

SPACECRAFT And Dan, I know we haven't had time to talk about it but every second that we've had just.....and we've really been having a lot of fun up here even though there sure a lot of heady's going on.

CAPCOM Roger Columbia you cut out on some of that but we did get get the update that you're having a good time.

SPACECRAFT You bet and we're both feeling real well.

CAPCOM Yeah, you guys must be tough.

SPACECRAFT (laugher) yeah.

SPACECRAFT Okay Dan, if you're ready to copy I can give you the COAS and the IMU numbers now.

CAPCOM Roger we're ready to go on those.

SPACECRAFT Okay the COAS delta bias was 0.22. And on the check it was 0.11. And if you're ready for the IMU alignment I'll start reading it back to you.

CAPCOM Break break, just a second Joe. Columbia, Houston. To get rid of that water message we'd like you to open the inlet on water tank C.

SPACECRAFT Okay. We'll open the inlet on water tank C.

CAPCOM Okay Joe, we're 30 seconds from LOS, we'll pick up the rest of those IMU numbers when we get over Guam and we'll be having you there in 5 hours and 48 minutes.

END OF TAPE

SPACECRAFT tank C

CAPCOM Ok, Joe, we're 30 seconds from LOS but we'll pick up the rest IMU numbers when we get over Guam and we'll be having you there in 5 hours and 48 minutes.

SPACECRAFT Ok

PAO This is Shuttle Control Houston. Five hours 41 minutes mission elapsed time. Loss of signal now with Columbia. Next station to acquire will be Guam in approximately 7 minutes. This is Shuttle Control Houston. This is Shuttle Control Houston at five hours 47 minutes mission elapsed time. Standing by now for reacquisition of Columbia through Guam.

CAPCOM Hello, Columbia, this is Houston, we're talking to you through Guam. We have you for three minutes.

SPACECRAFT Ok, Dan. Read you loud and clear and I'll go back down and get my PDP and get those IMU numbers off to you.

CAPCOM Roger, before that we would like flash evap primary B on please. That will use up some of the water and also cool you down a little bit.

SPACECRAFT Ok, flash evap bravo coming on. And Dan, do you want to take alpha to off?

CAPCOM That's affirmative Columbia. We'd like alpha off.

SPACECRAFT Ok, you got it. Ok, Houston, Columbia, if you're ready to copy the IMU log I'll bring them down to you.

CAPCOM Roger, Columbia. We're ready to go.

SPACECRAFT Okay. -Y was 47, -Z 31, and -Z acquired at 3 hours and 49 minutes. The angle -Y was 0.16 for -Z delta angle was 0.06. Angle error was 0.00. For IMU 1 X-0.10 Y + 0.06 Z + 0.08. For IMU 2 X-0.04 Y +0.14 Z + 0.03. For IMU 3 delta X - 0.11 Y + 0.06 Z - 0.08 and the execute time was 03 + 52 + 30.

CAPCOM Roger, Columbia, we copied all that and we're 30 seconds from LOS. We'll be talking with you at Hawaii at 6 hours and 1 minute.

SPACECRAFT Ok, we'll see you then, Dan.

CAPCOM Roger

SPACECRAFT And as we go over the hill, Dan, the CO2 absorber installation has been done.

CAPCOM Roger, thank you.

PAO This is Shuttle Control Houston. At five hours 52 minutes mission elapsed time. A loss of signal now with Columbia. Next station acquisition will be Hawaii in about eight and a half minutes. Shuttle Control Houston. Now receiving data through Hawaii.

CAPCOM Hello, Columbia, this is Houston, we're talking to you through Hawaii.

PAO Six hours mission elapsed time.

SPACECRAFT Ok, Dan, read you loud and clear.

CAPCOM Roger, we're reading you loud and clear also.

SPACECRAFT Dan, then what's your thinking on OMS 3 and 4 now?

CAPCOM Roger, you must be reading Neal's mind. He was just giving me a brief, we are plannning on doing OMS 3 alpha and bravo with the DTO's and 4 and we're also working up a fuel cell procedure to fake that a little further.

SPACECRAFT Good show, Dan.

CAPCOM Have you guys gotten a chance to eat your lunch yet?

SPACECRAFT Dan, I ate the sandwich that was in my pressure suit this morning and I think Joe is standing there maybe getting something for himself now.

CAPCOM Ok, that's good.

SPACECRAFT Yea, I'm getting the TV set up and I'll grab a sandwich as soon as I get in there.

END OF TAPE

SPACECRAFT Good show Dan.

CAPCOM Have you guys gotten a chance to eat your lunch yet?

SPACECRAFT Dan I ate the sandwiches in my pressure suit this morning and I think Joe is maybe getting something for himself now.

CAPCOM Okay, that's good.

SPACECRAFT And I'm getting the TV setup and I'll grab a sandwich as soon as I can.

CAPCOM Columbia, Houston, we're 30 seconds from LOS here in Hawaii we'll be talking to you over the states, in six hours and nine minutes.

SPACECRAFT Okay, over the states at six hours 9 minutes.

CAPCOM Roger, and we'll have the pads ready when we get over there and hopefully sometime over the states we can get you your OMS 3 alpha and bravo pad up.

SPACECRAFT Okay Dan we'll be ready to comment.

PAO This is Shuttle Control Houston, at six hours five minutes mission elapsed time, loss of signal now with Columbia but we will pick up over the states in approximately three and a half minutes.

PAO This is Shuttle Control Houston at six hours nine minutes mission elapsed time, now receiving data over the states.

CAPCOM Columbia, this is Houston we're talking to you over the states, we have you for 15 and a half minutes.

SPACECRAFT Roger Dan read you loud and clear.

CAPCOM Roger and before we fire the pads your way, on panel A12 we would like the APU heater, gas generator fuel pump there are three switches there we would like them turned on the bed temps in the APU are getting cold we would like to warm them up

SPACECRAFT Okay, and I'm down there now, the APU heater gas generator fuel temp 1 2 and 3 to A auto is that it?

CAPCOM Everything was right except its fuel pump and there are three of them to on.

SPACECRAFT Sorry about that, gas generated flash fuel pump is that right?

CAPCOM That's correct, should be three of them.

SPACECRAFT Okay, there are three switches and the choices are A Auto, B Auto or Off.

CAPCOM Columbia, we'd like A Auto sorry about that.

SPACECRAFT Okay, all three of them are A Auto Dan.

CAPCOM Roger, and that's all I have for you right now, other than the OMS 3 alpha and bravo.

SPACECRAFT Okay, give us a second.

CAPCOM Roger.

SPACECRAFT Okay Dan, we're ready to copy the OMS ped.

CAPCOM Roger, we're going to have a state vector coming at you while we're doing this.

SPACECRAFT Okay

CAPCOM Okay, on OMS 3 alpha, it will be the left OMS trim load is plus 0.4, plus 5.1, item 8 is N/A. The weight is 222213, TIG is zero days, seven hours, 45 minutes and 0 seconds, the PEG seven target is delta VX plus 0010.0 delta VY is all 0's, delta VZ is plus 003.0, the burn attitude, ROLL 336, PITCH 017, YAW 319, delta V total is 0010.4 T90 is 12 seconds. E go and X is plus 0009.86, Y is plus 002.09, Z plus 002.73 target HA is 127, HP plus 120.

SPACECRAFT Okay Dan we got those, and would you like a read back now?

CAPCOM Well we can read that back, or I can read you the next one which ever you'd druthers.

SPACECRAFT Okay you were a little scratchy we're willing to wait on the read back.

CAPCOM Okay, for OMS 3 bravo, there'll be a left OMS also, trim load is plus 0.4, LY is plus 5.1, RY is N/A

END OF TAPE

SPACECRAFT Okay as soon as I said that it stopped reading 13, when it was reading 13.

CAPCOM Roger we copy.

SPACECRAFT And now it jiggled back up to 14.

CAPCOM Roger Columbia we'd like to keep it going until it gets down to ten.

SPACECRAFT You bet, okay.

CAPCOM And Columbia, Houston we got 30 seconds to LOS looks like we may have to go for that five minute limit on that, and we'll be talking to you at looks like Botswana at, well make that at Quito at 7:56.

SPACECRAFT Okay Dan, we'll see you there, and I'll be watching it closely.

PAO This is Shuttle Control Houston, seven hours 56 minutes mission elapsed time, next station to acquire will be Quito, Ecuador.

PAO This is Shuttle Control Houston, seven hours 57 minutes mission elapsed time, we've acquired signal through Quito.

CAPCOM Okay Columbia we're back with you at Quito for two minutes.

SPACECRAFT Okay Dan, and I'm, we're coming up on five minutes now, about eight seconds, and the coolant pressure is not going to get down to ten so I'm going to shut it down at five minutes.

CAPCOM Roger.

PAO The pressure now reading 13.

SPACECRAFT (garble) fuel cell to stop.

CAPCOM Roger thank you and now we do have a quick note here for page 4-5 on the cap before we lose you at Quito.

SPACECRAFT Okay Dan go ahead.

CAPCOM Roger, for the PLT after the G3 to G2 transition we'd like to add the following change, prior to the SM 62 PCMMU/Payload COMM call out. And we'd like to add on panel C3, OY

END OF TAPE

CAPCOM ...Z+002.73 target HA is 127 HP +120.

SPACECRAFT Okay Dan we got those and would you like a readback now?

CAPCOM Well we can read that back or I can read you the next one which ever your druthers.

SPACECRAFT Okay you were a little scratchy. We're willing to wait on the readback.

CAPCOM Okay for OMS 3 bravo. It will be a left OMS also. Trim load is +0.4, LY is +5.1, RY is N/A weight is 221983, TIG 0 days 7 hours, 49 minutes, and 15 seconds. Your...

SPACECRAFT Break, Dan.

CAPCOM Go ahead

SPACECRAFT Houston PLT how do you read?

CAPCOM Roger PLT read you loud and clear.

SPACECRAFT Okay we were getting a loud background noise would you start again with the weight and try again.

CAPCOM Roger Columbia starting with the weight for OMS 3 bravo is 221983 the TIG is 0 days, 7 hours, 49 minutes, 15 seconds. The targets delta VX is +0021.0, delta VY +all zeros, delta VZ is negative 000.3. The burn attitude roll 336, pitch 016, yaw 319, delta V total is 0021.0. TGO is 24, seconds 0024. VGO at X +001984, NY is +004.21, Z+005.49, HA is 139, HP is +120.

SPACECRAFT Roger Dan. Standby one.

CAPCOM Roger.

SPACECRAFT Okay Dan I think we got all those and we can read them back if you've got time.

CAPCOM Roger we have nothing else for you right now.

PAO Shuttle Control Houston 6 hours 16 minutes Mission Elapsed Time. That was CAPCOM Dan Brandenstein.

SPACECRAFT We'll come back with the readbacks for OMS 3 alpha.

CAPCOM Roger go ahead.

SPACECRAFT Okay. Left engine +0.4 +5.1 weight is 222213 TIG time is 0 + 07 + 45 + 0. Delta VX +0010.0. Delta VY is +all

zips and Delta VZ is +003.0. Front attitude is 336017319. Delta V total 0010.4. TGO is 00+12. VGOX +0009.86, Y + 002.09, Z + 002.73 and the altitude is 127 and +120.

CAPCOM Roger that's all correct Columbia.

SPACECRAFT Okay coming at you with 3 bravo. Left engine 0.4, +5.1, and NA. Weight is 221983, TIG is 0+07+49+15.0, delta VX +0021.0, Y + all zips, Z - 000.3. Burn attitude is 336016.....

END OF TAPE

M0042 GMT 21/27/19

CAPCOM Columbia, Houston. Just to give you a little foresight into what we are planning on doing on the fuel cell, we will have a procedure for you later, we're working it up now. On fuel cell 1 what we plan to do is leave the reactant valves closed and then start up fuel cell number 1 and let it use the reactants that are in the system to run itself until all the reactants are used up. That way we get those two hyrdogen and oxygen out of there and safe the fuel cell good.

SPACECRAFT Roger Dan. What do you think we can recover the fuel cell for this later?

CAPCOM I don't believe we can.

SPACECRAFT Okay, well we'll wait on you to figure out exactly what to do and we'll be ready.

CAPCOM Roger, thank you.

CAPCOM Columbia, Houston. Still looking down the road with this fuel cell being safed and not being able to start it up. We'll probably be looking at the minimum mission.

SPACECRAFT Okay Dan. We understand.

PAO This is Shuttle Control Houston. 6 hours 22 minutes. That discussion between Dan Brandenstein and the crew aboard Columbia. He gave the crew a preliminary insight to the procedure that's being worked to turn on fuel cell 1, leave the reactants off line. This burns up the reactants, everything inside goes and the fuel cell is finished. This is a conservative procedure to avoid reactant contact. This brings into play the mission rule that calls for a minimum mission. A 54 hour mission with one fuel cell permanently off line. We are at 6 hours 23 minutes Mission Elapsed Time. Continuing to monitor this is Shuttle Control Houston.

CAPCOM Columbia, Houston. We have a minute 30 left we have something for you.

SPACECRAFT Okay go ahead Dan.

CAPCOM Roger in the PDP...

END OF TAPE

PAO We're at 6 hours 23 minutes Mission Elapsed Time continuing to monitor. This is Shuttle Control Houston.

CAPCOM Columbia, Houston. We have a minute 30 left. We have something for you.

SPACECRAFT Okay go ahead Dan.

CAPCOM Roger in the PDP on page 4-5.

SPACECRAFT Okay standby.

CAPCOM Sorry, sorry Columbia that's a CAP.

SPACECRAFT Okay.

CAPCOM I'm sorry about that Columbia it's 4-5 in the CAP.

SPACECRAFT Okay Dan go ahead.

CAPCOM Roger, on page 4-5 in the PLT's column, that TV setup you can delete that because that sets up for some scenes that would have been happening where we moved the OMS burns to.

SPACECRAFT Okay. Copy that.

CAPCOM And we're 30 seconds from LOS we'll be talking with you at Ascension at 6 hours and 39 minutes.

SPACECRAFT Okay I understand.

PAO This is Shuttle Control Houston. At 6 hours and 25 minutes. Loss of signal now with Columbia. The next station to acquire will be Ascension in approximately 13 minutes. Meanwhile, when fuel cell 1 is taken permanently off line, this brings about the mission rule that calls for the minimum 54 hour mission. We repeat. This is Shuttle Control Houston at 6 hours 26 minutes Mission Elapsed Time.

CAPCOM Hello Columbia, we're talking to you through Ascension and we'd like GNC CRT spec 1 for variable parameters to send up to you.

PAO This is Shuttle Control Houston. 6 h ours 38 minutes Mission Elapsed Time. That was Dan Brandenstein talking to the crew of Columbia through Ascension.

CAPCOM Roger thank you.

CAPCOM Columbia we have you for 2 minutes and 30 seconds here.

SPACECRAFT Roger Dan.

CAPCOM Columbia, Houston. We have those variable parameters in we'd like a resume and then an SM spec 1.

SPACECRAFT Okay, Dan. Thanks, standby.

CAPCOM Roger.

SPACECRAFT Okay Dan. SM spec 1 is on CRT 1.

CAPCOM Roger, thank you.

SPACECRAFT Houston, PLT. At the time of like right now in the CAP you want the OEX pallets on.

CAPCOM That's affirmative Columbia.

SPACECRAFT Okay.

CAPCOM And Columbia, we got our parameters up by CRT as yours we're 30 seconds from LOS and will be talking to you at Botswana at 6:50.

SPACECRAFT Understand 6:50 we'll see you there.

CAPCOM And, Columbia, Houston, as you go over the hill if you can hear us, we'd like the OEX recorder off.

SPACECRAFT Okay OEX turned off.

PAO This is Shuttle Control Houston at 6 hours 41 minutes Mission Elapsed Time. Loss of signal with Columbia. We will acquire Columbia again in 8 minutes 20 seconds through Botswana. This is Shuttle Control Houston at 6 hours 44 minutes Mission Elapsed Time. During this loss of signal period we will pass along the OMS 3 A and 3 B burn parameters as well as the OMS 4 burn parameter. For OMS 3 A time of ignition is 7 hours and 45 minutes is when it's scheduled. We'll have a delta V of 10.4 feet per second burn duration 12 seconds. It would result in an apogee of 127 nautical miles by 120 nautical miles for burn 3B, the time of ignition 7 hours 49 minutes 15 seconds. A delta V of 21 feet per second. Burn duration of 24 seconds and should result in an apogee of 139 nautical miles and a perigee of 120 nautical miles....

END OF TAPE

PAO ...a delta V of 21 feet per second. Burn duration of 24 seconds and should result in an apogee of 139 nautical miles and a paragee of 120 nautical miles. OMS 3 A and 3 B are two burns separated by four minutes and they are part of the mission's detailed test objectives to find steady state operations by firing the OMS engines shutting down and then restarting 4 minutes later. The right engine only is used for the burns. OMS 4 time of ignition 8 hours 33 minutes 20 seconds. Delta V 34 feet per second. Burn duration 42 seconds OMS 4 should result in an apogee of 140 nautical miles and a perigee of 139 nautical miles. This burn will include a crossfeed test with the left OMS engine only firing. We're at 6 hours 46 minutes Mission Elapsed Time. This is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 6 hours 50 minutes Mission Elapsed Time. Standing by now for reacquisition of signal with Columbia through Botswana. This is a UHF voice station only.

CAPCOM Hello Columbia this is Houston we're coming to you through Botswana we have you for two minutes.

SPACECRAFT Okay Dan we're reading you loud and clear.

CAPCOM Roger Columbia. We're reading you loud and clear also and when you come up over Guam, we won't pass it you here but we do have a fuel cell procedure for you and if you need us at Guam with page 7-52 of your mal open we will give you that procedure.

SPACECRAFT Okay we'll do it. Page 7-52 of the mal.

CAPCOM What we will be doing there is modifying the fuel cell power up procedure.

SPACECRAFT Okay.

CAPCOM And Columbia we'd like to isolate the tank water tank bravo on panel R12 we'd like the supply water tank bravo inlet closed please.

SPACECRAFT Okay. We'll get right up and do that.

CAPCOM And what we're trying to do we take all the KOH's in there and we just like to keep it isolated.

SPACECRAFT Roger.
END OF TAPE

SPACECRAFT Okay we'll get right up and do that.

CAPCOM What we're trying to do we take all the KOH's in there we just like to keep it isolated.

SPACECRAFT Roger.

CAPCOM And Columbia, we are wondering if you ever got the teleprinter hooked up so we know whether or not we can send messages.

SPACECRAFT Dan even as you speak I am hooking it up. Sorry it's late but it's going to be ready for you your next opportunity.

CAPCOM Okay fine. That's all we needed to know. Thanks a lot. We've got 30 seconds to LOS and then we'll be talking to you at Guam at 7 minutes and 20 sec....7 hours and 20 minutes. There may be a quick short squirt at Yarragadee, but I don't think we'll get anything there.

SPACECRAFT Okay Dan we'll see you there.

PAO This is Shuttle Control Houston at 6 hours 52 minutes Mission Elapsed Time. Loss of signal now with Columbia through Botswana. The next station to acquire will be Guam in approximately 27 minutes during the Guam pass CAPCOM Brandenstein should pass along the procedures for taking the fuel cell number 1 permanently off line during that pass. At 6 hours 53 minutes Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control Houston at 7 hours 17 minutes Mission Elapsed Time. We are a little less than 3 minutes away now from reacquiring Columbia through Guam. During this Guam pass we do expect CAPCOM Brandenstein to pass on the fuel cell procedures to turn on fuel cell 1 leave the reactant off this burns up the reactants, everything inside goes and the fuel cell is finished. This is a conservative procedure to avoid reactant contact. By doing this this brings into play the mission rule that calls for a minimum mission a 54 hour mission with one fuel cell permanently off line. We're about 2 minutes away now from reacquiring Columbia through Guam. We'll standby and monitor. Shuttle Control Houston 7 hours 18 minutes we do expect this fuel cell 1 procedure to take place during the stateside pass immediately following the burns of OMS 3 A and 3 B. Shuttle Control Houston 7 hours 19 minutes Mission Elapsed Time. Now receiving data through Guam.

CAPCOM Columbia Houston coming to you through Guam. We have you for 6 1/2 minutes.

SPACECRAFT Roger Dan and I just initiated a attitude maneuver

to the OMS 3 A burn attitude. We're still in OPS 2 and I've got the mal book open.

CAPCOM Okay. Two things we'd like to get done this pass is get that mal squared away with you and then I'll give you the OMS 4 burn guide because you're going to be real busy over the states. Okay, getting over to the mal book 7-2 the fuel cell power up procedure. What we want to do you call up spec 68 which is a cryo fuel cell to monitor this and this procedure applies only to fuel cell on obviously. Okay on step 1 we want you to do everything except the bottom line. Delete fuel cell 1 react valve open. Then in step 2 we would like you to do the first step, delete the fuel cell ready talkback turning gray because we do not believe that it will turn gray then we would like you to add when fuel cell 1 cool pressure is less than 10 psi or 5 minutes after going to start, we want fuel cell 1 to stop. And then we would like you to delete all of step 3.

SPACECRAFT Okay and confirm for me these changes.....

END OF TAPE

CAPCOM pressure is less than 10 psi or 5 minutes after going to start we want fuel cell one to stop and then we would like you to delete all of step 3.

SPACECRAFT Ok, confirm for me these changes are to SSR6 on 7-52. Is that right?

CAPCOM Right, that's page 7-52, SSR No. 6.

SPACECRAFT Ok, real quick. Spec 68 we use fuel cell 1 step 1 delete the last sentence about the react valves. Step 2 the last sentence delete, I mean ready talk back delete, and when fuel cell one ... pressure less than 10 or 5 minutes after the start we'll stop the fuel cell and delete step 3.

CAPCOM That is correct and we'll be planning on doing that after our OMS 3 bravo over the states and if you have time we still have about 4 and a half minutes on this pass for your OMS 4 pad.

SPACECRAFT Ok, we're ready to copy. Go ahead, Dan.

CAPCOM Roger, for OMS 4 it will be right ohms burn, the trim load is +0.4, LY is NA, RY is -5.1, the weight is 221521, the TIG is 0083320.2, the targets are delta VX +0033.9, delta VY + all zeroes, delta VZ negative -006.0, the burn attitude roll 029, pitch 184, yaw 035, the delta V total is 0034.4, T go is 0039, E go in X + 0032.50, Y - 006.94, Z + 008.99, HA is 140, HP is +139. On the bottom, the mid burn crossfeed delta V total of 017.

SPACECRAFT Ok, Dan, before I read this whole thing back, let me confirm that the V go for Y was -006.94.

CAPCOM That's correct.

SPACECRAFT Ok, I got it. Then I'm ready to read them back if you have nothing else for us now.

CAPCOM Ok, we have nothing else.

SPACECRAFT Ok, for the right engine burn pitch is +0.4, yaw is not applicable and yaw is for the right engine is -5.1, weight is 221521, TIG is 0 + 08 + 33 + 20.2, delta VX + 0033.9, delta VY is + all zips, delta VZ -006.0, and the burn attitude is 029, pitch is 184, yaw 035, delta V total is 0034.4, T go 00.39, Vgo X 0032.50, Y is -006.94, and Z + 008.99, apogee 140, perigee +139, and the crossfeed delta V total 017.

CAPCOM Roger, your read back is correct.

CAPCOM Columbia, Houston, we're 10 seconds from LOS. We'll be seeing you over the states and watching your burns at 7:42.

SPACECRAFT Ok, Dan, we'll be there.

END OF TAPE

CAPCOM Columbia, Houston, we're ten seconds from LOS. We'll be seeing you over the states and watching your burns at 7:42.

SPACECRAFT Ok, Dan, we'll be there.

PAO This is Shuttle Control Houston at 7 hours 27 minutes mission elapsed time. Loss of signal now through Guam. The next station to acquire or the next acquisition will be over the states at approximately fifteen minutes. This is Shuttle Control Houston.

CAPCOM Houston, COMTEC, ground 1 and 2 testing 1... 2... 3...4... 5... 4... 3... 2... 1... test out. Ok, good enough. You're go. Configure for the pass, thank you.

PAO This is Shuttle Control Houston at 3 hours 39 minutes mission elapsed time. About 3 minutes away from reacquiring Columbia over the states. The plan is continues for a minimum 54 hour mission. If the two fuel cells stay healthy and no other problems develop consideration could be given to extending that time frame. However, the fifty- four hour plan gives the opportunity for moving the highest priority items ahead in the flight plan. The present plan is for a fifty- four hour minimum mission. We're at 7 hours 40 minutes mission elapsed time. This is Shuttle Control Houston standing by for reacquisition. Shuttle Control Houston. Seven hours 42 minutes mission elapsed time standing by for acquisition with Columbia over the states.

CAPCOM Hello, Columbia, this is Houston talking to you over the states. We have you for thirteen minutes.

SPACECRAFT Ok, Dan, we were just coming up on two minutes to the burn and we're getting in configuration and you can watch it with us.

CAPCOM Roger, and we have nothing for you and we'll just watch you burn.

SPACECRAFT Good show. Houston, PLT how do you read?

CAPCOM Roger, Columbia, reading you loud and clear.

SPACECRAFT Roger, we're configured for the burn about 1:06 to go.

CAPCOM And Columbia, Houston, we have no data we'd like to on C3 to format that's fixed.

SPACECRAFT Roger, it is fixed.

CAPCOM Roger, thank you.

PAO Seven minutes 44 seconds. Static data in the control center. Now receiving downlink data. Burn attitude looks good reports GNC. This is the OMS 3A burn. Standing by. Should ignite momentarily. Report ignition in Mission Control.

SPACECRAFT Ok, burn's complete, Dan.

CAPCOM Roger, looked good to us.

PAO OMS 3A has been completed.

SPACECRAFT Houston, PLT, the N2 tank pressure decreased from 2080 to 1900. Are we still go?

CAPCOM That's affirmative, Columbia, you're go.

PAO Seven hours 46 minutes. We're about 3 minutes away now from the ignition of OMS 3B.

END OF TAPE

PAO Seven hours 46 minutes, we're about three minutes away now from the ignition of OMS 3-B.

SPACECRAFT Okay Houston we believe we're configured for the OMS 3 bravo burn.

CAPCOM Roger.

PAO Seven hours 49 minutes, standing by now for the ignition start of OMS 3-B. The prop flight controller reports the ignition on OMS 3-B looks good, seven hours 50 minutes, mission elapsed time, prop reports the burn has shut down.

CAPCOM And Columbia, Houston the burns look good to us, and to keep you from falling asleep, we'd like to get into the fuel cell procedure now.

SPACECRAFT Okay Dan, let me get back up there, I'll watch that one from between the seats.

PAO Columbia now at app

CAPCOM We have about five minutes 40 seconds left in the pass.

PAO Columbia now at an app

SPACECRAFT (garble) just for your info at shutdown we had to take out, we had about a .54 residual in VX negative, and we took it out to .19.

CAPCOM Roger, we copy thank you.

PAO Columbia now at an apogee at 139 nautical miles a perigee of 120 nautical miles.

SPACECRAFT Okay Dan I think step one is verified complete.

CACPCOM Roger, thank you.

SPACECRAFT Okay, Houston on my mark I'm going to put the fuel cell one start switch to start if your ready.

CAPCOM Roger, we're ready, go.

SPACECRAFT Okay 3 2 1 mark. And Houston, I'm going to be shutting it down when the coolant pressure equals ten which is coming up here in just a second, I'll give you a mark.

CAPCOM Fuel cell pressure coming down, now reading twelve.

CAPCOM ...PLT after the G3 to G2 transition we'd like to add the following change prior to the SM 62 PCMMU/payload COMM callout. And we'd like to add on panel C3 OI PCMMU format to GPC and then accomplish an item 2 execute called for on the PCMMU payload COMM spec 62.

SPACECRAFT Okay understand to go back to GPC on the format and do an item 2 execute on spec 62.

CAPCOM That's right thank you. And we got about 50 seconds left here.

SPACECRAFT Okay Dan thank you.

CAPCOM Columbia we are 25 seconds from LOS now we'll be talking to you at Botswana at 8:24.

SPACECRAFT Okay Dan we'll see you there.

PAO This is Shuttle Control Houston at 8 hours Mission Elapsed Time. Loss of signal now with Columbia through Quito. The next station acquisition will come with Botswana in approximately 23 1/2 minutes. This is Shuttle Control Houston.

PAO This is Mission Control Houston. I'm 45 seconds away from acquisition of Spacecraft Columbia through Botswana voice relay station. Two active fuel cells that are still alive and well aboard Columbia are showing some 15.19 kilowatts in current. Fuel cell number one is showing zero obviously. We'll standby here for CAPCOM Dan Brandenstein talking to Engle and Truly aboard Columbia through Botswana.

CAPCOM Columbia, Houston. We got a real lousy patch here. We probably won't hear you talk to the states but if you have anything quick we've got about 10 seconds here.

SPACECRAFT Okay Dan read you loud and clear. We're in OMS 4 burn attitude doing fine going to get the burn off.

CAPCOM Roger Columbia. We just nipped Guam and Hawaii so the next really good COMM pass we'll have is Buckhorn at 9:17.

SPACECRAFT Okay we'll see you then. We're in good shape for the burn.

CAPCOM Roger good.

END OF TAPE

SPACECRAFT Ok, we'll see you then. We're in good shape for the burn.

CAPCOM Roger, good.

PAO This is Mission Control Houston. There is scratchy limited communication through Botswana. But at this time some six minutes away from OMS 4 ignition the crew of Columbia reported being in attitude and preparing for that burn. We're 30 minutes away from the next station which appears to be Guam. To clarify somewhat what constitutes a minimum mission the fifty-four hour mission would not necessarily mean that we would automatically land in fifty-four hours but move many of the critical flight plan items ahead into day 1 and 2 so that at that time the mission could be extended if things were looking well. A day at a time the mission conceivably could run 3 days or 4 depending on how well the remaining two fuel cells operate, but the fifty-four hour minimum means just that. We're 29 minutes away from reacquisition through the Guam tracking station in the western Pacific. This is Mission Control Houston. Mission Control Houston. Acquisition through Guam tracking station. A very low elevation angle pass less than 3 degrees, about 2.2 degrees and very short duration. We'll standby in case the CAPCOM.

CAPCOM Columbia, Houston, we're passing over Guam, we got a real low pass but we might have you for about fifty seconds, so how do you hear?

SPACECRAFT Loud and clear, Dan. Clear, Dan, and the OMS 4 burn went just pernominal and we're getting back just got back in OPS 2.

CAPCOM Roger, thank you. And we're about 30 seconds from LOS, we'll see you at the states, and have your writing paper ready when you get there.

SPACECRAFT Ok, Dan.

PAO Mission Control Houston. A very brief exchange there between the spacecraft communicator, CAPCOM, Dan Briendenstein and the crew of Columbia through Guam. Thirteen minutes until reacquisition through Hawaii. Again a very low elevation pass. The bulk of the communications will be over the states. Through the Buckhorn and the Goldstone and tulah peak site and almost immediately through Quito. After loss of signal at Quito Neal Hutchinson's silver team of flight controllers will hand over to Don Puddy's bronze team. We're looking at an estimate of 6:45 p.m. central standard time for the change of shift briefing with flight director Neal Hutchinson in the main auditorium at JSC. We'll be back in twelve minutes. This is Mission Control Houston.

PAO Mission Control Houston. We do have acquisition through Hawaii. Very low elevation angle pass. May not be any communications at this station.

SPACECRAFT Joe, the both cabin heat exchanger intemps are high. Look at spec 88.

CAPCOM Roger, Columbia. We think caught part of that. We have you for about 5 more seconds.

SPACECRAFT Oh, Ok, Dan

CAPCOM We believe that it might be a water loop cycle.

END OF TAPE

SPACECRAFT ...Joe both cabin heat exchanger in temps are high. Look at spec 80a.

CAPCOM Roger Columbia. We think caught part of that. We have you for about 5 more seconds.

SPACECRAFT Okay.

CAPCOM We believe it might be a water loop cycle.

PAO Mission Control Houston here. We are in a gap now between Hawaii and reacquisition through Buckhorn. In approximately 2 minutes 30 seconds back over the Guam pass the crew reported that the OMS 4 burn was nominal so Columbia should be in an orbit about 140 by 139 nautical miles, however, until the vector is established and display shows that we have no confirmation on what the actual orbit size is. We'll standby here for reacquisition of this final stateside pass of the evening. We have acquisition through Buckhorn about 7 or 8 seconds ahead of predicted time.

CAPCOM Hello Columbia, this is Houston we're talking to you through Buckhorn. We have you for 6 1/2 minutes.

SPACECRAFT Okay Dan. We got you loud and clear and we are ready to copy I guess one thing our press out temps are running a little high we did get a cabin heat exchangers running a little high.

CAPCOM Okay we'll take a look at that. What we're going to do here is fire you up some let you know what we're doing to the timbu's and give you some switch configurations we're going to try and clean up some of these systems a little bit before we hand over to the other team. So, if you're ready to copy I'll let you know what timbul's are going to be sent. First the OMS crossfeed bulkhead mid we're going to lower the lower limit to 40 degrees. And then the cabin heat exchanger inlet temp loop 1 and loop 2 we're going to change the upper limit to 80 degrees. And then we plan on inhibiting fuel cell 1 exit temp.

SPACECRAFT Okay and I agree with all of those.

CAPCOM Okay now over to cleaning up some of the switches. On PCS configuration cleanup on panel M010W we would like the PPO2 controller system 1 to normal and then on panel L2 we would like the O2 N2 controller valve system 1 to auto.

SPACECRAFT Okay mighty fine Dan. That's going to auto now. Thank you.

CAPCOM Okay we also we got APU 3 off a little early and we didn't get the MPS TVC iso valve closed. We have a procedure

here to get that closed now.

SPACECRAFT Roger Dan. Standby a second.

SPACECRAFT Okay Dan CTS is configured and go ahead with your well standby just a second on your APU procedure. Houston, PLT I'm back in the front seat go ahead with your MPS procedure.

CAPCOM Okay we had just a little discussion on this I'll give you another one you can write down and we'll get back with this APU one as soon as we get it clarified. Down on the WCS we'd like you to we show that the vacuum vent valve is closed and we'd like that opened up you can get that whenever you get to it.

SPACECRAFT Okay. Say again which position you want it in.

CAPCOM Roger. We'd like the WCS vacuum vent valve to open.

SPACECRAFT Okay we'll do it.

CAPCOM Roger and we'd like to delete the interconnect OPS we're going to be leaving it as it is since you have to reconfigure right back for sleep period anyhow.

SPACECRAFT Okay Dan.

CAPCOM And we would we're curious as to whether you managed to get the nozzle activated.

SPACECRAFT I was just getting ready to do that when we decided to wait and come AOS here and get these messages. We'll get it right afterwards.

CAPCOM Okay, we were just curious. We do have a couple ...

END OF TAPE

CAPCOM ...and we were curious as to whether you managed to get the NOSL activated.

SPACECRAFT I was just getting ready to do that when we decided to wait and come AOS here and get these messages. We'll get it right afterwards.

CAPCOM Okay we were just curious. We do have a couple of garbled coming up we'll save that to the end and if we don't get it no problem. And this pass you will be getting a test message for the teleprinter. We'll also be sending up the weather updates.

SPACECRAFT Okay and tell us what the times are for the NOSL's.

CAPCOM Okay NOSL one is at 9 hours 34 minutes. There's some thunderstorms over South America and the other one is at 9 hours and 58 minutes and there's thunderstorms over the tip of Africa. And these are both night passes you have to use grating.

SPACECRAFT Okay copy. Houston, PLT you still with us?

CAPCOM Roger we are.

SPACECRAFT Okay.

CAPCOM And Columbia on the APU the first one is a switch cleanup and that's on panel R2 we would like the APU hydraulic boiler controller power heater 3 to alpha.

SPACECRAFT Roger Dan. 3's back in alpha.

CAPCOM Okay and now I'll read you a procedure that we would like you to do over Quito so we can watch it and that's to get the MPS TVC iso valve on system 3 closed.

CAPCOM And that procedure is APU hydraulic circ pump number 3 to ON and that's on R2. Then on R4 we want the hydraulic MPS TVC iso valve system 3 to close talkback closed and then back on R2 we would like the circ pump number 3 OFF and then APU controller power, 3 of them, to OFF.

SPACECRAFT Okay circ pump 3 to ON close the number 3 MPS TVC isolation valve, then turn the circ pump off and then turn all three controller powers off.

CAPCOM Roger. And we'll wait till we get over Quito so we can watch you do that one.

SPACECRAFT Understand, I should wait until you tell me to do that procedure.

CAPCOM Roger and we're 15 seconds from LOS and we'll be talking to you at Quito at 9:30.

SPACECRAFT Okay Dan we'll be prepared then to do this procedure.

CAPCOM Okay.

PAO Mission Control Houston. Loss of signal in the final pass this evening over the stateside station. We're 5 1/2 minutes away from reacquisition through Quito Equador. The crew reported they were preparing to activate the night/day optical survey of lightening experiment called NOSL. And it's an acronym. Two opportunities are coming up. One at 9 hours 34 minutes. Thunderstorms in South America and another at 9 hours 58 minutes. Thunderstorms over the southern tip of Africa. We'll be back in 5 minutes 20 seconds through Quito. This is Mission Control Houston.

PAO This is Mission Control Houston again. Flight Director Neil Hutchinson now estimates 30 minutes from now to the start of his change of shift press conference in the main auditorium at Johnson Space Center which will be a tad after 7:00 pm Center. Mission Control Houston.

CAPCOM Hello Columbia. Talking to you through Quito. We have you for about 7 minutes here.

SPACECRAFT Okay Dan. We're building the NOSL now we'll be right with you.

CAPCOM Roger.

SPACECRAFT Houston, PLT. You've got something for us we probably ought to knock off what we're doing with the NOSL and talk to you.

CAPCOM We don't have anything for you though we'd like to see that APU procedure. Make it the circ pump procedure.

SPACECRAFT Okay. Give me a couple of minutes and I'll be up there and we'll do it.

CAPCOM Okay.

SPACECRAFT Okay Dan. I'm half way up here you ready?

CAPCOM Roger we're ready to go.

SPACECRAFT Okay hydraulic circ pump number 3 is running and I see a low pressure in system 3.

CAPCOM Okay.

SPACECRAFT And I'm going to close the MPS TVC isolation valve. Okay and I've got a gray if you agree that it's closed I'll turn the circ pump off.

CAPCOM Roger, looks closed to us. You can turn the circ pump off.....

END OF TAPE

Okay, hydraulic circ pump number 3 is running and I see a low pressure in system 3.

Okay.

And I'm going to close the MPS TVC isolation valve.

Okay, and I've got a gray if you agree that it's closed, I'll turn the circ pump off.

Roger. Looks close to us, you can turn the circ pump off.

Okay, circ pump is off and now I'm gonna turn the 3 APU controller powers to off.

Roger. That looks good. A couple of other little quickies. When you get a chance we'd like the OPS recorder in full for where you did the GPC3 memory dump and when you get a chance you can report on the status of the teleprinter messages just to make sure everything is working.

Okay, I think Joe may go look down at the teleprinter messages and let me dig out those numbers on the recorder.

Okay, and that's all we have.

Okay, Dan. Are you ready to copy on the recorder.

Roger, go ahead.

Okay, this is a GPC memory dump. It was OPS2 recorder and record a...on track 5 moving forward to precipitate with 13 and the time at the start of the dump was 0 days, 8 hours, 47 minutes and 50 seconds.

Roger, we copy that.

And Houston PLT, how much time do we have left in this pass.

Roger. We've got about a minute and 20 seconds.

Okay Dan, real quick if you want to take 30 seconds garble because every time we garble

Dick, be advised you're cutting out.

Columbia Houston.

Columbia Houston.

Columbia Houston. We have no downlinking. We're not copying you if you're reading us in the blind, we've got 13 seconds to go to LOS and that finishes up for the silver team. Enjoyed getting you up there and we hope you have a good night and a good tomorrow.

Mission Control Houston. Had partial pass at least over Quito by the drop out toward the end the last 2 or 3 minutes of acquisition through Quito, Ecuador and in this final uplink tonight CAPCOM Dan Brandenstein was unable to raise the crew. The tracking sight also was unable to get any kind of downlink from the spacecraft so it was a loss of lock there. Flight director, Neal Hutchinson will be migrating over to the main auditorium shortly to hold his change of shift press conference in about 20 minutes from now. During break in communications here between state side and Quito, he congratulated his silver team of flight controllers for a job well done in running the ascent into orbit and troubleshooting the fuel cell problem during the day. Nineteen minutes away from next station which is Botswana, South Africa. This is Mission Control Houston.

This is Mission Control Houston. The second participant in the change of shift briefing with flight director Neal Hutchinson will be a Mr. Jim Riley of Johnson Space Center's Power and Propulsion Division. Neal is making moves toward leaving the control center but still tagging up with the OIO officer. When we see him put his jacket on that will be a good indication he's in route to the press center. Eleven minutes now away from acquisition from Botswana. We'll be back at that time. Mission Control Houston.

Columbia, this is Houston through Botswana for 5 and a half minutes. Over.

Columbia, this is Houston through Botswana for 5 minutes. Over.

SPACECRAFT Roger Rick. How do you read?

CAPCOM Okay Richard. We read you clear with a little bit of scratchiness. We did miss the last few sentences over Quito. You indicated you were going to be doing something and we did not copy.

SPACECRAFT Probably we were going build the NOSL which we have built now and are trying to get it into operation.

CAPCOM Okay, that sounds good to us. As Dan was going over the hill he wanted to....

END OF TAPE

CAPCOM Ok Richard we read you clear with a little bit of scratchiness but we did miss the last few sentences over QUITO. You indicated that you were going to be doing something and we did not copy.

SPACECRAFT Probably we were going build a NOSL which we have built now and are trying to get into operation.

CAPCOM Ok that sounds good to us. As Dan was going over the hill he wanted to ask from the silver team that they enjoyed working with you. And we with the crimson team are looking forward to spending the next few hours. Over.

SPACECRAFT Hey, you bet they did a good job they had. A lot of hard work and they really helped.

CAPCOM Okay, Richard we just have one note over Indian Ocean station which will be in about 8 minutes, we would like you to go down and get that teleprinter message that we will be sending up to you then. Meanwhile we will let you go ahead and see if you can get that NOSL data take.

SPACECRAFT Okay. (garble). Rick the first teleprinter message is shant with the updates and the weather, the message did come through real good. The teleprinter seems to be working Okay.

CAPCOM Okay, Joe. That's good to hear and the correction to my last is there will be two teleprinter messages at Indian Ocean station.

SPACECRAFT Okay. I understand. Rick following along in the timeline here. Disregard.

CAPCOM Roger.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead

SPACECRAFT Roger Rick. The opportunity for lightning on the Africa pass just did not pan out as well as you might check just the one that we saw in South America. We do have the NOSL built now, so if you can give us any more notice about other opportunities, we would sure appreciate it, Dick, because it does take a couple of minutes to get set.

CAPCOM Okay, we understand Richard and we'll sure do that.

SPACECRAFT Rick, I've got a question for you on page 4-7 on the cap.

CAPCOM Roger, we're there.

SPACECRAFT Okay, down at the bottom of the page, Rick, there at 9:50 we take the GPC's, 3 and 5 and bring them to off and in that procedure there we thought we let you have a vote before we did that because of the way we have been adjusting the timeline here.

CAPCOM Okay. We appreciate that opportunity and we will be right back to you.

And Columbia Houston with 45 seconds to go in the pass you can take GPC's 3 and 5 to off as indicated.

SPACECRAFT Houston did we understand it's Okay to take the GPC's to off. Over.

CAPCOM That's affirmative. 30 seconds LOS.

SPACECRAFT Okay, Rick see you next time.

Mission Control Houston here. New Capcom on duty. Here with the bronze team is Rick Hauck.

END OF TAPE

Mission control Houston here. You CAPCOM on duty here with the bronze team is Rick Hauck. H a u c k. Dick Truly reported that they now have the night and day optical survey of lightning experiment hardware assembled and was ready for any new viewing opportunities for lightning around the ground tracking. Meanwhile, here on the ground, the press conference will be starting momentarily in the main auditorium. Off going flight director Neil Hutchinson is en route. Fuel cell engineer Jim Riley will accompany him. Next tracking station in 3 minutes 30 seconds is Indian Ocean station. We'll be back at that time. This is misson control Houston.

Mission Control "ouston: getting data now through Indian Ocean ship station that is.

Indian Ocean: Roger at KS.

Read you loud and clear, we're coming up on air to ground one.

Indian Ocean: Roger, read you the same.

Roger, those teleprinter messages should be on their way shortly and we've got some timeline changes on there along with the procedure.

Ok we hear the thing at work and we'll get to it.

CAPCOM Ok thank you.

And Columbia Houston, we do have a change to the PD correction to the cap on page 4-8 when you have a chance.

Ok, Rick and got that go ahead.

CAPCOM Roger, on the bottom of the page, left side, the maneuver option, we'd like you to go to attitude of roll 268.4, pitch 194.9, yaw 24.6, pair will be -Z star 17, -Y star 21, and the reason for that change is its a minimum maneuver from the attitude you'll be in prior to that, over.

SPACECRAFT Ok attitude 268.4, 194.9 and 24.6 the stars are -Z star 17, and -Y star 21.

CAPCOM Roger that's affirmative, Richard and a reminder that we'll be deleting all the atonomous nav tests, over.

SPACECRAFT Roger, and I think I copy, we did delete the You did decide to delete the tail jet only test, is that correct isn't, the one we should be in now if we were going to do it.

CAPCOM Richard if we can do that, we'd like to do the tail

jet only test, however, we were going to delete the atonomous nav. test that follows on the next page, over. However, it's not essential.

SPACECRAFT OK, well help me out, it's now 10:10, we, I misunderstood, I guess, I thought we were not to start the tail jet only test and so I did not start it at 9:50, so it's strictly up to you, we have not started it yet.

CAPCOM We copy, we'll get back to you. Columbia Houston we will cancel the fail jet test and we'll look about doing it tomorrow. We got 50 seconds to LOS and no problem with that.

SPACECRAFT Ok.

CAPCOM Columbia Houston, 15 seconds LOS. Our next station pickup will be at Hawaii in 31 minutes.

SPACECRAFT Ok, Rick, see you then.

CAPCOM Roger.

Mission Control Houston. LOS through Indian Ocean station. 30 minutes until next pass over Hawaii in 31 minutes. Mission Control Houston.

end of tape

CAPCOM Columbia Houston, 15 seconds LOS. Our next station pickup will be at Hawaii in 31 minutes.

SPACECRAFT Okay, Rick (garble)

CAPCOM Roger.

Mission Control Houston LOS through Indian Ocean Station. 30 minutes now til the next pass over Hawaii in 31 minutes. Mission Control Houston.

CAPCOM Columbia, Houston through Hawaii. Over.

SPACECRAFT We're reading you loud and clear and quickly these charts. Can you the charts that you read up, 17 and 21 can you give me a time that there good for.

CAPCOM We will try to get that for you immediately and verify the roll 268.4.

SPACECRAFT Okay 268.4. Thank you.

CAPCOM Okay and its from 11 12 to 11 55 over.

SPACECRAFT (garble) Thank you sir.

CAPCOM Okay we will see you next at Santiago in about 20 minutes.

SPACECRAFT Okay and we will have an IMU alignment for you there Rick.

CAPCOM Very good.

SPACECRAFT Hey Rick, you wouldn't believe the scenery is really pretty up here.

CAPCOM You really know how to hurt a guy.

SPACECRAFT You bet. Its really nice we've been working but its really pretty sites.

CAPCOM Well its a real pleasure to see you all up there.

This is Mission Control Houston. 25 seconds from acquisition through Santiago, Chile station. Followed shortly thereafter by Botswana again. Both of these moderatly high elevation angle passes in excess of 6 minutes duration. We'll stand by for acquisition through Santiago.

CAPCOM Columbia Houston through Santiago. We'll be with you for 5 and 1/2 minutes. Over.

SPACECRAFT Okay, Rick we're with you. And we got half of our start for the alignment, the (garble) picked up here and the wide starcracker is still fine.

CAPCOM Roger and I'm sure you've open the shutters on both of them is that correct.

SPACECRAFT Yes. Sure did. Thank you alot for the hint though.

CAPCOM Okay

SPACECRAFT (garble)

CAPCOM Go ahead

SPACECRAFT What are the (garble) on those stars, we'll pick them up here any minute now.

CAPCOM Okay we've got a variety of notes here for you, none of them time critical. But if you got time we'll read them up for you.

SPACECRAFT Okay Rick we're ready for the variety.

CAPCOM Okay. It you can give up spec 1 on GNC machine, we'll send you some variable parameters. And also during this pass we got some TNDU's to send up. Now as far as the night time goes our plan just for information is we will spend the night with the evaporators off. We will plan to deselect IMU number 3 and you can do that at any time. We are interested in whether you think you can sleep with the teleprinter operative or not. We also have a reconfiguration that we would like you to do and I'll give you a break here to comment.

SPACECRAFT Okay Rick, I understand you want both evaporator vents off for tonight. We will deselect IMU 3 here shortly and I presume that means you do not want to include it in the starline that we're going to doing here any minute now. And also yes I think Dick and I discussed it here briefly and I think it won't be any problem sleeping with the teleprinter active.

CAPCOM Okay, and I missled you on the IMU. We would like you to align that on this alignment and then after that alignment you can deselect that.

SPACECRAFT Okay. Understand.

CAPCOM That's clearly to avoid the possiblity of a RM message wakening you up if it drifted beyond the limits. Over.

SPACECRAFT Okay. Understand. Good thinking.

CAPCOM Okay and CRT is yours. The TMU's are on their way up and we do have a note on the water dump, in the orbidox check
M0056 GMT 01/22/37 DATE 11/13/81 PAGE 3

list page 4-2. I can give you the notes if you have that out.

SPACECRAFT Clearing just a second. Okay Rick go ahead on page 4-2.

CAPCOM Okay we will, since the vehicle is already configured for the dump prep you can eliminate step 1 the entire dump prep. It will preform the dump initiation after the IMU alignment, that's your presently doing. And the quantities if you will dump water tanks Charlie through Oxtract to 65 percent, that's 65 percent and continue on with the dump termination which is step three on page 4-3 and we would like to emphasise that step 4 tank reconfig should not be done. We will delete step 4 over.

SPACECRAFT Okay. Let me read it back. We probably won't have to do much on step 4

END OF TAPE

CAPCOM Charley through fox trot to sixty five percent. That's 65 percent. Continue on with the dump termination which is step 3 on page 4-3 and we'd like to emphasize that step 4 tank reconfig should not be done. We'll delete step 4. Over.

SPACECRAFT Okay. Let me read it back. We probably won't have to do much on step 1 and dump preps because we're in configuration. For step 2 we'll do the dump after we do the garble and we'll take tanks Charley through Fox Trot to 65 percent. We'll go ahead with step 3 and we will not do step 4, the tank reconfiguration.

CAPCOM Okay. That's a good readback and that's of course the key tank deisolated. One other question. On your coaz, you'd indicated that she had done your coaz cal with the...using a flashlight. Just interest. Did you intend to change out the lightbulb or are you happy with the flashlight method?

SPACECRAFT We have not tried to stir bulb Rick. We're going to get to that but we started the flashlight and it turned out that they ended up using a reflection of the sun off the ceiling to get it. It really was kind of a unique thing. It would take a while to explain but it worked real good.

CAPCOM Okay. Your preference of course on that. One more item on your post align line attitude. The attitude specified in message 6 alpha will be a good attitude. Should you need to make the observation. We've got 30 seconds to LOS. Next contact is at Botswana in 16 minutes.

SPACECRAFT Okay.

CAPCOM And check that alpha please.

SPACECRAFT Okay. garble

CAPCOM Roger. That's all we've got.

SPACECRAFT Rick, one quick thing. The first time new attitude message 6 alpha. Okay. Thank you. We haven't taken that off yet.

CAPCOM Okay. Good enough.

Mission Control Houston, LOS at Santiago. Reacquisition again upcoming in 15 minutes through Botswana. Spacecraft communicator Rick Hopp passed up to the crew during the Santiago pass, the configuration and all the switches in systems aboard Columbia for the upcoming sleep period which is scheduled to begin at 13 hours elapsed time, some hour and 42 minutes from now. Returning in 14 minutes for Botswana. This is Mission Control Houston.

This is Mission Control Houston, 11 hours 32 minutes into the second flight of the spaceship Columbia. Got about a 6 minute pass coming up here over Botswana. We should be in acquisition of signal at this time and almost continuing overlap of Indian Ocean station following Botswana. Crew getting powered down, both themselves and the spacecraft in preparation for the upcoming sleep period. We'll standby for resumption of communications through Botswana.

CAPCOM Columbia Houston through Botswana will be with you for 6 minutes. Over.

SPACECRAFT Roger. Loud and clear and I have a question for you.

CAPCOM Roger. Go ahead.

SPACECRAFT We pulled off 6 alpha off the teleprinter and noted that the time referenced there was 10:15 MAT. Is that time perhaps a different time or do you want us to go ahead and maneuver to that attitude. I'm still in the starline attitud until I've got a chance to talk to you about that.

CAPCOM Okay Joe. You can go there right now and no problem.

CAPCOM garble Houston. I've got another note for presleep for the planning for the night if you...

SPACECRAFT Okay, sure enough. Go ahead.

CAPCOM Okay, we.....

END OF TAPE

SPACECRAFT Garble

CAPCOM Columbia Houston through Indian Ocean on air-to-ground 1. Over.

SPACECRAFT Roger. Go ahead Rick.

CAPCOM Okay Richard. We will get back to you responding to your request on the APU 1 and 3 status. We do have nothing else for you at the present time and we will certainly be working on a summary of the nights and the next days activities should it appear like it will change significantly.

SPACECRAFT Okay Rick. We'd appreciate it and standby, we may have another thing to talk to you about. Hang on. Houston TLT.

CAPCOM Go ahead.

SPACECRAFT Roger. I was in the process of doing the water dump and when I hit, tried to open the supply water dump isolation valve it should have gotten a open. It was barberpole and remained barberpole, and down here on ML86 BRAVO, that circuit breaker is open at the...on...it's the main desupply water dump isolation circuit breaker. I configured this garble this morning and believe that I closed every circuit breaker on that row which is row alpha except for the waterline heat of B, BRAVO circuit breaker for the checklist. Garble

CAPCOM Okay, we got that Richard, we will look at it and get back to you.

SPACECRAFT Okay. And Rick, until you get back with us, I'm going to go ahead and turn the dump valve enable nozzle heater to off.

CAPCOM Roger, and I'd like to verify with you the circuit breaker. Was that the main B supply iso valve your're talking about?

SPACECRAFT Well, just a second. Let me go back down there and read it to you.

CAPCOM Roger.

SPACECRAFT Okay Rick. It's the main B supply water dump isolation circuit breaker.

CAPCOM Okay, we see that. Third one over on row alpha under main B. Thank you.

SPACECRAFT That is correct.

CAPCOM And Columbia Houston will be with you for 3-1/2 more minutes.

SPACECRAFT Okay Rick.

CAPCOM Columbia Houston, we have some DMU's coming up to you.

Okay, garble

CAPCOM Columbia Houston, 30 seconds to LOS. Richard, we'll recommend that you reset that circuit breaker and attempt the procedure. Over.

SPACECRAFT Okay, we'll do it. Okay Rick, the circuit breaker is reset and garble

CAPCOM Okay Richard. You're breaking up. We'll see you next at Hawaii in 30 minutes.

SPACECRAFT Okay. Garble breaker stayed in. I think we're garble

CAPCOM Okay, and check Z Startracker off.

SPACECRAFT Roger that.

This is Mission Control Houston. Loss of signal through Indian Oceans Station. 27 minutes away from acquisition through Hawaii. Garble, the Hawaii pass, this preceeding orbit, there was a private medical conference between flight surgeon Dr. Sam Poole and the crew of Columbia. Dr. Poole reports that the crew is feeling great and they've neither asked for or has prescribed for them any medications other than the preventive ocean sickness medication taken in prelaunch. We'll be back in 26 minutes for Hawaii. This is Mission Control Houston.

Mission Control Houston at 12 hours, 17 minutes. Acquisition through Hawaii some 15 seconds earlier than projected.

CAPCOM Columbia, this is Houston through Hawaii. We'll be with you for 7 minutes. Over.

SPACECRAFT Okay Houston. Reading you loud and clear. And.....

CAPCOM Okay, we copy that. Roger, we copy that and you can go to ZLV at any time.

SPACECRAFT We're on our way. Thank you sir.

CAPCOM We do have a teleprinter message to come up. It

will contain some weather data and some zig times. We are also interested in your IMU line information. Over.

SPACECRAFT garble Houston TLT if you read me. The fuel cell purge for number 2 and number 3 is complete. I did it manually.

CAPCOM Okay. We read you Dick. Fuel cell 2 and 3 manual fuel cell purges. Thank you.

END OF TAPE

And Columbia Houston, I've got another note for presleep for the planning for the night. Are you ready to copy.

SPACECRAFT Okay. Sure enough. Go ahead.

CAPCOM Okay. We're going to ask you to do a slightly, slightly more power down for the sleep period. We would like you to operate with just the one CRT that is nominal, in other words, verify the 3 CRT's off for the sleep period and ensure that you've got minimin lighting. And also on the panel R11 row hotel we will ask you to take the DFI, PCM containers 1,2, and 3, strain gage signal conditioners to off. Over.

SPACECRAFT Roger Rick and would you like to see those come off now?

CAPCOM Richard that's not important, its in order to get us down to a power level which will permit us to run the post to pallet throughout the night. And I'm sure you'll be pleased to hear that we will be able to do that.

SPACECRAFT Okay.

CAPCOM And Columbia Houston should there be any doubt those are the three switches PCM container 1,2 and 3. Three of them. Over.

SPACECRAFT Understand. And Houston we are complete with the IU alignment now. Do you want us to go ahead and start the water dump now?

CAPCOM That's affirmative.

SPACECRAFT Okay. Houston, Columbia

CAPCOM Go ahead. We're with you for one minute and 30 seconds.

SPACECRAFT We were just wondering if sometime before going to sleep if either over the loop or on the teleprinter you could give us a rough idea of what your plans are for now for minimum mission so we can be thinking ahead a little bit also.

CAPCOM Okay Joe, I think if you cared to review the minimum mission plan for day 2, that will be our plan for tommorrow. There may be minor mods but we don't anticipate anything significantly, different from that over.

SPACECRAFT Roger Rick we will review the minium mission for day 2 this evening and also another thing I'd be interested in would be a short summary of the status of APU 1 and 3.

CAPCOM Ok that's certainly fair. We'll be with you for 30 seconds more and we'll pick you up at Indian Ocean station in about a minute and a half and we'll have you there for 8 more minutes.

SPACECRAFT Okay, Rick. See you then.

CAPCOM Columbia Houston through Indian Ocean on air to ground over.

SPACECRAFT Okay go ahead Rick.

CAPCOM Okay, Richard we will get back to responding to your request on the APU 1 and 3 status. We do have nothing else for you at the present time and we certainly will be working on a summary of the nights and the next days activities should it appear like it will change significantly.

SPACECRAFT Ok Rick, we appreciate it and stand by we may have another thing to talk to you about, hang on.

END OF TAPE

SPACECRAFT Garble

CAPCOM Columbia Houston through Indian Ocean on air-to-ground 1. Over.

SPACECRAFT Roger. Go ahead Rick.

CAPCOM Okay Richard. We will get back to you responding to your request on the APU 1 and 3 status. We do have nothing else for you at the present time and we will certainly be working on a summary of the nights and the next days activities should it appear like it will change significantly.

SPACECRAFT Okay Rick. We'd appreciate it and standby, we may have another thing to talk to you about. Hang on. Houston TLT.

CAPCOM Go ahead.

SPACECRAFT Roger. I was in the process of doing the water dump and when I hit, tried to open the supply water dump isolation valve it should have gotten a open. It was barberpole and remained barberpole, and down here on ML86 BRAVO, that circuit breaker is open at the...on...it's the main desupply water dump isolation circuit breaker. I configured this garble this morning and believe that I closed every circuit breaker on that row which is row alpha except for the waterline heat of B, BRAVO circuit breaker for the checklist. Garble

CAPCOM Okay, we got that Richard, we will look at it and get back to you.

SPACECRAFT Okay. And Rick, until you get back with us, I'm going to go ahead and turn the dump valve enable nozzle heater to off.

CAPCOM Roger, and I'd like to verify with you the circuit breaker. Was that the main B supply iso valve your're talking about?

SPACECRAFT Well, just a second. Let me go back down there and read it to you.

CAPCOM Roger.

SPACECRAFT Okay Rick. It's the main B supply water dump isolation circuit breaker.

CAPCOM Okay, we see that. Third one over on row alpha under main B. Thank you.

SPACECRAFT That is correct.

CAPCOM And Columbia Houston will be with you for 3-1/2 more minutes.

SPACECRAFT Okay Rick.

CAPCOM Columbia Houston, we have some DMU's coming up to you.

Okay, garble

CAPCOM Columbia Houston, 30 seconds to LOS. Richard, we'll recommend that you reset that circuit breaker and attempt the procedure. Over.

SPACECRAFT Okay, we'll do it. Okay Rick, the circuit breaker is reset and garble

CAPCOM Okay Richard. You're breaking up. We'll see you next at Hawaii in 30 minutes.

SPACECRAFT Okay. Garble breaker stayed in. I think we're garble

CAPCOM Okay, and check Z Startracker off.

SPACECRAFT Roger that.

This is Mission Control Houston. Loss of signal through Indian Oceans Station. 27 minutes away from acquisition through Hawaii. Garble, the Hawaii pass, this preceeding orbit, there was a private medical conference between flight surgeon Dr. Sam Poole and the crew of Columbia. Dr. Poole reports that the crew is feeling great and they've neither asked for or has prescribed for them any medications other than the preventive ocean sickness medication taken in prelaunch. We'll be back in 26 minutes for Hawaii. This is Mission Control Houston.

Mission Control Houston at 12 hours, 17 minutes. Acquisition through Hawaii some 15 seconds earlier than projected.

CAPCOM Columbia, this is Houston through Hawaii. We'll be with you for 7 minutes. Over.

SPACECRAFT Okay Houston. Reading you loud and clear. And.....

CAPCOM Okay, we copy that. Roger, we copy that and you can go to ZLV at any time.

SPACECRAFT We're on our way. Thank you sir.

CAPCOM We do have a teleprinter message to come up. It

will contain some weather data and some zig times. We are also interested in your IMU line information. Over.

SPACECRAFT garble Houston TLT if you read me. The fuel cell purge for number 2 and number 3 is complete. I did it manually.

CAPCOM Okay. We read you Dick. Fuel cell 2 and 3 manual fuel cell purges. Thank you.

END OF TAPE

CAPCOM data and some zig times. We are also interested in your IMU line information. Over.

SPACECRAFT garble Houston TLT if you read me. The fuel cell purge for number 2 and number 3 is complete. I did it manually.

CAPCOM Okay. We read you Dick. Fuel cell 2 and 3 manual fuell cell purges. Thank you. And Columbia Houston just for clarification information, we will expect you to do manual purges on both 2 and 3 for the remainder of the mission.

SPACECRAFT Roger Rick. I understand.

CAPCOM I have an answer to your questions on the APU's Richard and I'm prepared to tell you about them.

SPACECRAFT Roger. Go ahead.

CAPCOM Okay. APU 1 had apparently lost the GGVM tooling and probably has a gas bubble similar to APU 1 and 3 previously. APU's 2 and 3 showed nominal performance except the water sprayed boiler on number 3 froze and the freeze-up lasted longer than anticipated. We presently expect to have 3 good APU's for entry and we're still working on the optimum start plan. Over.

SPACECRAFT Okay Rick. And so you're saying that the reason the temp rose on APU 3 during the MPS dump was due to freezing up of the water spray boiler.

CAPCOM That's affirm and we expect that was thawed after the APU was shut down.

SPACECRAFT Okay. Understand and thanks a lot.

CAPCOM Roger.

SPACECRAFT Rick, if you're ready to copy the IMU results, I can give them to you now.

CAPCOM Okay, and while your reading that to us, we've got a few command loads to send up to you.

SPACECRAFT Okay. You need a spec up?

CAPCOM Negative. Those are TMBU's Joe. We'll adjust some limits. By the way, we think we might have caused a spec 66 water message. The last time we sent up some TMBU's we transposed a high and a low limit. We're going to fix that now.

SPACECRAFT Okay.

CAPCOM And go ahead with the IMU alignfed.

SPACECRAFT Okay sir. It was star -Y was 21, -Z was 17. Let's see, for IMU 1 the delta X was + 0.05. Delta Y + 0.05, delta Z - 0.11. For IMU 2, delta X - 0.25, delta Y + 0.01, and Z + 0.00. For IMU 3, X is - 0.10, Y + 0.14, and Z - 0.26. Execute time was 0 + 11 plus 20 plus 30.

CAPCOM Okay. We copied that Joe.

SPACECRAFT And Rick, there is a word or two on the tape just prior to AOS. We didn't quite get to finish it up but we've been looking the bird over from the inside and everything we can see looks real good externally. The tile are all good and in shape. We have that one discolored tile on the left pod that looks kind of pinkish. As you are well aware, our TV light kit is kind of on a leading edge down low but everything else looks real good.

CAPCOM Okay, thank you Joe.

SPACECRAFT In Houston TLT, we just got a spec 92 power RSL message.

CAPCOM Roger. We'll check on that.

SPACECRAFT Roger. Spec 92 SIR-A, it says the power RSL, the RSL reads a niner and I wasn't sure exactly what that meant.

CAPCOM Okay. We see that Richard and payloads is taking a look at that. Thank you.

SPACECRAFT Okay.

CAPCOM And from Houston check daf-A.

SPACECRAFT Okay. And Houston TLT, I'm back at R11. Want me to go ahead and turn these container signal conditioners off now?

CAPCOM Okay Richard. We'll go for that. We'll be with you for another minute and 20 seconds.

SPACECRAFT Okay. The 3 switches are off. And one other question. Will you be ready for me to do an SM checkpoint after the AOS?

CAPCOM Wait 1, we'll get back to you.

Columbia Houston, 30 seconds LOS. We'll have one more TMBU for you at Santiago so I think we can make the hold off on the SM checkpoint.

SPACECRAFT Okay Rick. No problem.

CAPCOM We'll see you in Santiago in 19 minutes.

SPACECRAFT Okay, we'll see you there.

END OF TAPE

Checkpoint after this AOS.

Wait 1, we will get back to you.

CAPCOM Columbia Houston, 30 seconds LOS. We will have one more TMBU for you at Santiago. So, I think we might hold off on the OMS checkpoint.

SPACECRAFT Okay Rick, no problem.

CAPCOM We will see you in Santiago in 19 minutes.

SPACECRAFT Okay we will see you then.

This is Mission Control Houston, loss of signal through Hawaii. Santiago, Chile upcoming in 18 minutes which will be the final pass before the start of the sleep period on Engle and Truley's first day in space. Spacecraft communicator Rick Hauck updated the crew on the current status of the water spray boiler on the APU 3 and gave them a thumbs up and all three APU's ought to be up and running for entry. Not to worry. Back in 17 minutes for Santiago at 12 hours 27 minutes 4 seconds elasped time. This is Mission Control Houston.

This is Mission Control Houston, 12 hours 44 minutes mission elasped time. We are about to make a pass over the Santiago, Chile tracking station which should, is the last scheduled communications with the vehicle and the crew before the crew is scheduled to go to sleep in about 15 minutes. Flight director Don Puddy is checking with all the other subsystems to see if there are any outstanding questions, things that need to be resolved before the crew is put to bed this evening.

CAPCOM Columbia Houston through Santiago for 6 minutes over.

SPACECRAFT Roger Rick. How do you read.

CAPCOM We've got you loud and clear. We have a few items for you also we will be waiting for your summary of where you all figured you were in the timeline.

SPACECRAFT Ok Rick why don't you go ahead and get yours out of the way real quick.

CAPCOM Roger I wanted to verify the D select IMU number 3 and also let you know IMU number 1 is the best IMU. Also that your state vector looks like it will be good for 7 orbits. Over.

SPACECRAFT Ok. Copy that Rick. Understand the deselect, we will deselect IMU 3 before we turn in and understand number 1 is our best one.

CAPCOM Okay. One more thing, you mentioned your flight to power spec 92 message, you cut out on the amount that you read on that spec. Could you, do you remember how, what that quantity was?

SPACECRAFT At the time it was higher. Right now it's indicating, it looks like a negative 7.

CAPCOM Okay. Understand niner. Next item, we wanted to verify that your planning to leave the UHF on transmitt receive. Over. And also also got a TMBU on the way. Go ahead.

SPACECRAFT Roger Rick we will leave the UHF on. And if that's all you have, I've got a couple of quick questions.

CAPCOM Go ahead.

SPACECRAFT Okay. We, I changed out that CO_2 absorber replacement. It's been pretty warm all day and I prefer we not connect the cabin temp control in the full heat position. Do you think that's necesary?

CAPCOM We will get back to you on that.

SPACECRAFT Okay, also I would like to inhibit the hardware C and W parameters 0 0 2, 0 1 2 and 0 9 2. Those are the 3 fuel cell 1 parameters that are leaving two lights on our C and W matrix that don't need to be there.

CAPCOM Roger we concur with that.

SPACECRAFT Okay and also right up to this LOS, I'm going to put some comments on there about the ascent phase, so you can take a look at that part of the recorder.

CAPCOM Okay we appreciate that. Anything else.

SPACECRAFT No sir, I don't think so, we will do this in checkpoint after this LOS also.

CAPCOM Okay then we would like to run a tape for you that came direct from a town of Forest, Mississippi from the high school chorus there. It will last about a minute and we will have about a minute after that to chat. Over.

SPACECRAFT Okay Rick do it please.

CAPCOM On the way. (chorus)

END OF TAPE

Music

CAPCOM That's it.

SPACECRAFT Hey Rick. That's beautiful. Please thank them and tell them I couldn't have had a nicer birthday than this one. Appreciate it.

CAPCOM We'll sure do it. A couple of notes. We'd like you to check DAP BRAVO. Let you know the state vector and TMBU's are onboard. We've got a gyro bias going up. Also check the port RMS heater into auto and you can terminate the water dump. The last item is a reminder that we're going to the no-voice configuration on the recorders. Data only. We've got 1 more minute to LOS.

SPACECRAFT Okay Rick, and we'll bring the flight evap off at this time. We'll deselect IMU 3 at this time so you can watch that.

CAPCOM Okay. Real fine.

SPACECRAFT Rick, did you say that you were going to data only so it won't do me any good to record voice after this HLOS?

CAPCOM Roger. We'll leave it in voice record. Go ahead and put that on the tape and we'll configure that at the next opportunity.

SPACECRAFT A-okay. Thanks a million. Appreciate it.

CAPCOM We appreciate the reminder. And a note from the crimsom team with 30 second LOS, we're real proud to see the team of Engle and Truly airborne and we're looking forward to your having a good sleep and we'll be turning you over to the bronze team and we'll see you in the morning.

SPACECRAFT Okay Rick. Thanks very, very much.

SPACECRAFT Thank you and you guys have a nice evening too.

CAPCOM Roger. Voices enabled on the recorders.

SPACECRAFT garble

Mission Control Houston, 12 hours, 51 minutes mission elapsed time. The Columbia has just passed over the Santiago, Chile tracking station. The last scheduled communication with the vehicle before the crew goes to sleep. We just heard a playing of a tape, a happy birthday salute by the Forest Mississippi High School Chorus for Richard Truly on his 44th birthday today. Forest, Mississippi is the home town of

Dick Truly's father and stepmother, Mr. and Mrs. James Truly. Today has been a rather busy day for the crew of Columbia. There were some remote manipulator system activities which were accomplished today. The RMS, the remote manipulator arm was put in a temperature monitoring mode and a shoulder brace release on the arm was performed. There were the regularly scheduled payload bay doors activities and the doors were successfully opened up and radiators deployed so that the Columbia could remain on orbit. There were some items which were left out of the timeline today due to a press of other activities with the fuel cells. The fact that there was 1 fuel cell which had to be shut down due to a malfunction. Some concern about the APU's, although we have heard now that all 3 of those auxiliarly power units are considered to be healthy for entry. A decision had been made on the basis of the problem with the fuel cell that we would move tomorrow after 1 day and 4 hours mission elapsed time into the minimum mission crew activity plan which is basically a 54-hour mission. About the length of STS-1 which compresses and moves many of the activities up early in the mission in order to get those of primary importance completed first in the event that we should have to bring it down early. There was the possibility that we might have to return. The vehicle would be entering and landing on Saturday afternoon if it were necessary and the decision were made to cut the mission short. However, it has been emphasized that there is a potential for continuing on a day by day basis through possibly the end of a normal 5 day mission. Among the activities that were moved up and will moved up earlier are several involving the reaction control system, the small rocket engines mounted in the nose and the tail of Columbia which control its attitude while in orbit. Those happen earler. The payload bay experiments have been working well....

END OF TAPE

CAPCOM Through possibly the end of a normal 5-day mission. Among the activities there were moved up and and will be moved up earlier are several involving the reaction control systems, the small rocket engines mounted in the nose and the tail of Columbia which control its attitude while in orbit. Those have been moved up earlier. The OSTA-1 payload bay experiments have been working well. The most obvious of those is the big SIR-A radar antenna, the side looking radar antenna and Dr. Charles Elanche, the principle investigator on that reports that his instrument is working fine and there have been several data takes during the day today. There was some interference and some replanning necessary because of the fuel cell problem but they do expect to get quite a bit of data in spite of that problem. At 12 hours, 55 minutes mission elapsed time. This is Mission Control Houston.

END OF TAPE

garble to get to sleep on orbit while STS-1 astronauts Young and Crippen reported that sleeping in zero gravity is like sleeping in a 360 degree water bed. They also noted that it's a little difficult to get to sleep when you have the sun coming up every hour and a half and more than half the time you're going around the Earth, you're in full daylight with the sun streaming in through the cabin window. Makes it a little difficult to go to sleep. Crew is sleeping on the flight deck in their ejection seats and that will continue to be the place that the crew will sleep during the OFT flight series and later during the orbital, after the orbital flight test series when we get into the operational phase, crew members will sleep mostly in the middeck area. At 14 hours, 1 minute mission elapsed time. This is Mission Control Houston.

Mission Control Houston, 14 hours, 4 minutes mission elapsed time. Crew is in their sleep period and has about 6 hours 45 minutes remaining in that time. Attempting to get to sleep on orbit after a busy and exciting day. The first flight of the STS-2, the second mission of Columbia. The first day of that flight they may be finding it difficult to get to sleep with the sun streaming through the cabin windows as it does more than half of each orbit as they circle the Earth, although astronauts Young and Crippen on the first flight reported that sleeping in zero gravity is like sleeping in a 360 degree water bed. Crew is sleeping in their ejection seats on the flight deck which will be the standard practice during the OFT program. 14 hours, 4 minutes mission elapsed time. This is Mission Control Houston.

This is Mission Control Houston at 15 hours mission elapsed time. The orbiter Columbia is on its 11th orbit around the Earth on this, its second flight of the orbital flight test program. Crew is well into their sleep period now, although there was some indication about 20 minutes ago as they passed over one of the ground tracking stations that they had perhaps used the water gun on board, getting a drink of water before turning in and that they had used some of the equipment on board, set an alarm to wake them up in the morning, so they are perhaps just now getting to sleep. It appears that we will be operating the OSTA-1 instruments during the night. There has been some concern earlier that with some reflected transmitter power on the Sir A antenna that appears to have been resolved and they should be operating those instruments automatically or from the ground during the night at 15 hours and 2 minutes missiosn elapsed time. This is Mission Control Houston.

This is Mission Control Houston at 16 hours mission elapsed time. Columbia is on its 12th orbit around the Earth and is now passing over the southern part of South America, over the Santiago, just past the Santiago, Chile tracking station. Flight controllers here in Mission Control are busy working on updates to tomorrow's flight plan. Tomorrow promises

to be a busy day as we condense and compress some of the activities going into the minimum mission flight plan. The crew has about a little less than 5 hours remaining in their sleep cycle tonight. The cabin temperature is approximately 88 degrees, although it's perhaps not quite that warm where the crew is depending on the location of that sensor is probably in a slightly warmer location than the spot of the cabin where the crew is at the moment. Humidity in the cabin is shown as 34 percent. 16 hours, 1 minute mission elapsed time. This is Mission Control Houston.

This is Mission Control Houston, 17 hours mission elapsed time. Columbia on its 12 orbit. Just past out of range at the Guam tracking station. Crew continues to sleep and has a little less than 4 hours remaining in their sleep time. Flight controllers in Mission Control continuing to monitor the vehicle and the condition of all the system.....

END OF TAPE

PAO This is Mission Control Houston. 17 hours mission elapsed time. Columbia on its 12th orbit just past out of range at the Guam tracking station. Crew continues to sleep and has a little less than 4 hours remaining in their sleep time. Flight controllers in Mission Control continuing to monitor the vehicle and the condition of all the systems. Everything appears to be nominal at this time, and the OSTA-1 instruments continue to take data as their targets of opportunity arise. At 17 hours, 0 minutes mission elapsed time, this is Mission Control Houston.

PAO Mission Control Houston, 18 hours, 0 minutes, mission elapsed time. Columbia on its 13th orbit. Crew has about 2 hours and 50 minutes remaining in their sleep period. Flight controllers here in Mission Control are busily engaged in updating the flight plan for activities to begin just a few hours from now. 18 hours, 0 minutes mission elapsed time. This is Mission Control Houston.

PAO This is Mission Control Houston at 19 hours mission elapsed time. The flight control team change of shift is just about been completed with the crimson team of flight directors Don Puddy and Harold Drawn, passing over to the bronze team headed by flight director Chuck Lewis. We have a change of shift briefing for the offgoing flight control team scheduled at approximately 4:48 a.m. this morning. The crew has about 1 hour and 50 minutes remaining in their sleep period and then will awake to face a revised crew activity plan that has been put together here this evening in Mission Control for a full day of activities later today. At 19 hours mission elapsed time, this is Mission Control Houston.

PAO This is Shuttle Control at the mission elapsed time of 19 hours, 26 minutes. Flight director, Don Puddy now estimates this change of shift briefing will begin at 5:00 a.m. central standard time. Change of shift at 5:00 a.m. central standard time in room 135 of the JSC news center.

PAO This is Shuttle Control at the elapsed time of 19 hours, 40 minutes. Flight director, Don Puddy has left the control center enroute to the news center for change of shift briefing which is estimated to begin at approximately 5:00 a.m. central standard time. He is accompanied by flight director Harold Drawn and flight activities officer, Dr. Pierce. Change of shift briefing will be in room 135 at the Johnson Space Center news center. There's 1 hour, 9 minutes remaining in the crew's sleep period. At 19 hours, 41 minutes mission elapsed time, this is Shuttle Control Houston.

PAO This is Shuttle Control at mission elapsed time of 20 hours, 38 minutes. Columbia is on its 15th orbit of the Earth about a half a minute away from acquisitions through the Quito, Ecuador tracking station, still about 10 and one half minute

left in the crew's sleep period. Normally we would send a wakeup call at Bermuda at that time, however, the flight director, Chuck Lewis has decided to make the wakeup call at Madrid which is in approximately 20 minutes. There's always a chance that the crew will be awake and give us a call at either Quito or Bermuda. We'll stand by through those stations in case they call us, but we do not intend to call them until Madrid acquisition in 20 minutes. 20 hours, 39 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 20 hours, 54 minutes mission elapsed time. Bermuda has loss of signal. Next station is Madrid in 5 minutes. We noticed on the data that the crew's alarm clock hadn't gone off aboard Columbia and along toward the end of this pass they were greeted with Pigs in Space. Responded just prior to LOS. We'll talk to them again at Madrid. 20 hours, 55 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 20 hours, 59 minutes mission elapsed time. Columbia is about 30 seconds away from acquisition through Madrid. CAPCOM is on this bronze shift. Astronauts Jim Buckley and Sally Ride will standby for conversation through Madrid.

CAPCOM Columbia Houston, we're with you at Madrid for 6 and 1/2 minutes.

SPACECRAFT Okay Houston. Read you loud and clear.

CAPCOM Okay Joe. We've got you loud and clear also. We're going to be sending a GMM up to clear the SPC buffer here at Madrid. It got locked up during the night and we want to clear it so we can use it.

SPACECRAFT Okay Jim. Do you need a (garble)?

CAPCOM Negative. No actions required on your part. That was info only and we did send some teleprinter messages during the night. If you've had a chance to look at them and have any questions we're ready to talk about them.

SPACECRAFT Jim, we got them off and I've had a chance to stand over the flash of that procedure only very quickly. I'd like to go over them again before talking about it in detail.

CAPCOM Evap OK, no problem, we can talk to them at Yarragadee. The flash message calls out for a time of 21:04, that's not including critical. There's no problem with delay in starting that.

SPACECRAFT OK, well that's no problem, I'll go ahead and do

that

END OF TAPE

CAPCOM ...104 that's not critical. There's no problem with delay in starting that.

SPACECRAFT Okay, well that's no problem. I'll go ahead and do that. It was the just the summary that I haven't had a chance to work on. I'll go ahead and do the flash evap stuff at 2104 on time.

CAPCOM Roger we copy.

SPACECRAFT And Jim, after we're LOS Madrid are you go for an SM check point?

CAPCOM Standby.

CAPCOM Columbia, Houston. In regard to the SM check point, we've got some DU equivalents that we're going to need to do so we'll give you a call when we'd like the SM check point and we won't need one at this time.

SPACECRAFT Okay Jim.

SPACECRAFT And Jim, I did get the message about the RMS. I believe I understand what you want today.

CAPCOM Okay real fine.

CAPCOM Columbia, Houston. We're ready with those DU equivalents at this time. If you could give us a spec 60 on a CRT of your choice, we'll send them up.

SPACECRAFT Okay, Standby. Okay Jim. We just passed over Rota didn't we?

CAPCOM You surely did.

CAPCOM Columbia, Houston. We see that you've given us spec 60 on CRT 2 and we'll send them up if that's alright.

SPACECRAFT Okay, Jim. And incidentally I'm sure we got a number of phone messages during the evening and I'm assuming that you got those on the downlist and understand them all. If so, no sense in talking about them. The only one that we didn't really understand was we did get one on the (garble) I believe. And was looked like after that it got directed either by the system or the by the payload (garble).

CAPCOM That's affirmative, we did fix it after that.

CAPCOM Columbia the only one that we don't understand right now is the S66 water message. Did you take a drink or something at that time?

SPACECRAFT Well, we got a whole bunch of S66 water messages and I don't remember any that we didn't understand. There was, you know, and we have been, you know, running the water down there.

CAPCOM Okay.

SPACECRAFT Jim, I'll tell you, this sure beats working for a living.

CAPCOM I'm glad to hear that.

SPACECRAFT We naturally we didn't get our well we did get plenty of sleep last night, but it's hard to sleep with all the opportunities to watch things. And also, the teleprinter did not bother us at all.

CAPCOM Okay, we copy. We're about 1 minute from LOS. Yarragadee is next at 2133. Be advised just as a reminder that we see both of the star trackers shutters closed and for info that DU equivalent that we were doing there is the APU tank valve and it's complete.

SPACECRAFT Okay. Thank you Jim and thanks for the reminder on the doors we'll get them open.

CAPCOM Roger, going over the hill, you're go to do a check point.

SPACECRAFT Hey, okay Jim. We'll get it.

PAO This is Shuttle Control. Madrid has loss of signal. Next station to see Columbia is Yarragadee Australia in 27 minutes. Columbia's current orbit 139 by 138 nautical miles with an orbital period of 1 hour 29 minutes 41 seconds. At 21 hours 7 minutes Mission Elapsed Time this is Shuttle Control Houston.

PAO This is Shuttle Control at 21 hours 33 minutes Mission Elapsed Time. Columbia coming up on acquisition through the tracking station at Yarragadee Australia.

CAPCOM Columbia, Houston through Yarragadee for 8 minutes how do you read?

SPACECRAFT Loud and clear, Jim.

CAPCOM Okay I've got you loud with a little background noise but you're readable.

SPACECRAFT Roger, Jim, and how do you read the PLT?

CAPCOM PLT, I read you the same way your loud slight

background noise and readable.

SPACECRAFT (garbled) checkpoint and I'm presently typing the end of the table that's set up for the free system interaction test.

CAPCOM Columbia, Houston. In regard to the three system interaction test, teleprinter message 9 Echo which was the CAP update, I believe we called to delete that. It's on line 13 at 2135. We're going to delete that at this time.

SPACECRAFT (garbled).

CAPCOM Columbia, Houston how do you read?

SPACECRAFT We read that last transmission okay, Jim. You are cutting in and out though.

CAPCOM Okay, did you copy that we're going to delete the three system interaction test at this time? We may reschedule it.

SPACECRAFT You bet. We copied that. We have a few words for you on flash evap if you're ready to copy.

CAPCOM Yes sir. Go ahead.

SPACECRAFT Actually ready to listen. There won't be much copy. And Jim we tried the procedure on the teleprinter message, and the evap out temps were 61 and 60 for left and right respectively. Then we implemented the procedure, and about 1 minute after we did from that return flash evap system primary 8 are on, the evap out temps started down and they brought them down.....

END OF TAPE

SPACECRAFT Well we did (garble) we turned flash evap system primary eta on the (garble) started down, and they brought it down at about 47 degrees. The brought it down, and it started back up again at about 1 plus 30 after evap was brought on line, the flash evap was brought on, then they went right back up to about 61 and 62 degrees again.

CAPCOM Okay Joe, we copy that.

SPACECRAFT And Jim as you can see, the freon loops one and two the evap out temps now are riding at about 58 and 57 degrees for one and two respectively.

CAPCOM Roger, 57 and 58.

SPACECRAFT 58 for loop one 57 loop two.

CAPCOM Roger

SPACECRAFT (garble)

CAPCOM Go ahead, PLT.

SPACECRAFT The teleprinter when we thought they were all up, but I'll go down there and check and make sure we got'em because we didn't see the one that deleted the inner action (garble) although that is no problem. And we can we start it for you anytime you'd like.

CAPCOM Roger, that message to nine echo you really need to get a hold of it to look at it, we got some new IMU alignment attitudes we'd like you to use on that message.

SPACECRAFT (garble) Houston, PLT do you read?

CAPCOM Read you loud and clear, go ahead.

SPACECRAFT Okay Jim , they probably passed it on to you, but we did not pin the cabin temp controllor in the full (garble) position last night so we don't need to even change it this morning. And incidently, the temperatures were fairly comfortable, Joe and I did put on a jacket, but we were not hot or cold.

CAPCOM Okay, copy you were comfortable.

SPACECRAFT That's affirmative, and also the inter connect left OMS/RCS was established on that. (garble)

CAPCOM Columbia Houston, how do you read?

SPACECRAFT Read you loud and clear Jim.

CAPCOM Okay, we'd like you to do something else for the FES at this time, we'd like you to take primary A off and primary B to on, and then go back through and redo the FES flush procedure again, and see if that will help.

CAPCOM Columbia Houston, how do you read?

SPACECRAFT (garble) Jim reading you loud and clear.

CAPCOM Okay, in regard to the FES flush procedure, there's no need to go back and do that procedure again, but we would like you to get on primary B turn the A controller off, and then see what happens.

SPACECRAFT We'll give it a try

CAPCOM Okay and we're about 40 seconds from LOS we'll pick you up at Orroral Valley at about 21:41.

SPACECRAFT Okay, see you there.

PAO This is Shuttle Control, Yarragadee has loss of signal, very noisey communications through that ultra high frequency station. We will have acquisition through Orroral, Australia momentarily.

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

SPACECRAFT Okay, read you loud and clear Jim. And flash evap B has brought the evap out temps down to 43 and 42 respectively, and they look like they're holding pretty steady.

CAPCOM Okay, that's outstanding.

CAPCOM Columbia, Houston were you able to find that IMU align attitude called out in message nine?

SPACECRAFT We just got it Jim.

CAPCOM Okay, real fine, the reason we'd like to do that is so that we can get a better handle on IMU 3 it's drifting fairly erratically and we'd like to keep our alignment attitudes as close to a constant attitude as we can, so we can get better data on IMU 3.

SPACECRAFT Okay, fine Jim and would you like attitude for the current alignment, I've currently maneuvered to the alignment for the cap. Do you want me to get alignment here, and then go to the new attitude?

CAPCOM No, we'd like you to use the new attitude at this time.

SPACECRAFT Okay, you bet you life we're on our way.

CAPCOM Columbia Houston, we're about 40 seconds from LOS we'll see you state side next at 22:17, and for info all of the IMU align attitudes called out in the cap we'll be updating those to you so that we can keep the vehicle attitude as close to being constant as possible, and again, the same rationale applies, we're trying to get some data on IMU 3.

SPACECRAFT Okay Jim, we'll copy that, and if any of those, any of the stars that we're going to are applicable for threshold hold verification test, and you want to plug it back in and why feel free to do so, we can tag it on the end of an IMU alignment real easy.

CAPCOM Okay we'll think about that thank you.

SPACECRAFT And Houston PLT, if you don't object and we're a little bit ahead we'll go ahead and do the RMS pre-deploy check it, and check out and we'll report to you at Madrid, I'm sorry at the states.

CAPCOM Okay, that sounds fine.

SPACECRAFT Okay.

PAO This is Shuttle Control, Orroral has loss of signal, next station is

END OF TAPE

PAO This is Shuttle Control. Orroral has loss of signal. Next station is Merritt Island, Florida in about 30 minutes. Astronaut Dick Truly reporting that the temperatures in the cabin were comfortable during the night. And the systems engineers here in the control center reporting to flight record checklist all their systems were looking good as Columbia lost acquisition through the Orroral Australia station. At 21 hours 48 minutes Mission Elapsed Time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 22 hours 16 minutes Mission Elapsed Time. Columbia is on orbit number 16 and is approaching the coast of Central America. We should have acquisition through the Merritt Island tracking station in about 30 seconds. We'll standby.

CAPCOM Columbia, Houston with you stateside for 11 minutes.

SPACECRAFT Okay Jim. We're with you and (garble) timeline here. We've completed the IMU check and Jim, for the teleprinter message I did turn off flash evap prime B during this (garble) pass and if you want it back on let me know about what time you'd like it to be activated.

CAPCOM Okay, we copy that.

SPACECRAFT And Jim, I'm on page - just off of page 1-2 - in the predeploy checkout in PDRS. One question under RMS activation it says check the wrist row range item 26 to be a 4. Turned up that it was 3 and I did an item 4, item 26 + 4 execute to make it match the checklist.

CAPCOM Okay we talked about that earlier Dick, 3 is acceptable. No problem there.

SPACECRAFT Okay, is 4 acceptable because I've already typed that in.

CAPCOM Right, that's no problem.

SPACECRAFT Thank you, Jim.

SPACECRAFT And Houston, the IMU alignment results are available when you want them.

CAPCOM Okay we're ready go ahead.

SPACECRAFT Okay, -Y was 21 -Z is 17 and the angle error was 0.01. For IMU 1, delta X -0.01, delta Y -0.02, and Z +0.05. For IMU 2, X is -0.11, Y -0.00, Z +0.06. And for old IMU 3. X was -0.10, Y +0.18 and Z-0.46 and the execute time was 0+21+58.

CAPCOM Okay, we copy that.

SPACECRAFT And we did run a threshold verification on 2 just because it was sitting there and on star 17 and the acquisition threshold was 3.

CAPCOM Okay mighty fine. Thank you.

CAPCOM Columbia, Houston. In regard to the flash evap. We've got no problems with turning primary B back to on. We'd like to do it at this time so we can watch it and there's no problem with doing that simultaneous with ser A data text.

SPACECRAFT Okay mighty fine Jim. I had turned it off reference teleprinter message 009 Echo in line 23 but it's back on now and temp should be coming down shortly.

CAPCOM Okay, we copy.

SPACECRAFT And Houston PLT. Question on page 1-4 PDRS. I've rechecked all the switches and in parameters select to test, I do not get all 8's on the indicators nor all the panel A8 lights come on.

CAPCOM Okay, we copy.

SPACECRAFT And I am aware of the 30 second limitation on the test position.

CAPCOM Roger that.

SPACECRAFT And incidentally the singularity light and the reach limit light are on so the garbled ...

CAPCOM Okay.

CAPCOM Richard, in regard to those lights on A8, can you recall whether or not these are the same lights that you had to push back in after ascent?

SPACECRAFT No, when I go to test I should get all 8's on the indicators and also all the panel A8 lights to on. There were only two of the anunciator panel lights in the center that were popped out a little bit.

CAPCOM Okay.

SPACECRAFT And Houston. One more piece of information. When I do move the parameter rotary switch from 4 temp to the other positions, I do get indications on the indicator light.

CAPCOM Okay we copy that.

CAPCOM Columbia, Houston. We'd like you to verify that you are using the rotary switch and go to parameter select to test.

SPACECRAFT Roger let me try it again. Hang on. Okay, I tried again right there and it worked.

CAPCOM Okay, understand it did work.

SPACECRAFT That's affirmative and I've completed page 1-4. And the 3 to 4 check out checks out good.

CAPCOM Okay, mighty fine.

CAPCOM Columbia, Houston. We've also noticed a little while back that you've got spec 66 hung up on CRT 3. That means that you only have one row in spec. We'd like you to assign and clear it and I've got some steps to follow if you want me to read them to you.

SPACECRAFT Okay. Boy I sure thought I cleared that spec but I'll take another look at it and I know how to do it.

CAPCOM Okay let us check to see if it let's see if it's still there.

END OF TAPE

CAPCOM Let's see if it's still there.

SPACECRAFT And Houston, PLT are we going to need a supply water dump this morning?

CAPCOM Columbia Houston, no dump we'll be required.

SPACECRAFT Okay, and I forgot to tell you, I did get a good purge on fuel cell two and three.

CAPCOM Outstanding. Thank you.

CAPCOM Columbia, Houston regard to spec 66 on CRT 3, Richard the last time we could take a look at it, we saw that spec on there and if you cleared it, there's no reason to go back and try that again.

SPACECRAFT Okay, thanks for the reminder me Jim, I'm almost certain that I did clear it, if we begin to run into problems that indicate that it's there I'll clean it up, but I think that it's no longer there.

CAPCOM Okay mighty fine

CAPCOM Columbia, Houston we're watching the FES controller B looks like it's doing a good job for us, but if for some reason you need to back out of that and you have a problem with the tempeature going back up again, you can go to RAD norm and primary B off.

SPACECRAFT Okay Jim I caught all that but go to RAD what?

CAPCOM Rad to normal.

SPACECRAFT Oh, roger that, gotcha.

CAPCOM Columbia Houston, we're about 1 minute to LOS, Madrid is next at 22:34 and be advised we'll be doing a ground low power test at Madrid, so if the comm comes in a little bit low or different, it's not an onboard problem it's something we're doing from the ground.

SPACECRAFT Okay, thank you for the warning Jim. (garble) we just got an S-68 fuel cell message and I looked at it, I don't see anything wrong there other than fuel cell one indication.

CAPCOM Okay, we copy, we'll take a look at it.

CAPCOM And going over the hill, fuel cells two and three look okay to us on the ground.

SPACECRAFT Good show.

PAO This is Shuttle Control, Bermuda has loss of signal, during this pass Dick Truly reported good purges of fuel cells two and three. Those fuel cells look good to the engineer monitoring them here in the control center as we lost signal. The next station to see Columbia will be Madrid in four and a half minutes at 22 hours 29 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control, we have acquisition at Madrid.

CAPCOM Columbia, Houston we're with you through Madrid for six and a half minutes.

SPACECRAFT Okay Jim. Read you loud and clear, we're setting up cameras and working our way right along.

CAPCOM Okay outstanding, and if you've got someone that can copy down a update for the cap, and I've got one message I need to get to you this pass if someone's available let me know.

SPACECRAFT We'll be with you in just a minute.

CAPCOM Okay.

SPACECRAFT What (garble) on the cap are you going to want Jim?

CAPCOM Okay, the first one is page 4-17.

SPACECRAFT Okay Jim, we're both looking at 4-17.

CAPCOM Okay, and if one of you can get back to panel R11 before we start any cap changes I'd like to get some switches in, we've got PCM container 1 2 and 3 SG, SC, Main A, Main B and Main B that we'd like put back in because we want to.

SPACECRAFT Roger, they are on Jim.

CAPCOM Okay we want to get a (garble) pressure read out at Madrid that's why.

SPACECRAFT Okay and go ahead with cap.

CAPCOM Okay and before I start that your go to deactivate to SIR-A and that's called out at 22 plus 22 in the cap and on page 4-17 I have a SIR-A update for you.

SPACECRAFT Okay Jim go ahead.

CAPCOM Okay the on time is 235015 and the PRF gets changed to 22, the CAL changed to 13. Off time will be 0000.

SPACECRAFT Okay, copy the on time is 23 plus 50 plus 15, the PRF is changed to 22, and the CAL is 13.

CAPCOM Roger, and did you get that off time on that as being 0000.

SPACECRAFT Yes we did. Off time 0000.

CAPCOM On page 4-19 is the next SIR-A update.

SPACECRAFT Alright, go ahead.

CAPCOM Okay, the on time for that is 012300, the off time is 013400, and the STC changes to 42.

SPACECRAFT Okay, got that, the on time is 01 plus 23 plus 00, off at 01 plus 34 plus 00, and STC is changed from 40 to 42.

CAPCOM That's affirmative.

CAPCOM And if you'll notice that the times were just delta by two minutes on all of those.

SPACECRAFT Roger that. Okay Jim we're going to try to take a break right in here, and get some breakfast, we will not dilly-dally though and hopefully get into the RMS stuff in time to be able to get that SIR-A pass there that you just said first when you just read it.

CAPCOM Okay we copy, just one reminder on panel R11 before we go LOS in Madrid we'd like you to get those three PCM container switches back off.

SPACECRAFT Okay, I must of misunderstood your note, they were already off, was it off you wanted.

CAPCOM We wanted them on, and then we wanted them off before we went LOS.

SPACECRAFT Okay, can I turn them off now?

CAPCOM That's affirmative you can turn them off now.

SPACECRAFT Alrighty, they are off.

END OF TAPE

CAPCOM Columbia, Houston. We're about a minute from LOS. IOS is next at 2252 and for info we've noticed that fuel cell 3 O2 flow transducer is acting a little bit irratic so if you see another fuel cell message you might want to take a look at that.

SPACECRAFT Okay Jim thank you.

PAO This is Shuttle Control at 22 hours 41 minutes Mission Elapsed Time. Madrid has loss of signal. The next station is Indian Ocean Station in 11 minutes. Crew on the timeline for this morning beginning breakfast at this time. At 22 hours 41 minutes Mission Elapsed Time. This is Shuttle Control.

PAO This is Shuttle Control at 22 hours 52 minutes Mission Elapsed Time. The Indian Ocean Station is about to establish contact with Columbia.

CAPCOM Columbia, Houston with you at IOS for 6 minutes.

SPACECRAFT Okay Jim garbled echo....

CAPCOM Roger we've got a little bit of an echo also. Be advised we're going to be sending a IMU 3 gyro bias update at IOS for all axis and then we're going to take a look at it for a while.

SPACECRAFT Okay we understand you're going to send up a bias for IMU 3 and didn't get the rest of that.

CAPCOM Roger, the rest just said that we're going to take a look at it for a while.

SPACECRAFT Okay understand. We'll leave it be selected.

SPACECRAFT Jim, how did the OSTA data takes been going?

CAPCOM Columbia they've been coming along real well. We think we're getting some good data out of those.

SPACECRAFT Super.

CAPCOM Columbia, Houston. If it's convenient I've got a NOSL data take opportunity for you that will be coming up over Australia in about oh, 20 minutes.

SPACECRAFT You bet go ahead.

CAPCOM Okay it looks like there's quite a bit of thunderstorm activity over central Australia should be available from 2312 to 2318 use the night setting and if you get data we'd like you to use 2 magazines 6 minutes of data for that. If after

that data take you see lightening off the east coast you can use a third magazine.

SPACECRAFT Okay we'll be ready for it. Thank you Jim.

CAPCOM Roger you bet.

CAPCOM Columbia, Houston. We're about 1 minute from LOS. Yarragadee is next at 23:07. We'll see you there.

SPACECRAFT Okay see you there Jim. Thank you.

PAO This is Shuttle Control. The Indian Ocean Station has loss of signal now. Next station is Yarragadee. We still Yarragadee in about 8 minutes. During this pass the crew is informed there may be an opportunity to perform the NOSL experiment thunderstorms over central Australia may provide some lightening. And we gave them the time for that and also inform them that there may be a further opportunity over the coast. At 23 hours Mission Elapsed Time this is Shuttle Control Houston.

PAO This is Shuttle Control at 23 hours 6 minutes Mission Elapsed Time. Columbia is about 30 seconds away from acquisition through Yarragadee.

CAPCOM Columbia, Houston with you through Yarragadee for 8 minutes.

SPACECRAFT Okay Jim we're reading you loud and clear. Richard has just deployed the arm and we're bringing it back to stow. We're on page 1-6.

CAPCOM Okay we copy.

SPACECRAFT It's running very smoothly.

SPACECRAFT Houston, PLT. The times for the deploy and the stow were 27 and 26 seconds respectively. Looking good.

CAPCOM Okay we copy that Richard thank you.

SPACECRAFT And Houston, PLT. For your information the MPM movement on Orbit is much much smoother than it was in there at the Cape. There's no jerking in it whatsoever.

CAPCOM Okay we copy that thank you.

END OF TAPE

CAPCOM Columbia, Houston. We're 1 minute from LOS. Orroral is next at 2317.

PAO This is Shuttle Control. Yarragadee has loss of signal. However, the Orroral Australia station will acquire in slightly more than 1 minute. Dick Truly has begun the flight test objective series involving the remote manipulator system. He reported he has deployed the arm and then placed it in a stow position. He described the manipulator position mechanism as smooth. We'll standby for further communications through Orroral.

CAPCOM Columbia, Houston with you through Orroral Valley for 4 minutes.

SPACECRAFT Roger Houston, you came at a good time because I got a question on RMS for you.

CAPCOM Roger go ahead.

SPACECRAFT Okay Jim. It's page 1-7.

CAPCOM We're there go ahead.

SPACECRAFT Okay I released the latches the retention latch talkback went to release in about 8 seconds. However the ready for latch aft is indicating barberpole and there where we look on spec 94 on the top column under aft ready it's got two zeroes instead of two ones over.

CAPCOM Okay we copy let's take a look at it.

SPACECRAFT Okay thank you.

CAPCOM And for the CDR, if it's convenient at this time, we'd like you to take the RAD controller out T to normal and turn off primary B.

SPACECRAFT Okay we'll do it right now Jim. Go to normal and ...

CAPCOM Okay real fine, then we'd like you to turn it back on Joe and after 30 seconds we'd like you to see that the evap out temperature is down to about 39 degrees.

SPACECRAFT Okay and that's flash evap 5B you want back on is that correct?

CAPCOM That's affirmative.

SPACECRAFT Okey doke, that .....work. And Jim one more piece of information I did not see the arm move at all when we released

the latches. It didn't look like it had any free load at all.

CAPCOM Okay, understand. No arm movement.

SPACECRAFT Roger.

SPACECRAFT Houston, PLT.

CAPCOM Roger, go ahead.

SPACECRAFT Okay Jim, I'm looking in my binoculars, at the end effector and even though we did not visually see any arm movement it almost looks like the end effector in fact did lift up a very minute amount and the lighting is not that good back there so I garbled but it does look like the end effector may have moved up just a hair.

CAPCOM Okay we copy.

CAPCOM Columbia we're about 50 seconds from LOS. We'll have some realtime TV over Conus coming up the next pass and for planning purposes we'll probably be wanting to use camera delta.

SPACECRAFT Roger understand.

CAPCOM Okay. break, break. We don't think there's a problem with the wrist pitch, we'd like you to drive it back down Richard.

SPACECRAFT Okay understand. Try to drive the wrist pitch back down and if I can get grays, I'm ready to go is that right?

CAPCOM Yes Sir. That's affirmative.

SPACECRAFT Okey doke, we'll do it.

CAPCOM Columbia we're about 10 seconds we'll see you stateside.

SPACECRAFT Okay see you there Jim.

PAO This is Shuttle Control 23 hours 21 minutes Mission Elapsed Time. Orroral Valley has loss of signal. Next station is Tula Peak New Mexico in 26 1/2 minutes. Dick Truly is continuing to proceed through the flight test objective series over Orroral was performing the Manipulator Retention Latch part of those tests. Was thought for a while that that there may have been a slight wrist pitch problem but, as we had loss of signal, there appeared to be no problem with that the end effector had moved slightly which gave Truly the indication he was receiving. We'll get television of the remote manipulator system operation during the next stateside pass over the Merritt Island

Station and then again when we have acquisition through Madrid. We're expecting first TV on the RMS at 9:01 Central Standard Time. At 23 hours 23 minutes Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control at 23 hours 48 minutes Mission Elapsed Time. Standing by for acquisition through Tula Peak New Mexico. With overlapping coverage through Merritt Island and Bermuda. We should get television of the remote manipulator system through the Merritt Island station. Columbia should have acquisition in about 15 seconds.

CAPCOM Columbia, Houston with you through states for 14 1/2 minutes.

SPACECRAFT Okay we're reading you loud and clear.

CAPCOM Got you the same.

SPACECRAFT Okay Sally, we got the arm secured right now we're just getting ready to activate the SIR-A. We've got the power on and we're getting ready to turn it on.

CAPCOM Okay sounds good.

SPACECRAFT You sound mighty good too.

SPACECRAFT And Sally, I'll be glad to let you know where we are in the checklist on RMS testing.

CAPCOM Okay go ahead.

SPACECRAFT Okay the arm is out for the.....

END OF TAPE

SPACECRAFT ...where we are in the checklist on RMS testing.

CAPCOM Okay go ahead.

SPACECRAFT Okay the arm is out for the first time. She's been deployed working great. We have done all the way through page 1-12 and we're sitting waiting for the SIR-A data take to be over and to get back into it and do the THC phasing Orbiter unloaded on page 1-13. Suggestion about the latch worked fine. I used direct mode and fiddled with it a couple of times and ended up with all three great gray.

CAPCOM Okay that sounds great and you guys do good work.

CAPCOM Columbia, Houston how do you read?

CAPCOM Columbia, Houston how do you read?

SPACECRAFT Houston, PLT read you loud and clear.

CAPCOM Okay your loud and clear now too. And we copied your RMS comments and sounds great.

SPACECRAFT Okay.

PAO We have a picture coming in now.

CAPCOM And while we've got a SIR-A data take going we'd like you to take the primary B FES controller off and then back on.

SPACECRAFT Okay Sally, thank you. I didn't even see that it had come down there.....

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead.

SPACECRAFT Roger are you getting TV down there?

CAPCOM We had a great picture of the flag from camera delta and now we've got a test pattern.

SPACECRAFT Okay, if you get a chance during the pass want you to get in go to look at the RMS elbow camera and tell us when you can do that if you get it locked up.

CAPCOM Okay we'll do that and we've got a picture of the flag back and we'll coordinate with INCO.

SPACECRAFT Super.

CAPCOM Columbia, Houston. We've got the elbow camera.

SPACECRAFT Okay.

CAPCOM Hi Mom.

SPACECRAFT garbled. And, Sally, you can tell INCO he can use any of the cameras now that he likes. We'll not be using them again until after the SIR-A pass.

CAPCOM Okay we copy thank you.

SPACECRAFT And Sally you might tell INCO that the cabin TV is operating now if he wants to tune in on that also.

CAPCOM Okay we'll tell him.

CAPCOM Columbia, Houston. While you got a minute, we'd like to cycle the cabin fans and the way we'd like to do that is have you turn cabin fan A on, let us verify that it's on and then we'll give you a go to cycle B off.

SPACECRAFT Okay sure enough.

SPACECRAFT Looks like it's a little cloudy out here Sally. It's a good thing the SIR-A sees through that.

CAPCOM And Columbia, we would like to get the cabin fans changed as soon as possible.

SPACECRAFT You bet it is on Sally. And we can hear it crank up on board.

CAPCOM Okay standby.

CAPCOM Okay we see fan A on and we'd like you to take Bravo off now.

SPACECRAFT Okay Bravo off.

CAPCOM Okay and be advised that we are looking at a great picture from looks like camera delta of the arm and the earth.

SPACECRAFT Good show. Very very good.

CAPCOM And we're looking inside the cabin now. Looks like you're having some trouble with your CAP.

SPACECRAFT Roger that. Like always Sally. .....

CAPCOM .....

PAO This is Shuttle Control both crewmen were photographing the earth through the overhead windows. The CAP that Sally Ride referred to is the crew activity plan that was the book that kept floating in front of Joe Engle.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead.

SPACECRAFT The SIR-A has been, Joe has deactivated the SIR-A so I'm going to get back into testing and you might let INCO know that I'll need to be moving some of the cameras around.

CAPCOM Okay we copy that and that's fine. A reminder that we're going to have realtime TV again at Madrid at the next pass. And we're about 40 seconds to LOS Madrid is next at 00+08.

SPACECRAFT Okay thank you Sally.

CAPCOM Columbia, Houston. If it's convenient over Madrid, during the realtime TV, the INCOs would like to use the elbow camera to pan the bay.

SPACECRAFT That will be no problem Sally. And I can help you move it or help him move it initially we'll be glad to.

CAPCOM Okay good.

PAO This is Shuttle Control. Columbia is beyond Bermuda's range now. Madrid will pickup Columbia in 4 1/2 minutes and we'll have more live television there. As we acquired at Tula Peak the Pilot Dick Truly reported that he had gone through about a half a dozen of the flight test objectives for the remote manipulator system. That he had secured it for the SIR-A pass over the continental United States. Reported that the arm worked great and he's now picking up the rest of the series of tests. We'll have acquisition now through Madrid on the 17th orbit in about 3 1/2 minutes...

END OF TAPE

PAO The rest of the series of tests. We'll have acquisition now through Madrid to on the 17 orbit in about 3 and a half minutes. At one day four minutes, mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control at one day eight minutes mission elapsed time. We're standing by for acquisition through Madrid.

CAPCOM Columbia Houston, with you through Madrid for six minutes.

SPACECRAFT Okay Sally

SPACECRAFT Roger Sally, and we've, we're in the test now, page 113 and we're getting through the wrist camera.

CAPCOM Okay, we copy.

CAPCOM And we've got some more good TV shots coming down.

SPACECRAFT Okay, Okay Sally the camera, the elbow camera is set up on a pretty good view and also camera delta has got a nice view on it now.

CAPCOM Camera delta is the one we're looking at.

SPACECRAFT Isn't that pretty though.

CAPCOM Really is.

CAPCOM Columbia Houston, if you get to a convienant break point in the RMS operations, we've got some heater reconfiguration on the cryo tanks.

SPACECRAFT Okay, stand by just a second, cause I think we're at a good break point now, have completed page 113.

CAPCOM Okay, let me know when your ready.

SPACECRAFT Okay Sally, I'm up here by the cryo tanks.

CAPCOM Okay, on tank set 1 we'd like 02 tank one bravo to auto, and H2, the hydrogen tank bravo auto.

SPACECRAFT Okay, be advised all the switches are presently in auto.

CAPCOM Okay and on tank set 2, we'd like 02 tank alpha auto, and H2 the hydrogen tank alpha auto.

SPACECRAFT Roger, they are.

CAPCOM And all the rest of the tank heaters off. OFF.

SPACECRAFT Oh dear, we've, okay let me just verify this so we won't end up with all of the tank three heaters to off, OFF, is that correct?

CAPCOM That's affirmative.

SPACECRAFT Okay and on the tank two's we want A to be in Auto and B to Off, that's correct?

CAPCOM That's correct.

SPACECRAFT And say again on tank one, was it A off, or B off?

CAPCOM That should be alpha off on tank one, and bravo off on tank two and all the tank three heaters off.

SPACECRAFT Okay it's set up that way now.

CAPCOM And Columbia, Houston when we you get back to panel A8 if you could select the elbow camera for us we're unable to do that from the ground.

SPACECRAFT Okay you got it Sally.

CAPCOM Okay, thank you.

CAPCOM Columbia Houston, we're one minute to LOS, Indian Ocean is next at 00 plus 25.

SPACECRAFT Okay we'll see you there Sal.

CAPCOM Okay.

PAO This is Shuttle Control, we've had loss of signal through Madrid, next station is Indian Ocean in 10 and a half minutes. Television at Madrid through both the wrist and elbow cameras on the remote arm. The elbow camera gave us tour of Columbia's exterior, also a shot of the arm deployed and of the Earth from the camera on the forward bulkhead of the payload bay. At one day 16 minutes mission elapsed time this is Shuttle Control Houston.

PAO This is Shuttle Control at one day 25 minutes mission elapsed time. Columbia is approaching acquisiton through the Indian Ocean station. We're beginning a playback of television received through Merritt Island and Madrid.

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

CAPCOM Columbia Houston, how do you read on UHF?

SPACECRAFT (garble)

CAPCOM Columbia Houston, how do you read?

SPACECRAFT (garble) read Sally

CAPCOM Columbia Houston, how do you read on S-Band?

SPACECRAFT Roger Houston, Columbia reading you loud and clear on. How me.

CAPCOM Okay we've got you loud and clear now.

SPACECRAFT Okay Sally, we heard your other calls, okay, a little bit echo when you coming up presumably UHF only, but your loud and clear now. We're just getting into the steps on page 1-17 going into the steps 2, 4, 6 course only.

CAPCOM Okay, 1-17 and per the changes to the flight plan.

SPACECRAFT That's correct, and also Sally on page 115 for your information on doing the test safing maneuver which it worked fine, the wrist pitch drifted into the reach limit while we were trying to watch the dynamics and we got it out so that worked fine.

CAPCOM Okay, we copy that.

SPACECRAFT Roger.

END OF TAPE

SPACECRAFT It works fine.

CAPCOM Okay, we copy that.

SPACECRAFT Roger.

SPACECRAFT Houston, PLT. The incidentally the operator commanded has been working very well.

CAPCOM Okay that's more good news.

SPACECRAFT This test is the first time we've tried it but it does work nicely.

CAPCOM Okay Good.

CAPCOM Columbia, Houston. We are about 1 minute to LOS. Yarragadee is next at 00+42.

SPACECRAFT Okay, we'll see you there Sally. And also Sally, we're on step 4 on page 117 and we repeated step 2 one time.

CAPCOM Okay step 4 and you did step 2 twice. And just a reminder, it's getting to be about time to switch the batteries in the wireless headsets.

SPACECRAFT Okay thank you.

PAO This is Shuttle Control. That's the end of the replay from the Mila television. There will be about a 45 minute delay 45 second delay before the Madrid replay begins. Columbia is out of range of the Indian Ocean station. Next acquisition through Yarragadee in 8 1/2 minutes. At one day 34 minutes Mission Elapsed Time, this is Shuttle Control.

PAO This is Shuttle Control at one day, 42 minutes Mission Elapsed Time. Yarragadee is about to acquire Columbia.

CAPCOM Columbia, Houston through Yarragadee for 7 minutes.

SPACECRAFT Okay we got you Sally and we're be with you in just a second. We're right in the middle of page 1-18 here.

CAPCOM Okay we've got you loud and clear and we don't have anything for you this pass.

SPACECRAFT Okay Sally. Richard is doing step 2 on page 1-18 now and tests are going good.

CAPCOM Okay good. Step 2 on 1-18.

CAPCOM This is Shuttle Control. Pilot Dick Truly is

continuing series of validation runs of the remote manipulator system during this pass over Yarragadee. So far RMS activities have gone very well. We'll continue to standby for any air to ground conversation.

SPACECRAFT Houston, PLT. We have completed step all the validation runs on page 1-18.

CAPCOM Okay that's super.

SPACECRAFT And for the backroom folks, we did on step three we did start it for maybe 5 seconds and I had repositioned in single and then not gone to direct. So we turned off the cameras and the VTR set it up and repeated it.

CAPCOM Okay we've got that.

SPACECRAFT Okay now you can help me stay on it Sally. On 1-19 I believe what your instructions were to skip steps 1,2, and 3 go to .....and set up the course test on steps 4,5,and 6.

CAPCOM That's affirmative. That's exactly what we want you to do.

SPACECRAFT It's in work.

CAPCOM Columbia, Houston. We're 1 minute to LOS. Orroral Valley is next at 0+51.

PAO This is Shuttle Control at one day, 51 minutes. The Orroral Valley station will have acquisition in about 10 seconds.

CAPCOM Columbia, Houston through Orroral Valley for 4 1/2 minutes.

SPACECRAFT Okay, loud and clear Sally. We have just completed step 1 on page 1-19.

CAPCOM Okay we copy. And we're going to be sending you a teleprinter message which will be their weather data.

SPACECRAFT Okay we copy that and correction on that that's step 4 on page 1-19.

CAPCOM Okay step 4.

CAPCOM Columbia, Houston. We're 1 minute to LOS. We'll talk to you stateside at 1+19.

SPACECRAFT Roger Sally. See you later.

CAPCOM Okay and over the states while you're doing the

SIR-A data take and taking a break from the RMS, we'd like to talk about our plans for the rest of the flight.

SPACECRAFT Okay. We'll be looking forward to that Sally. See you then.

SPACECRAFT Ready to keep going if you are.

CAPCOM I was afraid you'd say that.

PAO This is Shuttle Control at one day, 56 minutes Mission Elapsed Time. Orroral Valley has loss of signal. The next station is Buckhorn California in 23 minutes. NASA management has completed a review of the STS-2 mission status and a decision has been made to execute the minimum mission which was preplanned to accomplish the major tests, engineering and scientific objectives in the 54 hour abbreviated mission. Landing at Edwards Air Force Base is now planned to occur at 2 days, 6 hours and 6 minutes Mission Elapsed Time or 1:22 p.m. Pacific Standard Time. There will be a Mission Status Briefing in the building 2 auditorium at the Johnson Space Center at 11:30 a.m. today Central Standard Time. Participants will be Dr. Christopher Kraft, Director of JSC, Eugene Kranz, Deputy Director of Flight Operations and Glenn Lunney the Manager of the Space Shuttle Program Office. To repeat this announcement, NASA management has completed a review of STS-2 mission status and has decided to execute the minimum mission which was preplanned to accomplish major tests objectives.

END OF TAPE

PAO flight operations and Glynn Lenny the manager of the Space Shuttle Program Office. To repeat this announcement, NASA management has completed review of STS-2 mission status and has decided to execute the minimum mission which was preplanned to accomplish major test objectives in a 54-hour abbreviated mission. This will put the landing at Edwards Air Force Base at 2 days 6 hours 6 minutes mission elapsed time or 1:22 p.m. Pacific standard time tomorrow, Saturday. At 1 day 58 minutes mission elapsed time this is Shuttle Control Houston.

PAO This is Shuttle Control at 1 day 1 hour 3 minutes with a correction on the landing time tomorrow at Edwards. The mission elapsed time of landing will be 2 days 6 hours and 12 minutes. The Pacific standard time is as given 1:22 p.m.. Landing time in mission elapsed time 2 days 6 hours 12 minutes, Pacific standard time 1:22 p.m..

PAO This is Shuttle Control at 1 day 1 hour and 19 minutes mission elapsed time. Columbia is approaching acquisition through the Buckhorn tracking station in California. We'll standby.

CAPCOM Columbia, Houston, through Buckhorn for 18 minutes.

SPACECRAFT Loud and clear, Sally, we got the arm secured and we're set up ready to start the SIR-A. The power's been on for about 5 minutes now.

CAPCOM Ok, we copy.

SPACECRAFT And Sally, we are completed through page 123 and so we're gonna pick up on 124 when we get going again.

CAPCOM Ok, we copy. And Columbia, Houston, we're going to be sending you some accelerometer biases for all three IMU's and when you get a chance we'd also like you to check the teleprinter we sent up message 18 one eight at Orroral Valley and we had a problem, the tone stayed on the entire time so we'd like you to verify that that message came up good. And we're going to be sending you another message this pass. Message 17.

SPACECRAFT Ok, Hey, Sally, this thing have a number up in the message in the Orroral that you sent?

CAPCOM Message # 18.

SPACECRAFT Ok, Houston, PLT, we have gotten a couple of S68 fuel cells messages you might look for. I do not see anything that is strange other than fuel cell 1 again.

CAPCOM Ok, we just saw those also and it looks like fuel cell three erratic transducer.

SPACECRAFT And that's on the O2 flow?

CAPCOM That's affirmative.

SPACECRAFT Ok

CAPCOM In Columbia, Houston, we're working on a TMBV right now to fix that parameter for you.

SPACECRAFT Roger. I tell you, Sally, SIR-A's tranmitter's on calibrator and it's running.

CAPCOM Ok, good, we see that also and we just saw the evap out temps up at about 50 degrees. We'd like you to take the primary D FES controller off and then back on. And Columbia, Houston, when you've got a minute I can tell you about some of our plans for a later in the day.

SPACECRAFT Ok, just a second Sally.

CAPCOM Columbia, Houston, there's no action required on your part. We're about to switch pumps out on the OSTA pallet. We've been running on two phases on the pump that's on now. We'll be swapping them from the ground.

SPACECRAFT Ok, mighty fine and we're ready to copy the words you got for us.

CAPCOM Ok, first the bad news, our plan is that we're running a minimum mission and you'll be coming in tomorrow.

SPACECRAFT Oh boy. I'll tell you what. You're garbled and unreadable there, Sally.

CAPCOM Want me to say it again?

SPACECRAFT You got a real kind of a low frequency squeal in the background....., kind of .....

CAPCOM Ok, how's that?

SPACECRAFT That's much better.

CAPCOM Ok, you get to hear the bad news one more time then. We're running a minimum mission and you'll be coming in tomorrow.

SPACECRAFT Oh, Ok, that's not so good.

CAPCOM Think of it that you got all of the good OSTA data and all of the RMS data and you just did too good a job, we're going to bring you in early.

SPACECRAFT Ok

CAPCOM And for the minimum mission we'd like you when you get a chance to review the minimum mission pages in the CAP. There are some notes that are relevant on the tabbed page and that's page 5-8.

SPACECRAFT Roger, Ok.

CAPCOM We are going to be making some changes to it though and we're still working on those down here. The one thing that we do know is that we're going to be deleting the forward RCS tests that are called out in the minimum mission plan and we're deleting those in favor of getting some more OSTA data. So we'll be adding some SIR-A passes that will be commanded from the ground and we'll be doing those while we're on the PRCS on the primaries.

SPACECRAFT Ok, understand.

CAPCOM And that so that we can accomplish the vernier heater test.

SPACECRAFT Say again about the vernier.

CAPCOM Roger, we're going to be on the primary jets so that we can accomplish the vernier heater test.

SPACECRAFT Alright, understand.

CAPCOM And we'll be sending you a teleprinter message with more details on all this a little bit later.

SPACECRAFT Ok

CAPCOM One other thing, is that in order to get the aft RCS down to the right level for entry tomorrow, we'd like you to go normal feed on the RCS system and you can do that at your convenience, now would be a good time if you got a chance.

SPACECRAFT Ok, we'll do it.

CAPCOM And if you got the CAP handy I've got some updated SIR-A times for the manual data tapes that are called out for the rest of the RMS period starting on 4-20.

SPACECRAFT Houston, Columbia, do you read?

CAPCOM Roger, you're loud and clear now. We were in the middle of a handover.

SPACECRAFT Oh, Ok, and we're ready to copy those updates for

the SIR-A.

CAPCOM Ok, on page 4-20 the ontime will be 022145. That's 2145. The offtime is 31

END OF TAPE

CAPCOM 1 4 5 that's 2145, The off time is 3115, and the only changes in the data takes are to the PRF, that should be an item 23 instead of 22. And the STC should be in item 42. 42

SPACECRAFT Okay, copy that, the on time is 02 plus 21 plus 45, off at 31, 02 plus 31 plus 15, and the PRF changes to 23, STC changes to 42.

CAPCOM That's correct, and the next one is on page 421, next page.

SPACECRAFT Okay, (garble) that page.

CAPCOM Okay, on time is 035500. Off time is 040730, and the changes to the data take we'd like the cal to be item 13, 13 PRF stays the same, gain should be item 30, item thirty. And the STC should be item forty-one, 41.

SPACECRAFT Okay, copy that, the on time is 03 plus 55 plus 00, off at 04 plus 07 plus 30, cal is 13, gain is 30, STC is 41.

CAPCOM You've got it.

CAPCOM Columbia Houston, if you'd like to take care of that fuel cell three, 02 parameter yourselves, you can find it in the Ref Data book on page 4-15. And that's fuel cell three 02 flow and you can go ahead and inhibit that parameter, we think it probably be a little quicker if you did it.

SPACECRAFT Okay Sally, we'll do it.

CAPCOM Columbia Houston, we've got data for another five minutes here over the states. We'd like to see your RCS reconfiguration while we've got data, if it is convienant for you to perform that now.

SPACECRAFT Okay, stand by.

CAPCOM Columbia Houston, we're not sure whether you copied or not, I think we might have been in a hand-over when I mentioned it before. We saw the evap out temps go up to about 50, and we'd like you to take the primary B controller and cycle it off and then back on again.

SPACECRAFT Okay, sorry Sally we didn't get that. (garble) get that controller on and off now.

CAPCOM Okay.

CAPCOM And also, it's looking to us like IMU 3 is performing well and you can reselect it anytime.

SPACECRAFT Okay, I'll do it right now. And the RCS is reconfigured.

CAPCOM Okay we see that, and it looks good to us. And Columbia Houston, your getting praise from the payloads people down here, they said that the last two SIR-A data takes looked super.

SPACECRAFT Good, I'm glad they're working out.

CAPCOM Columbia Houston, we're about a minute and a half from LOS, Dakar is next at 1 plus 43, if you've got a chance we'd like to know whether you've gotten any NOSL data takes, and also how you feel about the RMS, whether you feel like your getting a little bit ahead, or falling behind.

SPACECRAFT Sally, we have not gotten any NOSL data yet, the last pass over, Australia, we saw the lightning way off on the horizon, but weren't able to get any data out of it.

CAPCOM Okay.

SPACECRAFT And Sally, on the RMS, frankly with these changes I can't tell if we are behind or ahead. I feel like we're a little ahead, but we certainly do want to finish the list for today, and you know, I think we'll get to do that.

CAPCOM Okay, just for your information, it looks like to us like you are a little bit ahead, and if you feel comfortable with it, we've been talking about maybe letting you at the end, if you finish early, get the elbow camera up t[illegible] and pan the bay and do that beginning of the group two.

SPACECRAFT You bet, that'd be a lot of fun and we'll, I'll look forward to that.

CAPCOM Okay good, we'll talk to you at Dekar.

SPACECRAFT And Sally, we're both feeling real good, and we've got plenty of energy left, there is no, Joe is standing (garble) a little bit we're go onboard here.

CAPCOM Okay.

PAO This is Shuttle Control at one day one hour 38 minutes, mission elapsed time. Columbia has just completed a lengthly pass over the continent of the United States, now out of range of the Bermuda station, next acquisiton through Dakar in five minutes. Crew was informed during this pass that tomorrow is landing day. They secured the Remote Manipulator System during this pass so that they could take data with the SIR-A experiment, one of the OSTA experiments. The OSTA people in

the payload control center reported that the crew of Columbia got outstanding data takes on SIR-A during this pass. We plan to delete the forward reactant control system test so that we can replace them with more OSTA data takes. When queried Dick Truly felt that he was a little ahead on the RMS work and the ground concurs with that, and it is possible that we may be able to get some work in group two of those tests later today. They reported feeling good, going to extend their day today. The ground would like to do that. There's a erratic transducer on fuel cell three that's caused alarms, in the cabin it is an instrumentation problem

END OF TAPE

PAO There is an irratic transducer on fuel cell 3 that's caused alarms in the cabin. It is an instrumentation problem, there is no problem with the fuel cell and the parameters on that will be changed to prevent alarms from disturbing the crew. We're about 3 minutes away from acquisition at Dakar. The mission status briefing with Chris Kraft, Gene Kranz and Glenn Lunney has been changed to 12:30 p.m. Central Standard Time, repeat the time for the mission status briefing with Kraft, Kranz and Lunney is now 12:30 p.m. Central Standard Time. At one day, one hour 41 minutes Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control one day, one hour, 43 minutes standing by for acquisition through Dakar.

CAPCOM Columbia, Houston through Dakar for 5 minutes how do you read?

CAPCOM Columbia, Houston through Dakar for 5 minutes how do you read?

SPACECRAFT Loud and clear Sally.

CAPCOM Okay your loud and there's a lot of background noise but you're readable.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. If you could give us a voice check and maybe a short count we could set the squelch that would help us some down here.

SPACECRAFT Okay Sally. Coming with a short count 1, 2, 3, 4, 5, 4, 3, 2, 1. Columbia out.

CAPCOM Okay thanks a lot, that helped.

SPACECRAFT Houston, PLT. We have completed step the procedure on page 1-26.

CAPCOM Okay very good.

CAPCOM Sounds like your ready to start the end effector OPS check.

SPACECRAFT You bet we sure are, Sally. Incidentally so far the arm is really been operating very smooth. The little overshoots that we have seen in the simulator are present and going to be very visible when you see the VTR for example of this tracking this SIR-A antenna. In general, it's a remarkable flying machine and it's doing exactly as we hoped and expected.

CAPCOM Hey, that's great news Richard. And, you might be interested to hear that our quick look at the first little bits of data that we've had looks like the arm performs quite a bit like it does up at sim fac.

SPACECRAFT Roger that.

CAPCOM Columbia, Houston. We're 30 seconds to LOS. We'll talk to you at Botswana at 2+00.

SPACECRAFT Roger.

PAO This is Shuttle Control at one day, 1 hour 49 minutes. We've had loss of signal at Dakar. Next acquisition through Botswana in 11 1/2 minutes. Dick Truly continuing to go through the remote manipulator system checkout. The system is operating as advertised. Doing what they had hoped and expected. Operation of the remote arm is very smooth. Earlier the crew had reported that they were unsuccessful thus far in acquiring any data on lightening. The NOSL experiment. Will continue to look for opportunities, but there has been no joy to date on that experiment. One day 1 hour 50 minutes Mission Elapsed Time, this is Shuttle Control Houston.

END OF TAPE

PAO This is Shuttle Control Control at 1 day 2 hours mission elapsed time. Approaching a very short acquisition through Botswana. Low elevation standby and see if we get any air ground communications.

CAPCOM Columbia, Houston, with you through Botswana for 2 minutes.

SPACECRAFT Ok, love, clear to Botswana, Sally.

CAPCOM We've got you the same.

SPACECRAFT Houston, PLT, we have are most of the way through the grapple fixture on the end effector test. It has gone very well, we have a kind of a funny on our TV monitors. The center of both monitors is a good bit fuzzy, however, I'm quite sure that the what is going to get recorded out the camera onto the VTR will be good.

CAPCOM Ok, we understand. And Columbia be advised we have an update to the SIR-A updates that I gave you a little while ago. It turns out that the PRF on both those data takes and that's on page 20 and also on page 21. The PRF should be 22, two two, on both of those.

SPACECRAFT Ok, understand. PRF is 22 for both those takes.

CAPCOM That's affirmative. And we're 40 seconds from LOS. We'll talk to you at Yarragadee at 2 + 17.

SPACECRAFT Ok, Sally, we'll see you there.

PAO This is Shuttle Control. Botswana has loss of signal. Columbia's next station is Yarragadee in 14 minutes. Over Botswana Dick Truly reported he's about halfway through the RMS end effector test and that it has gone well. This is Shuttle Control Houston.

SPACECRAFT Ok, good, we'll be looking for you there, Sally, see you there. Ready to keep going if you are.

PAO This is Shuttle Control at 1 day 2 hours 17 minutes mission elapsed time. Columbia is 30 seconds away from acquisition through Yarragadee.

CAPCOM Columbia, Houston, with you through Yarragadee for seven minutes, how do you read?

SPACECRAFT Ok, reading you loud and clear, Sally.

CAPCOM Ok, you're loud and clear also.

SPACECRAFT Sally, I've got a quick question for you before we crank up the SIR-A. Back on page 418 of the cap at 0 hours and about 29 minutes, I did not turn on the DFI recorder PCN to low sample and wondered if you would like to have that on now?

CAPCOM Standby

SPACECRAFT Ok

CAPCOM Columbia, Houston, we'd like the recorder, the PCN recorder in low sample.

SPACECRAFT Ok, thank you. And Houston PLT the RMS I'm not looking at the book right now but the RMS is completed the end effector test. Everything went well and I've maneuvered it so that it is ready to do an approach to the graple fixture after we get through the SIR-A.

CAPCOM Ok, we understand that the end effector works.

SPACECRAFT Yes it is. The only thing that I was a little unsure about was when we released it in backup the as I said it looks like fogging or some kind of blurring on our monitors and it was so darn dark that I really didn't have as good a look as I wanted to have, however, I did see the wires moving, looked like they nesseled right back in there, and then the subsequent test worked fine. So I'm sure that the data will show that it did.

CAPCOM Ok, sounds good.

SPACECRAFT And I have inhibited fuel cell three 02 (garble).

CAPCOM Good, that should help you some onboard.

SPACECRAFT And Sally the DFI recorders were already in low sample, so we were Ok on that.

CAPCOM Ok, that's good. That was just in conjunction with the circ pump test which we had deleted.

SPACECRAFT Yea, I just noticed that.

END OF TAPE

SPACECRAFT And, Sally the DFI recorders were already in low sample so we were okay on that.

CAPCOM Okay that's good. That was just in conjunction with the circ pump test which we had deleted.

SPACECRAFT Roger, just noticed that.

CAPCOM Columbia, Houston. We're 40 seconds to LOS. Orroral Valley is next at 2+25.

SPACECRAFT Okay, we'll see you there.

CAPCOM Columbia, Houston. We're back with you through Orroral Valley for 3 minutes.

SPACECRAFT Okay. Loud and clear Sally.

CAPCOM And Columbia, we're sending you a new state vector now.

SPACECRAFT Okay.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead.

SPACECRAFT We are recipients of a message 17 alpha and 18 there was a lot of other long paper with a bunch of garbage in that last send up so if you think you sent any other messages you might review that.

CAPCOM Okay, we copy I think those are the only two that we've sent recently.

SPACECRAFT Understand okay. We have these.

CAPCOM Okay. Good and we're one minute to LOS. Hawaii is next at 245.

SPACECRAFT Roger.

CAPCOM Columbia, Houston. We just got some data that shows you had a fuel cell message a little while ago. We were wondering whether that came before or after you inhibited the parameter.

SPACECRAFT That came before. That reminded be to inhibit the parameter.

CAPCOM Just as we suspected.

SPACECRAFT Roger.

PAO This is Shuttle Control. Orroral Valley has loss of signal. Next station is Hawaii in 16 minutes. That discussion at the end of this pass again referred to the fuel cell transducer. There is no problem with the fuel cell. Dick Truly reported during this pass over Australia that he has completed the end effector test and that also went well, so the RMS work continued to progress. At one day 2 hours, 29 minutes Mission Elapsed Time, this is Shuttle Control Houston.

PAO This is Shuttle Control at one day 2 hours 44 minutes Mission Elapsed Time. Hawaii will acquire Columbia momentarily.

CAPCOM Columbia, Houston through Hawaii for 4 minutes.

SPACECRAFT Loud and clear Sally. And, Sally we have completed the approach to the grapple fixture both Joe and I flew it and it's really very smooth and really no problem. It's very easy to control.

CAPCOM Okay good we copy.

SPACECRAFT And we're now just getting ready to do the cradle align the thing (garbled) on page 1-32.

CAPCOM Okay and we'll be interested in hearing how that comes out.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. We are 1 minute to LOS. We'll talk to you stateside at 253.

SPACECRAFT Okay Sally see you there.

CAPCOM Okay and just a reminder that's going to be a realtime TV pass.

SPACECRAFT Okay. They get to see some cradling.

CAPCOM Okay and something that might help on the monitors, we think that if the brightness is turned up too high, that may decrease the sensitivity there. So, you might try adjusting the brightness a little.

SPACECRAFT Okay. Sally, I'm not sure what it is. It's a little funny now. Monitor two seems to clear up fairly well. Monitor one is does have a brightness low but it still has a fuzzy spot so I I'm not sure.

CAPCOM Okay.

PAO This is Shuttle Control Hawaii has LOS. Columbia is on it's 19th orbit. Buckhorn will pickup Columbia in about 2 1/2 minutes...

END OF TAPE

PAO ...orbit. Buckhorn will pickup Columbia in about 2 1/2 minutes. We will have live television during this pass over the continental United States.

CAPCOM Columbia, Houston with you over the states for 20 minutes.

SPACECRAFT Roger.

SPACECRAFT I'm sure you're watching it on the data but I we just straightened out the elbow joint and are now going to lower the pitch, pardon me the shoulder pitch.

CAPCOM Okay. We're watching.

CAPCOM Columbia, Houston. We'll be sending you a teleprinter message over the states.

SPACECRAFT Okay Sally.

CAPCOM And it will be the CAP update for the rest of the afternoon.

SPACECRAFT Okay very good.

CAPCOM And we've got a great picture from camera delta of the arm going down into the cradle.

SPACECRAFT Okay good.

SPACECRAFT I'll tell you the old eye ball looking out the window is the best alignment device I think.

CAPCOM And now we have a picture of the PLT moving the arm.

SPACECRAFT You know take camera D and zoom it Sally.

CAPCOM Okay go ahead and take camera delta. And it looks like the aft visuals are working great.

SPACECRAFT Oh, you got it.

SPACECRAFT And I've got camera Charlie now looking at the aft two MPMs.

CAPCOM Okay we copy.

CAPCOM Columbia, Houston. The PLT is hiding behind two CAPS. We've got the thank you much better.

SPACECRAFT Okay got three grays.

CAPCOM Super.

SPACECRAFT Lights are on.

CAPCOM Okay and when you get a chance, we need you to cycle the primary B controller again. Off and then on.

SPACECRAFT Okay Sally. ..garbled...off and back on.

CAPCOM Okay.

SPACECRAFT Sally this is a look ma no hands or feet.

CAPCOM When do I get my turn?

SPACECRAFT Incidentally Houston one of the things that has supprised me at least, I didn't think it would be this way, but we have not felt the RMS move the orbiter at all.

CAPCOM Okay we copy that.

SPACECRAFT Okay we're now getting ready to cradle in Direct.

CAPCOM Okay cradle in Direct.

SPACECRAFT And Sally cradle in Direct and then uncradled in Direct and then we'll move back to that other part of the checklist and cradle and back up.

CAPCOM Okay that's good. And just a reminder since you mentioned it. After the RMS PRCS test, we need you to auto maneuver back to -ZLV per the CAP and I think that that's per page 4-42 of the CAP.

SPACECRAFT Okay we'll do.

CAPCOM And Columbia, if you're not using the D camera we'd like to move it around.

SPACECRAFT Yes you can have it Sally.

CAPCOM Okay we'll take Delta.

CAPCOM Columbia, Houston. If you could select the elbow camera vice the wrist camera we could pan that around also.

SPACECRAFT Okay Sally. Okay you got the elbow.

CAPCOM Thank you.

SPACECRAFT Houston, PLT. You still there?

CAPCOM That's affirmative we're watching camera Charlie.

SPACECRAFT Okay it's not hard but because of the low damping in Direct it takes longer and it's a little more difficult if that's the right way to put it. But, there's enough low damping that when I for example get an input off the elbow joint, it tends to bounce the pitch a little bit even though I've got a gray on pitch and it hasn't been changing.

CAPCOM Okay we were noticing that the dynamics were pretty impressive. The arm is oscillating quite a bit out there by the wrist.

CAPCOM And Columbia be advised that we just saw camera Bravo show an overtemp.

SPACECRAFT Okay Sally, we'll take it off for a while. Thank you a lot.

SPACECRAFT Okay Houston, we are still 3 gray ready to latches in Direct.

CAPCOM Okay that's super. You guys do good work.

CAPCOM Columbia, Houston. We're 1 minute to LOS. Dakar is next at 3+16 and that's super work on the TV.

SPACECRAFT Roger see you there.

CAPCOM Okay and I'm going to turn you back over to the Marines.

SPACECRAFT Okay, Good.

PAO This is Shuttle Control. Columbia has moved out of range at Bermuda. Next station Dakar in 3 1/2 minutes. A reminder that the mission status briefing will begin at 12:30 Central Standard Time in building 2 auditorium about 7 minutes from now. At one day 3 hours 13 minutes, this is Shuttle Control Houston.

PAO This is Shuttle Control at one day 3 hours 15 minutes Mission Elapsed Time. We are standing by for communications through Dakar with overlapping coverage at Ascension Island on this orbit.

END OF TAPE

PAO ...Dakar with overlapping coverage at Ascension Island on this orbit.

CAPCOM Columbia, Houston. We're with you through Dakar and Ascension for the next 10 minutes.

CAPCOM Columbia, Houston with you through Dakar and Ascension for the next 10 minutes.

SPACECRAFT Okay read you loud and clear Jim.

CAPCOM Okay got you loud and clear also.

SPACECRAFT Houston, PLT. Why don't you get somebody to call out there to that tracking station in Dakar and tell them how glad we are to have them aboard.

CAPCOM Roger we'll sure do that. It sure has been nice to have a site here while we're going through Africa. It sure fills in the hole that we had before.

SPACECRAFT Boy it sure it. It helps a whole lot Jim.

CAPCOM Columbia, Houston. In regard to a question you had earlier today about the SIR-A forward power message I've got some words on that.

SPACECRAFT Okay go ahead Jim.

CAPCOM Roger, apparently what's happened is we're seeing a drop in output power. We're down to about 750 watts and then back up to around 900 or 1000 which is what normal operating power is. The lower limit was set at 800 watts so that's why you got the message. However, they have had a chance to take a look at all the data they've gotten in and there seems to be no problem with it operating at the lower 750 limit. The data all looks good and everybody is pleased with the data we are getting for all of the passes.

SPACECRAFT Okay very good.

CAPCOM And one other question for you Columbia. We're trying to track down the water messages that you got during the night and we're trying to determine whether they are associated with the use of the WCS or with use of the water gun. If you could shed some light on that for us we sure could use some help in tracking that down.

SPACECRAFT Jim, there was one of them that was associated I believe with the WCS. I don't know if there were any others or not I'm sorry. We did have a number of them.

CAPCOM Okay we copy. If it happens again, we'd appreciate knowing if there is an event that occurs that's associated with it.

SPACECRAFT Okay.

SPACECRAFT Houston, PLT. We are setting up on page 158 for the RMS PRCS interaction test.

CAPCOM Okay. We're there and following you.

CAPCOM Columbia, Houston. No need to acknowledge. Over the states we sent you up message 19 Charlie which is the CAP update for this afternoon. If you get a chance to look at it at your convenience, if you have any questions we'll be ready to discuss them with you.

SPACECRAFT Okay Jim. Thank you much. We'll get it out just as soon as we finish this test.

SPACECRAFT Houston, PLT.

CAPCOM Roger. Go ahead Columbia.

CAPCOM PLT, Houston. Go ahead.

SPACECRAFT Roger Jim. I do not have rather in front of me the message you sent this morning about the RMS I believe the instructions were, and you can clarify quickly while we're AOS, to go ahead and do those steps in this PRCS that you wanted done and then to cradle and backup. Would you confirm that please?

CAPCOM Okay standby.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead.

SPACECRAFT Yeah, Jim. We're configured and we're ready to go and .....PRCS.....configured and we're going to come out at LVLH at this time.

CAPCOM Okay we copy and in regard to Dick's question, what we'd like you to do if it looks like you've got time, is do the PAO maneuvers before you do the backup cradle after the PRCS test.

SPACECRAFT Okay Jim understand. We'll give a whack at it.

CAPCOM Columbia, Houston. For info looking ahead on page 5-14 in the CAP, we'll want to make sure that we get the vernier RCS test started there by CONUS so for planning purposes, make

sure you're all squared away with the RMS by then.

SPACECRAFT I'm sorry Jim. I didn't have the CAP say again and what the time is.

CAPCOM Okay Dick it's on page 5-14 in the minimum timeline CAP and we want to make sure that the vernier heater test gets started there as called out at the beginning of the Conus pass and it's just a reminder to have the RMS all squared away prior to the start of that test.

SPACECRAFT Okay Jim we'll sure do it thank you.

CAPCOM Columbia, Houston. We're about 50 seconds from LOS. Botswana is next at 3:33. We'll see you there.

SPACECRAFT I'm sorry Jim say again.

CAPCOM Roger, we're going LOS Botswana's next at 333.

SPACECRAFT Okay.

PAO This is Shuttle Control at one day 3 hours, 27 minutes Mission Elapsed Time. Ascension has loss of signal. Next station is Botswana in 6 minutes.

PAO This is Shuttle Control one day 3 hours 33 minutes Mission Elapsed Time. Standing by for communications through Botswana.

END OF TAPE

PAO This is Shuttle Control, one day three hours 38 minutes, mission elapsed time, standing by for communications through Botswana.

CAPCOM Columbia Houston, we're with you through Botswana for five and a half minutes.

SPACECRAFT Okay Jim, reading you loud and clear.

CAPCOM Roger, have you loud and clear also.

SPACECRAFT And Jim we're setting up for step 10 on page 159.

CAPCOM Okay, I copy.

SPACECRAFT And Houston, why don't you pass that same message for us down at the tracking station at Botswana, those two really are helping it.

CAPCOM We'll sure do that.

CAPCOM Columbia I don't know if your aware of it or not, but Botswanas' been having some really bad weather conditions down their the last couple of days, and in spite of it all they've been able to hang in there for us, and we sure appreciate it.

SPACECRAFT Well Jim, we're receiving a whole bunch of lightning down their right now, so I can understand what your saying.

CAPCOM Okay

SPACECRAFT And another thing, (garble) extra effort they're doing, keeping their station up for us.

CAPCOM Columbia Houston, in regard to that lightning that you see, if you think you can get some NOSL data on it, we'd sure appreciate it. We've got another REV coming up, the next REV will also be going over the same area so you might wanna plan on that and we'll have a pad for that one.

SPACECRAFT Okay

SPACECRAFT Houston, PLT

CAPCOM Go ahead PLT

SPACECRAFT Roger, we're set up at the IC for steps 10 and 11 on 1-59, and wrist, we're unable to get a picture out of the wrist camera. We've got RMS selected to the RMS camera to monitored two.

CAPCOM That's fine.

SPACECRAFT Let us switch a couple of switches

CAPCOM (garble)

CAPCOM Okay we're about a minute to LOS, Yarragadee is next at three plus 52 and we'll see you there.

SPACECRAFT Okay, if we can't get this wrist camera to work, we're going to pick one of our choice and go ahead and do the test, over.

CAPCOM Roger, understand just press on.

SPACECRAFT (garble)

PAO This is Shuttle Control at one day three hours 39 minutes, mission elapsed time. Columbia's out of range at Botswana now, next station is Yarragadee in twelve minutes. This is Shuttle Control Houston.

CAPCOM Columbia Houston with you through Yarragadee for the next seven minutes do you read?

END OF TAPE

CAPCOM Columbia Houston, with you through Yarragadee for four minutes, how do you read?

SPACECRAFT Loud and clear Jim, and we're just bringing the SIR-A up now.

CAPCOM Roger, copy and for the PLT just a quick question we're you able to get the wrist camera back functioning?

SPACECRAFT No we weren't and as a matter of fact we were unable to get the wrist or the elbow camera to either operate or in the case of the elbow camera to pan or tilt. The power on talkback indicates, it's off now but we had, it indicated on, but we essentially had no joy, so what we intended to do was to park the arm over by the, you know low on the port side, and we intended to go ahead and get this SIR-A data take and unless you can help us figure out anything with the RMS cameras we would delete that one group two activity that you suggested and then ago ahead and cradle the back up visually.

CAPCOM Okay, one thing you might check on panel R15 row echo, there are three port RMS TV circuit breakers, you might check those and see if they are out.

SPACECRAFT Okay, Jim

SPACECRAFT Okay Jim on row echo, the RMS port camera pan and tilt the circuit breaker is out and I believe that's the only one that is out on that one row, and with your concurance we can reset it and try it.

CAPCOM Okay, stand by on that

CAPCOM Columbia Houston, your go to reset that circuit breaker.

SPACECRAFT Okay, here we go. Okay it'set, Jim the circuit breaker is reset but when Richard tried to run the pan and tilt on the elbow camera the circuit breaker popped out again.

CAPCOM Okay we copy, let's just continue on without them.

SPACECRAFT Okay.

SPACECRAFT And Jim you might pass on to the SIR-A folks, we were a little late getting the power on this time, we wanted to wait until we got the arm back down in position to cradle here, so we were a few minutes late in getting the power on but we started the data take about on time with no warm up.

CAPCOM Okay we copy that, we're about 40 seconds to LOS, Hawaii is next at 4:17.

SPACECRAFT Okay, we'll see you then. And Jim in any event I think I'm going to wait to do this back up in daylight.

CAPCOM Columbia Houston, before we go over the hill, just we'd like to make sure that you got the teleprinter message that calls out for some CAP changes for this afternoons starting at day one four hours and five minutes. There is some information on there about your attitude that you'll need to get.

SPACECRAFT Okay, we'll pick it up right now.

PAO This is Shuttle Control, Yarragadee has loss of signal with Columbia. Next station is Hawaii is 17 and a half minutes. Crew performing a SIR-A data take over Australia on this pass. Remote Manipulator System is part, reported that problems with the wrist camera and the elbow camera found a popped circuit breaker reset it, but when Dick Truly tried to run the elbow camera pan and tilt (garble) breaker popped out again. They'll press ahead with the RMS work, without the cameras. At one day four hours mission elapsed time, this is Shuttle Control Houston.

PAO This is Shuttle Control at one day four hours 17 minutes mission elapsed time. Shuttle is approaching acquisiton through Hawaii.

SPACECRAFT Houston, Columbia do you read?

CAPCOM Columbia Houston with you for seven minutes, go ahead.

SPACECRAFT Okay Jim we've terminated the SIR-A and secured it and we configured for the VRCS heater test we're still in verniers until Dick gets the arm cradled and he's got some word for you on that.

CAPCOM Okay, go ahead

SPACECRAFT Okay Jim in a nutshell I've just gone to back up power and I did a phasing check just to make sure that everything was okay

END OF TAPE

CAPCOM Columbia, Houston, with you for seven minutes, go ahead.

SPACECRAFT Ok, Jim, we've terminated the SIR-A and secured it and we've configured for the VRCS heater test. We're still in verniers until he gets the arm cradled and he's got some words for you on that.

CAPCOM Ok, go ahead.

SPACECRAFT Ok, Jim, in a nutshell, I've just gone to backup power and I did a phasing check just to make sure that everything was Ok and I cannot get the shoulder yaw joint to drop either positive or negative in backup. All the other joints do drop positive and negative but the shoulder yaw does not. And unless you have a quick suggestion I'd suggest we get back in primary and just go ahead and cradle in single and lock it up.

CAPCOM Ok, standby, Dick.

SPACECRAFT Roger, and I am sitting in backup power now.

CAPCOM Roger, that. Columbia, Houston, we'd like you to go back to primary power for the arm and cradle in single.

SPACECRAFT Roger, Houston, I agree.

CAPCOM Columbia, Houston, for info only no need to acknowledge, we have the entry weather message for orbits 19 through 21 coming up to you over Hawaii.

SPACECRAFT Ok, thank you, Jim.

CAPCOM Columbia, Houston, we'd like you to cycle the primary B FES controller off then back on at this time please.

SPACECRAFT Ok, we'll do that, Jim.

CAPCOM Roger, thank you.

SPACECRAFT And a Houston, do you have data, what station is this?

CAPCOM Roger, we're coming to you from Hawaii.

SPACECRAFT Ok, I was just going to let you know that we're back in primary. The shoulder yaw joint does drive in primary and send it zero and I'm setting up the cradle.

CAPCOM Ok, that's outstanding.

CAPCOM Columbia Houston, we're ready to monitor the vernier, your tests and we need to select normal jets when you get all squared away, and also reminder on 016 row F to get the vernier driver off.

SPACECRAFT Okay Jim we'll do that and adapter is set up and we'll go to ten BRAVO now.

CAPCOM Okay mighty fine Joe.

SPACECRAFT And Houston PLT, the arm is latched and rolled in.

CAPCOM That's outstanding Dick, that was just super with the RMS.

SPACECRAFT One thing wrong that's on my mind, fresh on my mind, though, I said before that these alignment marks are very easy to use when cradling, there is one small funny, however, if you, in the forward MPM it's alignment box lined up exactly at zero, the alignment marks line up, however when lowering the elbow, into its MPM that mid MPM the elbow looks both visually and with the alignment marks to be outboard a little bit so I had to use a little bit of shoulder yaw to get it to line up exactly, no problem it, but the two alignment marks are not exactly compatable with each other.

CAPCOM Okay, we copy that.

SPACECRAFT But all in all, I think she worked really well.

CAPCOM We certainly concur with that.

CAPCOM Columbia Houston, I've got a couple of quick items for you. The first one is a NOSL opportunity.

SPACECRAFT Okay, go ahead Jim

CAPCOM Okay, we're looking for thunderstorms over South Africa, and the time should be 5:08, and that's available to 05:14, you'll use the night setting, and we'd like you to use two magazines for the data take if you can get them.

SPACECRAFT Okay, we got it.

CAPCOM Columbia Houston, just looking ahead in the CAP if you have some VTR for playback later on we'd appreciated you'd giving us a call on that so we can look ahead in the CAP to schedule it later on this afternoon.

SPACECRAFT Okay Jim, I've got about a little over two cassettes of the test VTR that I ran during the RMS, if you'd like that, it certainly is available.

CAPCOM Okay if we get back to you on it, looks like our opportunity for that'll be our next CONUS pass and we'll get back to you with it.

SPACECRAFT Okay.

CAPCOM Columbia Houston, just a quick question to how the heart land of America is looking?

SPACECRAFT Jim incidently a minute ago we can see the runway at the Cape at KSC from this pass we're looking right down the runway on this pass.

CAPCOM That's great.

CAPCOM Columbia Houston, we noticed on the ground that we just lost the GPC MCIU IO and wondering if the, if it was something you were doing at this time?

SPACECRAFT Negative Jim, we don't think so.

CAPCOM Okay

SPACECRAFT Oh wait a minute Jim, perhaps we did, I'm sorry I've you said MCIU and I wasn't thinking as a matter of fact I was going to ask you, what procedure in the PDRS checklist do you want me to use to put the arm in the configuration that you want it.

CAPCOM Okay, just a minute Dick we'll, we want to check that for just second.

CAPCOM Columbia Houston, we think all you need to do on Spec 94 is an item 5 and that will get the IO back in there.

SPACECRAFT Okay Houston, I've done that. And Houston we're going directly to DAP A at this time.

CAPCOM Roger

CAPCOM Okay Richard, that did the trick and we need you to cancel safing and we should be all squared away.

SPACECRAFT Okay, I hit the safing cancel switch, and GPC data light went away. I do not have the port arms selected, so the (garble) is still barberpole.

CAPCOM Okay your configuration looks good Dick.

SPACECRAFT Roger thanks Jim.

END OF TAPE

SPACECRAFT Ok, I hit the saving kits on switches GPC data light went away. I do not have the port arm selected so the .....is still bottled wrong.

CAPCOM Ok, your configuration looks good, Dick.

SPACECRAFT Roger, thank you. Houston, PLT

CAPCOM Go ahead, PLT.

SPACECRAFT Ok, some information on the PDRS decks they were running. Towards the end of the testing where we were using the decks the run lights on the low aft track didn't illuminate. It did not have an end of film but it we'd turn it on and it just wouldn't show run. And there was only on ..... the other day just before we took the last data using the decks we do get an end of film in the mid aft deck. Other than that I think all our data was achieved.

CAPCOM Ok, we copy. Columbia, Houston, we're about 30 seconds to LOS. Ascension is next at 4 + 55 and we'd like to confirm that you're in the tail only option at this time. If you're not we need you to go to tail only.

SPACECRAFT Ok, Jim, sure will, thank you.

PAO This is Shuttle Control. Bermuda has loss of signal. Next station is Ascension in eight minutes. The remote arm has been secured. Operations of the remote manipulator system are over. Crew reported Joe Engle reported seeing the runway at the Kennedy Space Center. At this time the vernier reaction control system ejector heater test is underway. The desire here is that there be no vernier RCS jet firings for at least 10 hours or until the vernier RCS leak detector temperature reaches 132 degrees Farenheit so that the cyclic steady state operation of the injector heaters may be observed. Observing this cyclicing will provide an indication of heat loss through the known thermal conduction pads. There is some concern that these heaters may be marginal in size to compensate for normal heat loss when in a cold attitude and actual flight test is required to determine their adequacy. The test was placed on this flight since STS-3 attitudes will result in cold vernier RCS injectors. The forward RCS test that had been planned for today was cancelled so that additional OSTA data takes could be accomplished. At one day 4 hours 49 minutes mission elapsed time this is Shuttle Control Houston.

CAPCOM Columbia, Houston, with you through ascension for 7 and 1/2 minutes.

SPACECRAFT Ok, Jim, reading you loud and clear.

CAPCOM Roger, have you same.

SPACECRAFT And we have the NOSL set up and we're ready to try and check those thunderstorms.

CAPCOM Very good. Columbia, Houston, just for info, at about 5:02 just after or about the time you are going into darkness if you'll look back to the southeast you should or you might be able to pick up a satellite that's just coming over the horizon. It should still be in the sunlight and it might be kind of interesting to see if you can see that.

SPACECRAFT A Ok. Thank you Jim, we'll do that.

CAPCOM Columbia, Houston, we're about 2 minutes from LOS at ascension. We'll be handing over to the ascent team. We really enjoyed working with you today, it's been great. You've done a super job and we've enjoyed it.

SPACECRAFT Well, thank you, Jim, we sure have enjoyed working with you up there, you're a big help. Thank all of you. Really good work. See you later.

CAPCOM Ok, we'll see you by tomorrow morning and we'll about to crawl out of the trenches and hand over to the ascent guys.

SPACECRAFT A Ok.

CAPCOM And we're one minute from LOS. Botswana is next at 5:07.

SPACECRAFT Ok, Jim, see you later.

PAO This is Shuttle Mission Control. We've had a loss of signal at Ascension Island. Acquire again in 5 minutes at Botswana.

END OF TAPE

SPACECRAFT Okay

CAPCOM And we're one minute from LOS Botswanas' next at 5:07

SPACECRAFT Okay Jim see you later.

PAO This is Shuttle Mission Control, we've had loss of signal at Ascension Island, acquire again in five minutes at Botswana. Neil Hutchinson Flight Director for the silver team and his team of flight controllers have resumed positions in the mission operations control room, relieving Flight Director Chuck Lewis and the Orbit team. Change of shift briefing will be conducted at 2:45 Central Standard Time, and moving to newscenter room 135 with outgoing Flight Director Chuck Lewis and Capsule Communicator Sally Ride. Mission elapsed time is one day five hours four minutes. This is Mission Control Houston.

PAO Shuttle Mission Control, coming up on acquisiton of signal at Botswana, the duration of the pass will be slightly longer than five minutes. Columbia commander Joe Engle earlier said they were configured for NOSL testing Night Optical Sensor of Lightning, Columbia is presently in darkness approaching the tip of South Africa should be reporting on the availability of NOSL testing.

CAPCOM Columbia Houston, UHF through Botswana.

SPACECRAFT Hello there Houston, we're reading you loud and clear and we're coming up on Africa now, and we're looking for some thunderstorms.

CAPCOM Roger, we have nothing for you and happy hunting for the thunderstorms.

SPACECRAFT A-ok

CAPCOM Columbia Houston, one minute left here at Botswana, we'll see you next at Yarragadee at 5 plus 26.

PAO This is Shuttle Mission Control, mission elapsed time one day five hours 13 minutes. Had loss of signal at Botswana, acquire again in approximately 12 minutes at Yarragadee over Australia, duration of that pass will be seven minutes and 20 seconds. The vehicle will cross the termination just before passing over the coast of Australia which will represent the end of opportunities to take NOSL photographs during this current orbit. Cabin temperature onboard Columbia is 85 degrees and steady, humidity is 34 percent and stable and acquisiton of signal in approximately 12 minutes, mission elapsed time one day five hours 14 minutes. This is Shuttle Mission Control.

PAO Shuttle Mission Control Mission elapsed time, one day five hours 25 minutes, coming up on acquisiton of signal at Yarragadee, duration of this pass will be slightly over seven minutes. At this point in the flight plan, Columbia pilot Dick Truly would be going through the suit donning procedure where he is for the first time in zero gravity putting on the pressure suit that he would wear during reentry, and its principly to establish reliable timelines on how long it takes to do that and how long it takes to ingress and egress from his seat so that when we do prepare for entry they have a better understanding of the time it takes and the difficulties associated with that task. Flight Director Tommy Holloway and flight controllers are now configuring the vehicle for some RCS testing that will be done

CAPCOM Columbia Houston on UHF through Yarragadee

SPACECRAFT Roger Houston, reading you loud and clear.

CAPCOM Roger your loud and clear. Did we find any thunderstorms there at Botswana?

SPACECRAFT Yes sir we sure did. I think Richard got a pretty good track on one of them, we saw one big one coming up and one of us was playing spotter out the front window window and wind up the overhead window to try and get it, and I think we got one pretty good.

CAPCOM Roger, sounds good. This is six and a half minute pass here at Yarragadee and is Richard

END OF TAPE

SPACECRAFT Okay we'll look at that and get ready to talk to you about it then.

CAPCOM Roger sounds good.

CAPCOM Columbia Houston, one minute to LOS we'll see you at Guam at 5 plus 39.

PAO This is Mission Control Houston, mission elapsed time is one day five hours 34 minutes. loss of signal, acquisiton again in five and a half minutes over Guam. The console communicator Terry Hart, TJ Hart as he's called, has instructed commander Joe Engle to prepare for a procedure of which would close, call for closing the port radiator on Columbia in order to preclude the flash evaporator from tripping off as that experience during the flight and that procedure going the subject of more discussion during AOS at Guam in about four and a half minutes, the duration of that pass at Guam will be slightly more than six minutes. This is Shuttle Mission Control.

CAPCOM Columbia Houston, we're AOS at a keyhole in Guam, over.

SPACECRAFT Okay, we got you TJ and lucky it's a keyhole cause we havn't to look over the PDP yet, we'll get right to it.

CAPCOM Ah, there's no rush on that at all, take your time and this will be a seven minute pass after we're out of the keyhole.

SPACECRAFT Okay, good thank you.

CAPCOM Columbia Houston, no need to answer we have a state vector coming your way.

SPACECRAFT Okay TJ thank you.

PAO This is Mission Control Houston, were now in a keyhole which is just a thirty second gap in acquistion of signal we will be out of that keyhole and in contact with Columbia again in just a few moments, mission elapsed time is one day 5 hours 41 minutes.

CAPCOM Columbia Houston, one minute left here at Guam we'll see you next at Hawaii at five plus 54.

SPACECRAFT Okay TJ we're both

END OF TAPE

SPACECRAFT One of us playing spotter up the front window and lined up the overhead window to try and get a, I think we got one pretty good.

CAPCOM Roger, sounds good this is a six and a half minute pass here at Yarragadee and is Richard donning his suit now?

SPACECRAFT Yes he is just now starting.

CAPCOM Okay, thank you we'll leave you alone.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control, that exchange between console communicator Terry Hart and Columbia pilot, Columbia commander Joe Engle affirming that pilot Richard Truly had acquired some NOSL Night Optical Sensing of Lightning photographs during the LOS period and that Dick Truly is indeed now going through the suit donning process. Mission elapsed time is one day five hours 28 minutes. This is Shuttle Mission Control still in an AOS period over Yarragadee.

CAPCOM Columbia Houston

SPACECRAFT Alright go ahead Jim.

CAPCOM Roger I got TJ here now and he would like to talk to you sometime in the near future at your convienance about a procedure to close the port radiator and we're thinking that may help our flash evap problem with the tripping off.

SPACECRAFT TJ I cut you out when I realize it was you and not Jim on a, say again that transmission.

CAPCOM Roger at your convienance when you have some time to listen we'd like to talk about a procedure to close the port radiator and we're thinking it may improve the problem with the flash evap tripping off.

SPACECRAFT A ok if you give us a couple of minutes we'll be right with you.

CAPCOM Sure thing, take your time, I'll tell you, we have a Guam pass coming up shortly and if you wanna look at the procedure while we're talking about it, it's in the Deorbit PDP on page 3-20.

SPACECRAFT Deorbit PDP page 3-20, we'll look at it and talk to you at Guam, and how long, how far away is Guam?

CAPCOM Roger, we have three minutes left in this pass and Guam is about ten minutes away.

CAPCOM Columbia Houston, one minute left here at Guam, we'll see you next at Hawaii at five plus 54.

SPACECRAFT Okay TJ we're both bored on the loop now and if you, we got our books open to page 321 if you want to give us a quick run down on what that (garble) going to happen. At 5-20 I mean, 3-20.

CAPCOM Roger, we think that the problem with the flash evap tripping off may be due to the high beta angle that we're flying at, the sun coming up underneath the left port radiator, and we're thinking that by closing that radiator, but not latching it, using this procedure and opening the starboard radiator circuit breakers it will be able to stabilize the loops a little better, over.

SPACECRAFT TJ you faded out their, you can try it again or we can catch you

CAPCOM Roger we're going LOS we'll see you at Hawaii.

PAO This is Shuttle Mission Control, we've had loss of signal over Guam acquistion of signal again in six minutes over Hawaii, the exchange between the ground the crew that time again referred to the plan to close the port radiator, in order the stablize the flash evaporators which had been observed to be tripping off from time to time. It appears that the position of the vehicle in this configuration may cause some shading affect or uneven loading in the radiators which could be stablilized by closing that port radiator, the exchange between the CAPCOM and Commander Joe Engle was incomplete at that .....plan to resume that discussion during acquistion of signal at Hawaii in about five minutes, duration of that Hawaii pass will be almost seven minutes long. During this period Columbia pilot Dick Truly would be continuing with the suit donning process activating the fan and that pressure suit again which he would wear during reentry and going through seat ingress procedures mission elapsed time is now one day five hours 49 minutes, have acquistion again in just under five minutes. This is Shuttle Mission Control.

PAO This is Mission Control Houston, coming up on acquistion of signal over Hawaii. There will be another keyhole during this pass which will represent loss of signal due to geographic irregularity at that location and should be out of touch only for about thirty seconds during this pass, total duration of the pass will be about five minutes.

CAPCOM Columbia Houston, AOS Hawaii for about five minutes.

SPACECRAFT Okay TJ loud and clear.

CAPCOM Roger, and before we talk about the radiator at LOS Guam there we saw a left OMS XFEED valve that may have been moving we need you to check the talk back on the left OMS XFEED bravo, we think it might have had a microswitch failure, and the valve may be driving, over.

SPACECRAFT The, both talkbacks read closed.

CAPCOM Roger, copy alpha and bravo both closed.

SPACECRAFT That's affirmative on both sides

CAPCOM Roger, and we recommend you take the bravo to GPC.

SPACECRAFT Okay, the left OMS XFEED bravo is, switch is in GPC talkback closed.

CAPCOM Roger, we'll have some more words on that for you later, and are you ready to talk about the radiators again?

SPACECRAFT Roger, go ahead, give me just a second TJ, give me five seconds.

CAPCOM Roger.

SPACECRAFT Okay TJ go ahead.

CAPCOM Roger, we think the flash evap problem may be due to the high beta angle that we're flying at, allowing the sun to get underneath the port radiator so we'd like you to do that procedure on 3-20 to close, but do not latch, that is stow but do not latch the port radiator and that will require pulling circuit breakers listed at the bottom of the procedure for the starboard radiator over.

SPACECRAFT Roger, and its the port radiator that you want to be closed?

CAPCOM That's affirmative, stow but do not latch.

SPACECRAFT I understand.

SPACECRAFT Okay, let us read this procedure real quick and and we'll see if we have any questions.

CAPCOM Roger, and there's no rush on that Richard, at your convienence.

SPACECRAFT Okay.

CAPCOM (garble)

SPACECRAFT And TJ I presume that you want to, at the top of the procedure, would you like to leave flash evap primary B as the active, leave it ON and A off?

CAPCOM We'd like you to enter the procedure under STOW RADIATORS

SPACECRAFT Oh, okay, gotcha.

CAPCOM And if that works out it will help us get some more post light data and if it stablizes the loops we'll go ahead and plan on using that for the sleep configuration.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control, we're now in that keyhole period which represents loss of signal for just about a minute due to a mountain or some georgraphical.

CAPCOM Columbia we have one minute to LOS here at Hawaii, we'll see you at Buckhorn at six plus 02.

SPACECRAFT Okay, let me make sure I understand this, what you want me to do TJ, you want us to go ahead and stow both radiators

END OF TAPE

Shuttle Mission Control, Columbia commander Joe Engle's earlier remarks about

CAPCOM Columbia to Houston we have two other activities that are timed to the timeline if you'd like to copy those as well.

SPACECRAFT TJ, you cut out just as you were planning to give us those timelines, changes, and you boomed in real loud and clear right there at the last. If you could start over, I'd appreciate it.

CAPCOM Roger, there are three activities that we think, time permitting, you can pick up. The first one is a noise level survey, orbit OPS checklist page 2-4.

SPACECRAFT Roger, TJ, I did that last night.

CAPCOM Roger, we're wondering if you had a chance be sure to do all locations Alpha through Romeo.

SPACECRAFT No, I did the ones that were listed in the CAP for yesterday. But I will be glad to try to pick them all up.

CAPCOM Roger. The next activity is at 7 hours and 10 minutes and that's a solid sorbent sample, and you can find that on the CAP on 4-9. And shortly after that seven plus 25 window observation, and that's in the photo TV checklist on page 3-2, over.

SPACECRAFT Ok, we got all those, thank you a lot TJ.

CAPCOM Roger.

Shuttle mission control Capcom TJ Hart. Uplinking some detailed test objectives which is hoped that the crew can perform during the suit donning and seat ingress and egress period. Pilot Dick Truly indicating that he had last night performed several of the noise level survey detailed test objectives which represent recording decimal levels in different parts of the vehicle, flight like deck and middeck. Still during an acquisition of signal period of about 3 minutes remaining. Vehicle now on 21 orbiter here almost directly over Miami Florida.

CAPCOM Columbia Houston we have one minute left in this pass and we'll see you next at Ascension at 6 plus 33.

SPACECRAFT Ok, we'll see you then TJ.

This is Shuttle Mission Control. Mission elapsed time is now 1 day 6 hours 18 and 1 half minutes. We've had loss of signal over

PAO This is Shuttle Mission Control, we're now in that keyhole period which represents loss of signal for just about a minute due to a mountain or some geographical

CAPCOM Columbia, we have one minute to LOS here at Hawaii, we'll see you at Buckhorn at six plus 02.

SPACECRAFT Okay, let me make sure I understand this one, what you want me to do TJ, you want us to stow both radiators and re-open only the starboard per this procedure, is that correct?

CAPCOM Negative, we want you to stow only the port radiator. And do that we'll

SPACECRAFT Okay, we'll, okay I understand.

PAO Shuttle Mission Control, mission elapsed time one day six hours one and a half minutes coming up on acquistion of signal over the mainland of the United States where the Buckhorn being the first to acquire.

CAPCOM Columbia Houston, AOS at Buckhorn.

SPACECRAFT Okay TJ, we got you loud and clear. And we're starting into the procedure to close the port radiator.

CAPCOM Roger, and Richard I'd like to confirm with you, that it's the port radiator and it's stow only do not latch.

SPACECRAFT That's affirmative TJ

CAPCOM Okay sounds good we'll watch you.

CAPCOM And Columbia Houston, we have a SIR-A pass coming up in about a minute and we need the half degreed deadband.

SPACECRAFT Okay TJ, I'll get it.

SPACECRAFT And Houston, we're in DAP-B with half a degree deadband, is that satisfactory for the SIR-A?

CAPCOM Roger, it looks good to us, and how do you read on this transmittor now?

SPACECRAFT Okay, you're loud and clear.

CAPCOM Columbia Houston, radio check on this transmittor.

SPACECRAFT Well it's not quite as loud, we, readable though.

CAPCOM Roger Columbia, and we need one more, we're setting up for later this afternoon, How's this?

SPACECRAFT Ah that's great. Check you loud and clear.

CAPCOM Okay that was UHF, the one before it was S-Band, thank you.

SPACECRAFT Okay.

SPACECRAFT Houston, PLT the port radiators' stowed and not latched.

CAPCOM Roger, it looks good to us Richard.

PAO This is Shuttle Mission Control, Columbia pilot Richard Truly confirming what data had indicated here in the mission control center that the port radiator is indeed now closed, however not latched. Again, a procedure aimed at precluding the flash evaporators from tripping off. Still in acquistion of signal period another ten minutes of voice contact and data contact remaining.

CAPCOM Columbia Houston, we recommend cycling a FES B off and then back to primary bravo.

SPACECRAFT Okay.

SPACECRAFT Okay, TJ flash evap B is coming off and back on.

CAPCOM Roger.

PAO Vehicle presently directly over the United States.

SPACECRAFT TJ where are we right now?

CAPCOM Roger, you look like your right over the heartland of America. We have about eight minutes left in this pass.

SPACECRAFT Ah Ha.

PAO That was Columbia Pilot Richard Truly asking for a fix. Vehicle now in its 21st orbit of the Earth.

CAPCOM Columbia Houston, now we're wondering whether your still using the TV system we can command it off down here if your not to save some power.

SPACECRAFT Negative, we'll turn it off now, thank you TJ, we had it on to put the raditor closing on the VTR.

CAPCOM Roger, understand

CAPCOM And Columbia Houston we have some activities that you can be doing while each others in the middle of suit donning

activity if you'd like to copy.

SPACECRAFT Ok, hold on just a second. Ok TJ, go ahead.

CAPCOM Roger, in an attempt to pick up some of the FTO's that otherwise we wouldn't with a minimum timeline. If you can, at any convenient you can do a noise level survey on the orbit OPS checklist page 2-4, and that's all locations Alpha through Romeo.

PAO Shuttle mission control, Columbia commander Joe Engles earlier remarks about.

CAPCOM And Columbia Houston we have two other activities that are timed to the timeline if you'd like to copy those as well.

SPACECRAFT

end of tape.

the mainland United States. We will reacquire voice contact the vehicle once again in 13 1/2 minutes at the Ascension Island station.

This is Shuttle Mission Control. Mission elapsed time is 1 day 6 hours, 32 minutes. Coming up on acquisition of signal over Ascension for a 2 1/2 minute pass, if they are on timeline. Pilot Dick Truly should have completed his seat ingress and egress and suit doffing at this period and Joe Engle should be preparing to begin that process. An acquisition of signal momentarily.

CAPCOM Columbia Houston, we're AOS Ascension for 2 minutes.

SPACECRAFT Ok, TJ, read you loud and clear.

CAPCOM Rog, and if you have nothing for us we have some words for you on that OMS cross feed valve.

SPACECRAFT Ok, TJ, go ahead.

CAPCOM Roger. Dick, We think that the motor was indeed driving and that it's overdrive protection had stopped it. We don't understand quite why yet. But we think the valve is usable and being in GPC position where we are right we will just be fine.

SPACECRAFT Ok, TJ, we'll leave you at GPC and keep you posted if you think it out any deeper.

CAPCOM Roger.

end of tape.

SPACECRAFT Okay TJ, we'll leave it at GPC and keep me posted if you think it out any deeper.

CAPCOM Roger

CAPCOM Columbia we have one minute left here at Ascension, the BOTSWANA pass that showed in the CAP we don't think we be available to us in this orbit today. And we will plan on seeing you at Guam at 7 plus 14.

SPACECRAFT Roger TJ, we'll see you at Guam.

This is Shuttle Mission Control we have had loss of signal, and although we will acquire again at, in about 8 minutes, that will be a medical conference, a private conference available for the astronauts to give them the opportunity to talk to the flight surgeon. And there will be no air to ground between the Columbia crew and the capsule communicator during that pass which will be about 2 minutes and a half duration and the next air to ground between the Columbia crew and Capcom will occur at Guam. Mission elasped time is 1 day 6 hours 35 minutes. This is Shuttle Mission Control.

END OF TAPE

Shuttle Mission Control, mission elapsed time, 1 day, 7 hours, 13 minutes, 14 minutes now. We have acquisition of signal over Guam. Mission Conrol Center now processing downlink data from the vehicle. Have voice contact momentarily. Duration of this pass is a little over 6 minutes.

CAPCOM Columbia Houston, AOS Guam.

SPACECRAFT Roger Houston loud and clear.

CAPCOM Roger. We have you for 5 minutes and we have a NOSL pass if you'd like to copy and also a note to help you read us...to help us read the tire pressures on the upcoming stateside pass.

SPACECRAFT Okay. Standby. Okay T.J., go ahead.

CAPCOM Roger Joe. There is significant convective activity over Central America on this next descending pass and the start MET is 7 hours and 42 minutes. The latitude is 27.7 north. Longitude is 111.0 west. It will be a late afternoon day pass and you can use up to 4 magazines if you're getting data.

SPACECRAFT Okay. And what were the coordinates again T.J.?

CAPCOM Roger. Latitude 27.7 north. Longitude 111.0 west. Over.

SPACECRAFT Okay. Got it. Thank you. And go ahead with the tires.

CAPCOM Roger. At the upcoming Buckhorn AOS, we'd like you to throw 3 switches on R11 row hotel for us so that we will be able to read the tire pressures and that's PCM container number 1, strain gage signal conditioner to main alpha and container 2, same switch to main bravo. Container 3, same switch to main bravo. And then return all those to off after buck 1 LOS. Over.

SPACECRAFT Okay. Understand. Signal conditioner container 1 main alpha, 2 main bravo, and 3, main bravo

CAPCOM Roger. You got it. We have nothing else for you and there is 3 and one half minutes left here at Guam.

SPACECRAFT Okay. And Houston PLT, I inadvertantly put the CRT 1 power to standby and we got an IO Error CRT. That explains that. I've turned the power back on and so far I have not got a picture on it yet.

CAPCOM Roger. Thank you Richard and a reminder for DAP 2 alpha please. Standby.

SPACECRAFT Roger. The DAP is in alpha.

CAPCOM Roger. We got it now. Thank you.

CAPCOM Columbia Houston, one minute left here at Guam and we recommend that you run MAL 5.4 fox trot. It's on page 5-40 for CRT 1 to regain it. Over.

SPACECRAFT Wilco.

CAPCOM And Columbia, we'll see you at Buckhorn at 7 + 36.

SPACECRAFT Roger. T.J. See you there.

CAPCOM Mission Control in Houston. Mission elapsed time is 1 day, 7 hours, 20 minutes, 40 seconds. Had loss of signal now at Guam. We missed Hawaii on this pass. We'll next acquire voice contact with the vehicle at Buckhorn. During that pass capsule communicator T. J. Hart advised Columbia pilot Dick Truly that there was some convective activity reported over the Americas which constitutes a good opportunity for the crew to perform some of the NOSL experimentation, night optical sensing of lightening. This is orbit number 22 for Columbia and the vehicle will pass over the United States entering in the Baha area and the orbital path on this flight, on this pass appearance of vehicle over Latin America and through South America exiting just south of Brazil and much of that pass will be in twilight conditions and crossing the terminator into darkness just at about the heart of South America. We'll have acquisition of signal again in 14 minutes at Buckhorn if the crew is indeed on its timeline spacecraft commander Joe Engle. He woould at this time, be performing seats ingress having suited in the pressure suits that the crew wears on ascent and entry as a precaution in case they would need their ejector in those phases of the flight, and again this.....

END OF TAPE

The crew is indeed on it's timeline. Spacecraft commander Joe Engle, would at this time be performing seat ingress having suited in the pressure suits that the crew wears on ascent and entry, as a precaution in case they would need to eject in those phases of the flight. And again, this function is performed to establish timelines for the suiting process and the seat ingress process, so that when we reenter, tomorrow, they would know approximately or more certainly how much time it would take to perform that suiting process. And although, of course, they have put on the suits before this will be the only opportunity they've had to perform that function in a zero gravity environment. Misson elapsed time is now 1 day, 7 hours, 23 minutes, 30 seconds. This is Shuttle Mission Control.

Shuttle Mission Control. Mission elapsed time is 1 day, 7 hours, 36 minutes. Approaching acquisition of signal at Buckhorn. Duration of this pass will be 7 minutes 41 seconds. We should have voice contact momentarily. Correction duration of this pass will be 9 minutes, 45 seconds.

CAPCOM Columbia Houston AOS Buckhorn for 10 minutes.

CAPCOM Columbia Houston were AOS Buckhorn.

CAPCOM Columbia Houston AOS Goldstone.

SPACECRAFT Ok, Houston we're reading you loud and clear.

CAPCOM Roger, Joe and we're you reading us through Buckhorn about 30 seconds ago?

SPACECRAFT Negative, we did not copy.

CAPCOM Roger, and Joe recommend a 1/2 degree deadband for SIR-A at this time.

SPACECRAFT Ok, just going after. Thank you TJ.

SPACECRAFT And Houston PLT, we need to talk about DEU number 1. We have been through the malfunction procedure and cycle power on at several times. We get an IO error every time we take the power to off. However, when we bring it back on the screen still is blank.

CAPCOM Roger. We copy that.

CAPCOM Columbia Houston. Richard we're continuing to look at CRT number 1 and we think that if you just leave it powered off right now, no other action will be required.

SPACECRAFT Ok, TJ, why don't I sit tight on it.

This is Shuttle Mission Control. Vehicle now over Mexico. That last exchange between the spacecraft communicator and Columbia pilot Dick Truly pertaining to the nonfunctioning cathode ray tube and the Columbia flight deck with CRT number 1 which is directly in front of the commander. We are still in acquisition of signal with 3 minutes remaining before we loose signal.

SPACECRAFT Houston Columbia.

CAPCOM Columbia Houston, go ahead Joe.

SPACECRAFT Alright TJ, I think I may have copied down a time wrong from you on a NOSL pass. I copied down 742. And do you have one coming up pretty soon, a NOSL pass coming up pretty soon, I may have copied down the wrong time.

CAPCOM No you got it right Joe, it's Central America and you should just be coming up on some activity at this time.

SPACECRAFT Ok. Well, I'm the forward observer on this pass, and I see a couple of isolated buildups ahead of us but not a big system.

CAPCOM Roger. We copy, we have some more for you a little bit later over Indian Ocean on this orbit and we'll pass that out to you Quito if you like.

SPACECRAFT Roger that.

CAPCOM Columbia Houston, 1 minute left of AOS here, we'll see you at Quito at 7 plus 50. over.

SPACECRAFT Roger, TJ, 7 plus 50 at Quito, see you there.

CAPCOM Roger, and a reminder you can turn the strain gauge signal conditioners off. Over.

SPACECRAFT Wilco

Shuttle Mission Control. Mission elapsed time 1 day 7 hours 46 minutes. We've now had loss of signal. We'll acquire again in 3 1/2 minutes through the ground station at Quito Ecquador. That discussion between the crew and the capsule communicator pertain principally to

end of tape

This is Shuttle Mission Control, mission elapsed time 1 day 7 hours 46 minutes. We now had loss of signal. We will acquire it again in 3 and a half minutes through the ground station of Quito, Ecuador. That discussion between the crew and the capsule communicator pertains principally to the night optical sensing of lightning data take which we expected to acquire over Central America and advice to the crew that there might be more opportunities for photography over the Indian Ocean with futher advice on that later on. Columbia now on orbit 22, apogee of 140.9 nautical miles. Perigee of 139.5 nautical miles, velocity of 25,428.6 feet per second.

Shuttle Mission Control, mission elasped time is now 1 day, 7 hours, 47 minutes. This is Shuttle Mission Control.

Shuttle Mission Control we have acquisition of signal through Quito (Ecuador) for 5 minutes. Voice contact monentarily.

CAPCOM Columbia Houston we are AOS Quito for 5 minutes.

SPACECRAFT Hi, TJ, we're with you.

CAPCOM Roger and we have that NOSL opportunity anytime you have a second to jot it down.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, its a tropical storm in the Indian Ocean and the MET time will be 8 hours 27 minutes and 30 seconds the latitude is 11 south and 75 east. The pass should occur right at dawn and no grading is required so you may treat it as a day pass. Over.

SPACECRAFT Okay, we'll give it a try.

CAPCOM Columbia, Houston we have a maneuver, a small attitude maneuver we would like to request of you to improve some payload performance when you have a minute to jot it down.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, the problem is a sensor problem with the FILE and essentially we're asking you to yaw the spacecraft by about 20 degrees to improve the sensor resolution and the first maneuver would begin at 8 hours and 5 minutes and it will be a auto maneuver to bias the minus ZLV atitude. Target ID is plus 2 body vector is plus 3 and the change is omicron will now be plus 205. Over.

SPACECRAFT Okay. Automaneuver and it will be ID 2, body vector 3, and omicron is 205.

CAPCOM Roger you got it and we can come out of that atitude at 9 hours and 30 minutes and back into the omicron of plus 180 atitude over.

SPACECRAFT Okay TJ, and say again the time that you want to go into that atitude?

CAPCOM Roger, we would like you to go into it at 8 hours and 5 minutes. Its coming up in about 10 and come out of it at 9 hours and 30 minutes over.

SPACECRAFT Okay, we'll sure do it.

CAPCOM And Columbia we have 1 plus 30 left in this pass and as you will recall our Quito will no longer be with us after STS-2 and we would like to join with you in expessing our appreciation for all of our friends down there in Quito who have supported the first two Shuttle flights so well. Over.

SPACECRAFT You bet TJ, we're sorry to see them go, they're a big help and they filled a big gap down there. Hate to see them go.

CAPCOM Roger and reminder that there's a medical conference coming up at the next pass at Botswana and we shall see you then at Hawaii at 9 plus 06 following that. Over.

SPACECRAFT Okay. Thank you very much.

This is Shuttle Mission Control. We are now at loss of signal and it will be another 20 minutes before we reacquire to Botswana. Mission elasped time is now 1 day 7 hours 57 minutes 35 seconds. Shuttle Mission Control.

Mission Control Houston, we have acquisition in Botswana. Mission elasped time is 1 day 8 hours and 21 minutes. It's a low and brief pass, there may be no air to ground transmission.

CAPCOM Columbia Houston 30 seconds left here at Botswana and we will see you at Hawaii at 9 plus 06.

SPACECRAFT Okay, T. J.

CAPCOM And Columbia be advised that message 23 delta is on board and that requires some action at 10 hours. We will be glad to discuss it with you later when you have a chance to read it. Over.

SPACECRAFT T. J. I've got it in my hand and we'll talk about it.

END OF TAPE

PAO Shuttle Mission Control, mission elapsed time is 1 day, 8 hours, 24 minutes, and 14 seconds. We are in a loss of signal area. Acquire signal in 43 minutes in Hawaii. Data acquired from the vehicle indicates that the flash evaporators have been performing nominally and that the mitigation taken by closing that radiator earlier in the flight did have the desired effect. Mission elapsed time is now 1 day, 8 hours, 25 minutes. This Shuttle Mission Control.

PAO This is Shuttle Mission Control in Houston. Mission elapsed time is now 1 day, 9 hours, 5 minutes, 37 seconds. The President of the United States has just entered the mission operations control center and is receiving a round of applause from the flight controllers on duty here. The President's being greeted by NASA Deputy Administrator, Hans Mark and Dr. Cristopher Kraft, Director of Johnson Space Center. We have acquisition of signal over the Hawaii station in just a few seconds. A very brief pass of approximately 1 minutes 15 seconds in duration. President Reagan now approaching the Flight Director's console.

CAPCOM Columbia Houston, AOS Hawaii for 1 minute.

SPACECRAFT Okay. Read you loud and clear T.J.

CAPCOM Roger, you're loud and clear Richard and we just have one note for you this pass. We would like the IECM moved to position number 2 so that we may do some checkout on the mass spectrometer. Over.

SPACECRAFT Okay. We'll get that for you.

CAPCOM Roger, and be advised of message 17 alpha will apply at Buckhorn and we'll see you there. We're 35 seconds from LOS at this time and Buckhorn will be in 5 minutes.

SPACECRAFT Okay. Be looking for you there. And T.J., Buckhorn will be TV pass. Is that affirm?

CAPCOM Negative TV but 17 will apply.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control, mission elapsed time, 1 day, 9 hours, 7 minutes, and 30 seconds. During that pass, capsule communicator, T. J. Hart, instructed Columbia Commander Joe Engle in configuration of the development flight instrumentation in the payload bay. President Reagan is now standing behind the Flight Director's console. Center Director, Dr. Christopher C. Kraft is describing to him the functions of the mission operations control center. We will have acquisition of signal again in 3 minutes, 40 seconds through the

Hawaii station,...through the Buckhorn station and the duration of that pass will be 4 minutes.

COMTECH Buckhorn Houston, air to ground 2.

COMTECH Yes Buckhorn, reading you 5 by 2.

COMTECH Okay. 5 by let me do a quick team check.

COMTECH Houston time garble testing 1, 2, 3, 4, 5. Test out.

CAPCOM This is Shuttle Mission Control, mission elapsed time 1 day, 9 hours, 10 minutes, and 50 seconds. Have acquisition of signal through Buckhorn in approximately 40 seconds. It is a very brief pass, slightly more than 4 minutes in duration and it is expected that President Reagan will engage in conversation with the crew during this pass. He is presently seated behind the capsule communicator's console talking to Astronaut Dan Brandenstein, primary capsule communicator for the ascent team. Acquisition of signal momentarily.

CAPCOM Columbia Houston, we are AOS Buckhorn for 4 minutes. Over.

SPACECRAFT Roger Houston. Columbia reads you loud and clear.

CAPCOM Roger. You're loud and clear and Dan and I are proud to say that we have a visiting CAPCOM here with us today and he's asked to speak to the crew of the Columbia, America's pride, and with your permission we'll turn this pass over to him.

President Reagan Joe, Dick, this is Ronald Reagan.

SPACECRAFT Hello Mr. President.

President Reagan Hello. I just wanted to make a request. I just wondered if when you go over Washington before your landing.....

END OF TAPE

CAPCOM Roger, go, you're loud and clear and Dan and I are proud to say that we have a visiting CAPCOM here with us today and he's asked to speak to the crew of Columbia, America's Pride. And with your permission, we'll turn this pass over to him.

PRESIDENT REAGAN Joe, Dick. This is Ronald Reagan.

SPACECRAFT Hello, Mr. President.

PRESIDENT REAGAN Hello, I just I wanted to make a request I just wondered if when you go over Washington before your landing at Edwards Air Force Base, could you pick me up and take me out, I haven't been to California since last August.

SPACECRAFT We'll be proud to sir.....California.

PRESIDENT REAGAN Okay, thank you very much. Let me just say, I'm sure you know how proud everyone down here is and how this whole nation, I'm sure the world, but certainly America has got it's eyes and it's heart on you.

SPACECRAFT Well, thank you very much Mr. President. We're we're awfully honored that we've got the opportunity to take part in this and I'm sure that we're very glad that you're getting a chance to meet all the people there in Houston that are making it happen.

PRESIDENT REAGAN Well, I've enjoyed meeting them. I told them when I came in this was a rare experience for an old horse calvary officer.

SPACECRAFT Well, Mr. President, we certainly do appreciate you taking the trouble to show all the people working on the Space Shuttle how much you care and it makes us mighty proud.

PRESIDENT REAGAN Well, I care and again, God bless you both and from all of us here are watching with great pride.

SPACECRAFT Thank you very much sir. Thank you sir very much.

PRESIDENT REAGAN Thank you.

CAPCOM Columbia, Houston, we have two minutes left in this pass.

SPACECRAFT Okay T.J.

CAPCOM Columbia, Houston. We have one minute left here at Buckhorn. And at Quito we would be glad to talk to you about the hydraulic circ pump procedure and also have another OSTA pass there if you do have time.

SPACECRAFT Okay mighty fine. Okay T.J. we'll see you there.

PAO Shuttle Mission Control, President Reagan now greeting the wives of the astronauts, Cody Truly and Mary Engle and their families. Just approaching loss of signal to the Buckhorn station. The President was given a pin by Deputy Administrator Hans Mark which was emblazed with the phrase I love a Launch. We've had loss of signal at Buckhorn. We'll reacquire in approximately 9 minutes through Quito Equador. Mission Elapsed Time is one day 9 hours 16 minutes 25 seconds. This is Shuttle Mission Control.

END OF TAPE

We've had loss of signal at Buckhorn. We'll reacquire in approximately 9 minutes through Quito Ecquador. Mission elapsed time is 1 day 9 hours 16 minutes 25 seconds. This is Shuttle mission Control.

President Reagan still talking to the wives, that's Mrs. Codi Truly, wife of Columbia pilot Dick Truly, in the center of the screen. Dr. Christopher Kraft, with his back to the camera, to the President's left, and just to the left of Dr. Kraft is Mrs. Mary Catherine Engle, wife of Columbia pilot, Joe Engle. Columbia commander Joe Engle.

The families have returned to the VIP viewing room here in the Mission Operations Control Center. President Reagan again repeating a round of applause from the flight control team and has now left the Mission Operations Control Center. Mission elapsed time is 1 day 9 hours, 19 minutes. We are in a loss of signal period. We will acquire again in 6 1/2 minutes through Quito Ecquador. The is Mission Control Houston.

CAPCOM Columbia Houston, AOS Quito for 4 minutes.

SPACECRAFT And Houston Columbia, how do you read.

CAPCOM Roger. You're loud and clear Richard.

SPACECRAFT Ok, and I've got this circ pump message in front of me.

CAPCOM Roger. We got it here too, is there anything that was not clear.

SPACECRAFT No, I think I understand all the steps, the only thing that I'm not, I'm want to make clear to myself is when to do which steps. We're going to start the whole business at Indian Ocean station at 10:00 is that right.

CAPCOM That's affirmative.

CAPCOM And Columbia Houston, Richard we'd like the circ pump started at 10 hundred.

SPACECRAFT Well at Indian Ocean station we're going to do all three steps, are we not?

CAPCOM That's affirmative, you can do up to turning on the circ pump, prior to that however, and start the circ pump at 10 hundred.

SPACECRAFT I tell you while Richard's thinking about that, would you confirm that you do want to do the nose jet attitude test at 9:30.

CAPCOM Columbia Houston, Joe, that's affirmative, we would like to do that.

SPACECRAFT Ok, thank you.

CAPCOM Columbia Houston you're dropping out slightly, go ahead.

This is Mission Control Houston, we've had loss of signal through Quito, Ecquador. Acquire again briefly in less than 2 minutes through the ground station Santiago Chile. And again that will be a rather brief pass of less than a minute. Mission elapsed time is 1 day, 9 hours, 31 minutes, and 10 seconds. This is Shuttle Mission Control.

CAPCOM Columbia Houston, we're AOS Santiago for about 1 minute.

SPACECRAFT Ok, Terry.

CAPCOM Roger, we lost you at a key hole, there, and Richard I think you dropped out asking a question.

SPACECRAFT Negative Terry, I just said that I'd come up configured at Indian Ocean station if I didn't understand something then, I'd have my thoughts better put together better then. And incidentally I do have a message 21A the change to the entry pocket checklist on the hot restart.

CAPCOM Roger, and if want to just start into the procedure at IOS, at Indy, that will be fine. And reminder to come out of the omicron yaw that we're in prior to the nose jet attitude test. over.

SPACECRAFT Ok, thank you TJ.

CAPCOM And Columbia we're going LOS now. We'll see you Botswana at 9 plus 52.

This is Shuttle Mission Control, we've had loss of signal, through Santiago Chile. We'll acquire again in 18 minutes through Botswana South Africa. Mission elapsed time is 1 day, 9 hours, 34 minutes. This is Shuttle Mission Control.

Shuttle Mission Control. Mission elapsed time, 1 day, 9 hours, 51 minutes, 38 seconds. Acquisition of signal in just 10 seconds or so, through Botswana for 6 minutes and 51 seconds.

CAPCOM Columbia Houston, UHF through Botswana for 6 minutes.

SPACECRAFT Hey TJ, How are doing?

CAPCOM Fine Richard you're loud and clear. We have a couple of notes for you. If you have a minute.

SPACECRAFT Ok, standby for just a second.

end of tape.

PAO Shuttle Mission Control, mission elasped time 1 day 9 hours 51 minutes 38 seconds. Acquisition of signal in just 10 seconds or so through Botswana for 6 minutes and 51 seconds.

CAPCOM Columbia Houston UHF through Botswana for 6 minutes.

SPACECRAFT Hey, T. J. how are you doing?

CAPCOM Fine Richard you're loud and clear. We have a couple of notes for you if you have a minute.

SPACECRAFT Okay, stand by for just a second. Okay Terry go ahead.

CAPCOM Roger Joe. We left some stored program commands in that are going to turn on the SIR-A in about 1 minute for a 3 minute 15 second pass through South Africa here and we negelected to ask you to go point 5 dead band. Do you think you can do that?

SPACECRAFT Yes I can and I'll do that right now.

CAPCOM Okay thank you and we have some words on a temperature that's coming down on F5 R due to the FTO that we're running now and we think its going to come down far enough to cause a RM message here soon and if it does be advised that a leak is not there and no action will be required. We would like you to leave it deselected until a later time, when we come out of the FTO over.

SPACECRAFT Okay so its jet foxtrox 5 romeo and you suspect it will be declared a failed leak?

CAPCOM Affirmative and we don't anticipate any problems reselecting it but we would like you to wait until the test is over, we would like to see how low its going to get.

SPACECRAFT Okay.

CAPCOM Also an update on the CRT 1. We're convinced that the power supply has failed and we're discussing a possible change out procedure for CRT 1. Right now we don't think its advisable but we would like to get your opinion on it. Over.

SPACECRAFT Well, the first part of your message I think we cut you out but I understand your considering conteplating change out of CRT 1 is that affirm?

CAPCOM Affirmative. We don't think we want to do that but it appears power supply has failed hard and we're talking about it and would like your opinion sometime.

SPACECRAFT Well we'll sure be glad to do it and as a matter of fact we would probably have some time this evening to get on it. I guess it sure would be nice to have that CRT for entry.

CAPCOM Roger we concur, and one other item, we checked out the IECM and it does look good to us and request you go back to position number 1 at your convience.

SPACECRAFT Okay, its position number 1. And T. J. if you're still there I'm starting into the power down for this circ pump test.

CAPCOM Roger we're here for about 2 more minutes Richard and we will be waiting for you at IOS to watch that test.

CAPCOM Columbia Houston we have one minute left here at Botswana and we're wondering how you made out the meal preparations and generally how's the food tasting these days?

SPACECRAFT Well, Terry I'm just getting into the meal prep right now as a matter of fact and the food is tasting good and we're getting a lot less air in our water today. We got quite a bit of air in our water yesterday but its a lot better today.

CAPCOM Roger we're glad you're drinking that good water and we'll see you at IOS shortly and don't let us interrup your meal periods there with too much work there now.

SPACECRAFT Okay and T. J. if your pretty sure that CRT is powered down is that correct?

CAPCOM Affirmative. We think the power supply is down hard.

SPACECRAFT Okay well certainly its up to you all what you think is the best thing to do but I be (garble) change it out. Certainly like to have that one coming in tommorrow.

END OF TAPE

Garble

CAPCOM Roger. We're glad to hear that your're drinking that good water and we'll see you at IOS here shortly and don't let us interrupt your meal periods there with too much work here now.

SPACECRAFT Okay and T. J., you're pretty sure that CRT 1 is hard down. Is that correct?

CAPCOM Affirmative. We think the power supply is down hard.

SPACECRAFT Okay. Well certainly it's up to you all what you think is the best thing to do but I'd garble change it out, I'd certainly like to have that one coming in tomorrow.

CAPCOM Roger. We copy that and we'll be thinking about it and talking to you later.

SPACECRAFT Okay. See you later.

PAO This is Shuttle Mission Control. We've had loss of signal. The discussion of CRT number 1, cathode ray tube number 1, cathode ray tube number 1 apparently has failed. Seems to be a power failure. It is possible for the crew to change that out of the ...CRT is one of 4 on the flight deck which the crew has displayed on the panel in front of them and it is possible for the crew to call up displays on other CRT's. CRT number 1 does not have any unique information on it. However it is located directly in front of the Commander and during entry it would be the primary source of landing display information for Joe Engle, Columbia pilot. And in as much as he has simmed using CRT number 1, he used CRT number 1 during simulations, he has indicated that it would be his preference to change that CRT out and have it available during entry process and flight controllers here in the mission control center are now looking at the eventuality and determining the advisability of having the crew change that cathode ray tube so that that would be operational. The capsule communicator also asked Columbia pilot, Dick Truly, to configure the vehicle for a Sir-A pass over South Africa which was an automatic data take by, the shuttle imaging radar, and they had earlier neglected to ask the crew to configure the vehicle properly to acquire that data. Acquisition of signal now present over the Indian Ocean station and we should be in contact with the vehicle for about another 6 and 1/2 minutes.

CAPCOM Columbia Houston. We're AOS at Indi for 6 plus 30 and coming to you on S-band only. How do you hear it?

SPACECRAFT Hear you loud and clear Terry.

CAPCOM And the Sir-A pass is complete if you'd like to resume to the other deadband.

SPACECRAFT Okay. Mighty fine.

SPACECRAFT T. J. I'm getting ready to start step 3. I've got a question for you though. Almost simultaneously with the...in step 1 with 2 switches on panel Romeo 11 Lima, we got a S86 APU hydraulic message and a couple of down arrows from both APU's 2 and 3. Were they related?

CAPCOM Copy the question. Standby please.

SPACECRAFT And T. J., to be specific, the indication accumulator pressure, number 2 shows 16 low and number 3 shows 16 low.

CAPCOM Roger. We copied 16 low. Say again the parameter name please.

SPACECRAFT Roger. It's hydraulic accumulator pressure.

CAPCOM Roger. Hydraulic accumulator.

CAPCOM Columbia Houston, Richard you can continue with the procedure. We'll be back to you later on the message.

SPACECRAFT Okay.

SPACECRAFT Okay T. J. All the tank 1 and 2 heaters are on and I'm waiting on the cryo pressures to build.

CAPCOM Roger. We copy and like you to understand that you're go to continue the test after LOS.

SPACECRAFT Roger. Understand. Incidentally we understand what Crip and John said about these big jets. We need garble bunch of Howitzers.

CAPCOM Rog. Understand your seeing the nose jets firing up.

SPACECRAFT garble you know it when they fire.

CAPCOM Sorry Columbia. We're receiving a lot of static and didn't copy your last.

END OF TAPE

CAPCOM Rog. I understand you're seeing the nose jets firing.

SPACECRAFT Big jets and, boy, you'll know it when they fire.

CAPCOM Sorry Columbia, we're receiving a lot of static, and didn't copy your last.

SPACECRAFT Roger. No problem, you can disregard TJ.

CAPCOM Roger. You're coming a little bit better, we have about a minute left at IOS. We'll see you next at Hawaii at 10 plus 38.

SPACECRAFT Ok.

PAO Shuttle Mission Control. We've had loss of signal, mission elapsed time is 1 day, 10 hours, and 9 minutes. We will acquire again in about 30 minutes. Vehicle is on orbit number 24, the next acquisition of signal will be at Hawaii in 30 minutes. Humidity onboard the vehicle is 39 percent and steady. Cabin temperature is 85 degrees also steady. Columbia now in the Indian Ocean, having just completed a SIR-A data take during the pass over of South Africa. Mission elapsed time is 1 day, 10 hours, 10 minutes. This is Shuttle Mission Control.

PAO This is Mission Control Houston, Mission elapsed time is 1 day, 10 hours, 37 minutes, 31 seconds. Columbia is now on it's number 24th orbit of the Earth presently over the Pacific Ocean. Vehicle's apogee is 145.9 nautical miles pergee 139.6 nautical miles. Velocity 25,436.6 feet per seconds, coming up on acquisition of signal over Hawaii over a rather lengthy loss of signal period. Duration of this acquisition is signal will be just slightly more than 6 minutes. Have voice contact momentarily.

CAPCOM Columbia Houston we're AOS at Hawaii for 6 minutes, over.

SPACECRAFT Ok, TJ, reading you loud and clear.

CAPCOM You're loud and clear Joe, and we would like to change a filter limit if you could give us spec 60 on an SM machine, we'll go ahead DEU equivalent to change the filter on the supply water inlet pressure and I hope we won't have any alarms waking you up on that one tonight.

SPACECRAFT Ok, good thank you. And ok, its going to be CRT 2 and say again in the spec you need.

CAPCOM Roger, CRT 2, we need specs 60 SM table maintenance.

SPACECRAFT Ok, TJ it's up on CRT 2 and I've got a question for you on the circ pump test. I did get it started and did to it the times that the circ pump actually, by the time the cryo tanks pressurized, it was 10 minutes after 12, pardon me 12 minutes after 10, that I got that circ pump off. I didn't know how precise you wanted to be with this, would you like it exactly 1 hour, or just do it again at 11 o'clock and again at 12 o'clock?

CAPCOM Roger, we would like 1 hour on that Richard.

SPACECRAFT Ok, then the circ pumps are going to be probably scheduled on the 12 minutes after the hour instead of right on.

CAPCOM Roger, that sounds good to us. And we have about 5 minutes left in this pass and we do have some words for you on CR, a disregard.

SPACECRAFT Ok, go ahead.

SPACECRAFT Ok, go ahead TJ.

CAPCOM Rog. stand by on that one Columbia.

CAPCOM Columbia Houston, CRT 2 is yours again and that parameter has been changed, thank you.

SPACECRAFT Ok, TJ, thank you.

CAPCOM And Columbia Houston, we just sent up some teleprinter messages to you, they are for weather block data, and perigee adjust, and we do think that that F5R jet will trip RM here shortly.

SPACECRAFT Ok, we'll be ready for it.

SPACECRAFT And TJ, what is your thinking right now on that CRT changeout.

CAPCOM Roger, we're looking at the data we just received here since AOS and still considering it we'll have some more words for you here hopefully before LOS.

SPACECRAFT Ok.

SPACECRAFT Houston PLT

CAPCOM Roger, go ahead, Richard.

SPACECRAFT Roger, last night we reported to you that there was a on the starboard side of the vertical fin there was a little bitty area of some FRSI that had kind of poked up from somewhere and was sitting there, and we just noticed that it is now gone.

CAPCOM Roger, we remember your comment and end of tape.

SPACECRAFT Houston, PLT.

CAPCOM Roger, go ahead Richard.

SPACECRAFT Roger, last night we reported to you that there was a on the starboard side of the verticle fim, there was a little bitty area of some FRSI that had kind of poked up from somewhere, and was sticking there, and we just noticed that it is now gone.

CAPCOM Roger, we remember your comment and I understand you say that it is now gone.

SPACECRAFT Yeah, I don't know where it went, but it's not with us anymore. Maybe one of these big jets dislodged it.

CAPCOM Roger, we copy.

SPACECRAFT I think you can file that under interesting, but, not significant.

CAPCOM Ok, we were just discussing how much wind you might have up there.

CAPCOM Columbia Houston, 30 seconds left here and Richard you have a go to, for the CRT number 1 changeout, we'd like to make sure you don't interfere with your eating and drinking however, and we are not a hundred percent confident that it will work. We're afraid that the problem may be due to an RPC interfering with the power flow, and we're going LOS here, we'll see you next at Santiago at 11 plus 4, over.

SPACECRAFT Ok, TJ, I understand we have a go for the CRT changeout is that affirm?

CAPCOM Affirmative.

SPACECRAFT Ok, we'll get right on it.

PAO This Mission Control Houston, mission elapsed time 1 day,10 hours, 45 minutes, now in a loss of signal period about 19 minutes in duration before we acquire again at this ground station at Santiago Chile. Crew during that pass given a go to change the cathode ray tube display CRT number 1 which is on the flight deck right in front of the commanders position. Mission elapsed time 1 day, 10 hours, 45 minutes, 47 seconds. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control, mission elapsed time, 1 day, 11 hours, 4 minutes, coming up on acquisition of signal at Santiago Chile, ground station. The crew during this last night of mission, the signal was instructed to change out that cathode ray tube display in the forward cabin

CAPCOM We're AOS Santiago for 6 minutes, over.

SPACECRAFT Hi TJ, how are you doing.

CAPCOM Doing fine, Richard, how you making out there.

SPACECRAFT Doing pretty good, we of the cryos are warming up again, and Joe is down in the bowels of the ship, working on a CRT. And I was just going to ask him, cause he's been dealing with you on these attitude tests on page 5-23. I'm assuming I should terminate the nose jet attitude test and start the RCS jet test, is that correct?

CAPCOM Roger, that's affirmative, Richard.

SPACECRAFT Ok. And TJ, how do read CDR.

CAPCOM You're loud and clear Joe Henry, go ahead.

SPACECRAFT Ok, I'm sorry my battery was loose, I guess in this thing.

CAPCOM Columbia Houston, concerning the screws that hold the CRT's into the panel, we think the CRT number 4 screws may be about 1/8 of an inch longer and may require some sort of shimming to maintain CRT 4 tightly in the CRT 1 slot, over.

SPACECRAFT Ok, thank you for the tip TJ.

CAPCOM And Columbia Houston the cryo pressures look just fine now, no problem.

SPACECRAFT Ok. Ok, TJ, that's foxtrot 5 Romeo that just failed a leak.

CAPCOM Roger, we see it and you have a go to put it back in.

SPACECRAFT Ok, I understand you do want me to go ahead and reselect it and then do you want me to inhibit RM?

CAPCOM Standby

CAPCOM And Columbia Houston, when you reach that point in the flight plan you have a go to reselect that jet and do not toggle RM, over.

SPACECRAFT Wilco, and you're call on cryo pressures I'm assuming that you're satisfied with H2 even though it did not quite get to 250, and am I to go turn on the circ pump?

CAPCOM standby, yes you are go for the circ pump.

SPACECRAFT Ok.

CAPCOM Columbia Houston, we have 2 minutes left in this pass. You have a new state vector onboard now, and Richard we concur with the messages that you received at the time you turned the BFI PCM container number 2 off and

end of tape.

CAPCOM Stand by. Yes you are go for circ pump.

SPACECRAFT Okay.

CAPCOM Columbia Houston we have two minutes left in this pass. You have a new state vector onboard now. And Richard we concur with the messages you received at the time you turned the DFI PCM container 2 off and and we would like to get that FPA back and we recommend that you change the power down procedure to leave the DFI PCM container 2 MDM dedicated signal conditioner main alpha and bravo both on. Over.

SPACECRAFT Wilco

CAPCOM Columbia Houston 20 seconds left here at Santiago. We will see you at Botswana at 11 plus 26. Over.

SPACECRAFT See you then.

PAO This is Shuttle Mission Control we've had loss of signal. We will reacquire in 15 minutes 30 seconds at Botswana for a pass of 6 minutes 48 seconds. During that pass we heard that Joe Engle was in the process of changing CRT number 1 on the flight deck. The replacement for that defective CRT would be the, one of the two CRT's in the aft flight deck. The crew has not been through a change out procedure before although they have been familiarized with the parts in the process and have walked through it on a table top checkout in the past. It's expected that the CRT change out should take Joe Engle about 1 hour to 1 hour and a half to accomplish. Mission elasped time is one day 11 hours 12 minutes. This is Shuttle Mission Control.

PAO Shuttle Mission Control, in less than a minute we will have acquistion of signal at Botswana, South Africa. Duration of this pass will be 6 minutes 47 seconds. Only about an hour and a half remaining until the crew goes to sleep for the night. Mission elasped time is 1 day 1 hour 26 minutes and we should have air to ground communications shortly. This is Shuttle Mission Control.

CAPCOM Columbia Houston on UHF through Botswana. Over.

CAPCOM Columbia Houston UHF through Botswana. Over.

SPACECRAFT Roger T. J. Stand by just a second.

CAPCOM Roger.

SPACECRAFT We're in RCS jet test on page 9-7 and presently firing the plus YAW pulses.

CAPCOM Roger

SPACECRAFT And Houston PLT we're the circ pump is off, we're into the second cycle now.

CAPCOM Roger we copy Richard.

CAPCOM Columbia Houston we have one minute left here at Botswana and we will be AOS at Indi station in about 2 minutes. Over.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control. We've had loss of signal at Botswana and just in a little over a minute we will acquire again as the vehicle proceeds within range of the Indian Ocean station. Site Columbia on its 25th orbit of the Earth. We will have reacquisition of air to ground transmission again momentarily. Mission elasped time is 1 day 11 hours 34 minutes. This is Shuttle Mission Control.

END OF TAPE

CAPCOM (garble) sight. Columbia on its 25th orbit of the Earth. We will have reacquisition of air-to-ground transmission again momentarily. Mission elapsed time is 1 day, 11 hours, 34 minutes. This is Shuttle Mission Control.

CAPCOM Columbia Houston. We're AOS at Indi station and we have a couple of reminders for you Richard when you have a second to listen.

SPACECRAFT Okay, please hold off just a second while I garble reconfigure garble this RCS jet test is complete. Hang on just a second.

SPACECRAFT And T. J., we just finished the RCS jet test. The forward CRT, CRT 1 is loose. We haven't pulled it out yet and we're going back to get to the aft one right now.

CAPCOM Roger. We copied you.

SPACECRAFT And Houston PLT, the RCS jet test is complete. Why don't you look at page 523 and see if there is any of that on the left side that should be deleted. My book doesn't have any of it deleted.

CAPCOM Roger. Standby.

SPACECRAFT Thank you T.J. And I'm ready to copy your notes whenever you get them.

CAPCOM Columbia Houston. You're go for all the tests even though we're going LOS here in about 3 minutes and you're also go to reselect F5R and also a reminder that the OEX recorder power will be required.

SPACECRAFT Roger T.J. Where is that in the procedure?

CAPCOM Roger. The OEX power is under your PLT column.

CAPCOM Roger. It gets turned under the PLT column at 11 plus 25.

SPACECRAFT Ah hah. Okay. Well, before you go over the hill, look at 1140 and it says that we require some ACIP data via SPC or RTC at that point. Is has that been accomplished or should we stop there?

CAPCOM We copy. Standby.

SPACECRAFT Roger.

CAPCOM Richard, the ACIP is on and we'll leave it on until we can command it off at Hawaii and you're go for all those tests. One further reminder, the IMU alignment attitude that's required will be the one in message 9 echo. Over.

SPACECRAFT Okay. I think we've got that Terry.

CAPCOM And Columbia, one more. We'd like to

SPACECRAFT (garble) and see you at the next station.

CAPCOM Roger. We have 1 plus 30 here and we need to give you some information on the upcoming water dump which will be before Hawaii. Over.

SPACECRAFT Roger. Go ahead.

CAPCOM We'd like you to dump tanks Charley through Fox Trot to 73 percent. That will require about 1 hour of dump and you will recall that in the procedure you will be deleting steps 1 and 4 doing only steps 2 and 4, 2 and 3, rather, because of our tank configuration. Over.

SPACECRAFT Roger T.J. It's tanks Charley through Fox Trot to 73 percent and just like we did before, delete steps 1 and 4.

PAO You got it. We've got 30 seconds left here and we'll see you at Hawaii at 12 plus 12. Over.

SPACECRAFT Roger.

CAPCOM This is Shuttle Mission Control at loss of signal and once again we are in a rather lengthy period before we have another acquisition, almost half an hour now before we acquire it in Hawaii. During this period the pilot, Dick Truly, will be deactivating the NOSL experiment and has just completed some RCS jet testing. There will be a manual water dump during this loss of signal period and some hydraulic pump purging. Pilot Commander Joe Engle is still working on a change out of that cathode ray tube, an IMU maneuver and IMU inertial measurement unit maneuver and alignment, also planned before the crew begins presleep after which .....

END OF TAPE

PAO Some hydraulic pump purging. Pilot Commander Joe Engle is still working on the change out of that cathode ray tube. An IMU maneuver and IMU inertial measurement unit maneuver and alignment are also planned before the crew begins presleep activity which should occur at mission elapsed time, presleep activity beginning at 12 hours and 15, 20 minutes. Right in there.

PAO Mission elapsed time is presently 1 day, 11 hours, 44 minutes. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control. Mission elapsed time is 1 day, 12 hours, 11 minutes and 40 seconds. Just moments away from acquisition of signal at Hawaii. Duration of this pass will be about 7 minutes. The vehicle passing almost directly over the Hawaiian Island chain. Just less than an hour remaining before the crew enters the sleep period and we will be getting...

CAPCOM Hello Columbia. Houston AOS Hawaii for 7 minutes. Over.

SPACECRAFT Okay T.J. Read you loud and clear and I've got a question for you from the startracker attitude.

CAPCOM Roger Joe. Go ahead.

SPACECRAFT Okay T.J. The attitude we've got on message 009 echo is roll 79, pitch 6149, and yaw at 3578 and we're in that attitude T.J. and it looks like a the -Y startracker is pointing out toward the sun. I was a little reluctant to force the shutter open. Could I double check that attitude with you?

CAPCOM Roger. We copied the same numbers that we see on the message. Standby. We're double checking.

SPACECRAFT And Houston PLT, the final cryo cycle is in work and I've presently have purged fuel cell 2 and have...I'm sorry I have purged fuel cell 2 and I am purging fuel cell 3 and all the RCS tests that we left you last time did get accomplished.

CAPCOM Roger. That's super work Richard. Standby please.

CAPCOM Columbia Houston. Richard you are go to toggle the RM now on F5R. It looks just fine to us.

SPACECRAFT Okay. I'll sure do it in just a second.

CAPCOM Columbia Houston. We have new attitude and stars for you if you are ready to copy.

SPACECRAFT I'll get them. Okay go ahead.

CAPCOM Roger Dick. The roll 28.1. Pitch, 252.7. Yaw, 9.9. Delta angle will be 91.2. The -Z star will be 59. -Y star will be 33. The LOS is 12 plus 49 for the Z. 12 plus 53 for the Y and the maneuver should take 10 minutes. Over.

SPACECRAFT Okay T.J. I'll get it typed in and we'll be right on our way.

CAPCOM Roger. We'll have some words later on what happend there but we'll let you get ahead with the maneuver.

SPACECRAFT Okay. That's all right garble That's okay T.J., but also, do you want a special verification on these?

CAPCOM Standby.

SPACECRAFT garble go ahead and get them. We'll get her right at the end of the IMU alignment if you like.

CAPCOM Roger. Go ahead Joe. We think those stars will be good for the threshold FTO.

SPACECRAFT Okay. Thank you.

PAO Columbia Houston. 1 minute to LOS and we see F5R is back in RM and the maneuver is looking good to us. We'll see you at Santiago at 12 plus 38. Over.

SPACECRAFT Okay Terry. We'll see you there. Thanks a lot. And T.J., just to let you know how we're coming on this CRT changeout, we're taking R14 off right now.

CAPCOM Roger. Sounds good Joe. We'll look forward to hearing about that at Santiago.

SPACECRAFT Okay.

CAPCOM This is Mission Control Houston. We have a loss of signal over Hawaii, 20 minutes and we will acquire once again at Santiago, Chile for a pass of 6 and 1/2 minutes duration. During that pass the flight control team passed up an attitude change to the vehicle to align it for more favorable sightings for the startracker as Columbia crosses the ....

END OF TAPE

PAO This is Mission Control Houston, we have loss of signal over Hawaii 20 minutes and we will acquire once again at Santiago Chile for a pass of 6 1/2 minutes of duration. During that pass the flight control team passed up an attitude change to the vehicle to align it for more favorable sightings for the star tracker as Columbia crosses the terminator into darkness as it shall do in approximately 5 minutes. Downlink data here in the mission control center indicated that the maneuver had been initiated and as we lost signal and as of the correct numbers were typed in by the crew so it maneuver may be as incorrectly performed, we shall acquire signal in approximately 18 minutes. Mission elapsed time now 1 day, 12 hours, 20 minutes, 45 seconds. This is Shuttle mission control.

This is Shuttle misison control, we have acquisition of signal in Santiago.

CAPCOM Hello Columbia, this is Houston, we have you at Santiago for six minutes.

SPACECRAFT Hello there Dan, and we got some good news, the CRT 1 is working now, we swapped it out with 4 and it's working ok.

CAPCOM Alright, you get the golden wrench award.

CAPCOM And I do have, this our last pass tonight before you go to bed, so I do have a couple of things to pass you, if you're ready to copy.

SPACECRAFT Ok, Dan and how long is till the next pass.

CAPCOM It's one rev, that's an hour 1/2.

SPACECRAFT Oh ok. Well, I tell you what, Dan, if you see, you, can tell if CRT's are powered, can you not?

CAPCOM That's affirmative.

SPACECRAFT I'm sure, I hope we're not still up, but if we are, you're certainly welcome to call us.

CAPCOM Well, we certainly expect you to be asleep, but we'll call you if we see something that looks like some activity going on.

SPACECRAFT Ok, if we're still up, there'll be two CRT's on.

CAPCOM Ok, thanks.

SPACECRAFT And if you want us to fix that fuel cell, we can run it on out to 5 days.

CAPCOM Roger, Columbia, and your stars will be setting shortly here, and we do have, we would like not to have to talk to you again, so we'd like to get these other two things set up quick.

SPACECRAFT Ok, go ahead.

CAPCOM Roger, we'll need, on panel R 1, we'll need the payload aft, main B, and then we'll have to reset the IECM sequencer, and to do that we'll verify that it's in position 1, and then switch it to position 2, and hold it for four seconds, and then switch it back to position 1, and that will complete it.

SPACECRAFT Ok, I've got that, and it's aft main B is the switch on R1, is that correct.

CAPCOM That's right, payload aft main B and you can terminate the water dump. For your info. in the morning, in the cap you'll be picking up a nominal flight day 6 wake up, that's at page 4-98, and all the times you'll have to add 2 hours to it.

SPACECRAFT Ok, so we should use flight day 6, and I'm not looking at it now, what time is that wake up.

CAPCOM We'll get it for you in a second.

SPACECRAFT Ok, anything else?

CAPCOM It'll be an MET of 1 day and 21 hours.

SPACECRAFT Ok, Dan, I got it, 1 day and 21 hours, and if that's all you have, I have one questions.

CAPCOM Ok, go ahead.

SPACECRAFT On the proper way to secure from this circ pump test, I'm looking at the message, and I got a little confused by the sentence that says leave landing gear hydraulic isolation valve 2 closed while the pump is on, and that's what the procedures above that does anyway. So I closed the valve while the pump was on, I then turned the pump off and I'm now prepared to go back and return the power, and do step 4.

CAPCOM Roger, standby 1, I believe that's correct, I'm standing on it.

SPACECRAFT Ok, Dan

CAPCOM Roger, Columbia, that is correct.

SPACECRAFT Super Ok. Anything else?

CAPCOM Well the only thing we'll, if you'll save the data from this IMU align you're getting, they'd like that first thing in the morning so they can work up their biases.

SPACECRAFT Ok, we'll sure do it.

CAPCOM And, once again, be advised that the stars will be setting here very shortly.

SPACECRAFT Roger, it's in work.

end of tape.

play thing if you will save the data from this IMU align you 're getting they would like that first thing in the morning so they can work up their biases.

SPACECRAFT Ok we're sure do.

CAPCOM And once again be advised that stars will be setting here very shortly.

SPACECRAFT Roger, its in one. Okay Dan the stars are in the table.

CAPCOM Roger, Columbia, we see that and once again a reminder to terminate the water dump at LOS, we're 40 seconds from LOS. The silver team will not be working any more this flight so we really enjoyed getting you up there and wish we could have worked with you a little more but, we're wishing you a safe trip home and we'll see you when you get back.

SPACECRAFT Dan I can run the numbers off real quick if you want to try and copy them.

CAPCOM Roger we've got enough data, we're going to be able to get them, no need to read them off.

SPACECRAFT Okay, super. Thank you a lot. And Dan we really have appreciated, we appreciate that and we really have enjoyed working with you all. Wishes it was a little longer but we will see you in Houston.

CAPCOM Okay have a good night sleep and have fun flying home.

SPACECRAFT You bet.

PAO This is Shuttle Mission Control, we've had loss of signal from the Santiago, Chile station. During that pass Columbia commander Joe Engle reported that he had sucessfully removed the cathode ray tube, from the alt crew station in Columbia's flight deck and installed it in CRT number 1 position in front of the commander's seat, replacing, replacing that failed CRT and the news that that repair had been effected and the cathode ray tube display was working properly, brought something of a cheer from the flight controllers here in Mission Operations control room and apparently bouyed by his sucess, Joe Engle suggested they let him go out and fix the fuel cell and extend the flight back to five days which the suggestion to which the flight controllers kind of tactfully ignored. The crew is in its presleep activity right now which is configuring cabin lighting putting curtains up over the windows and readying the cabin in a sleep configuration entering the sleeping period in about 13 minutes. We will not have acquisition of signal again

for another hour and a half. And for the duration of the sleep period, unless there's some extraordinary event or if the crew happens to be awake and at work there will be no further air to ground transmission until the wake period, 8 hours from now. As the vehicle continues to fly through the night and passes over ground station we will continue to receive down link data from Columbia telling flight controllers the status of systems on board. Mission elasped time is now 1 day 12 hours 47 minutes. Columbia presently on its 26th orbit of the Earth. Just now crossing the tip of South Africa. Sorry, crossing the tip of South America and heading out across the Atlantic Ocean. Through the sleep period we will continue with periodic updates, reporting on the status of the vehicle. Mission elasped time, 1 day 12 hours 48 minutes. This is Shuttle Mission Control.

PAO This is Shuttle Mission Control for the past 30 minutes here in the Mission Control center, the silver team, ascent team, has been replaying video tapes of yesterday's launch of the space shuttle. Incredibly, ironically, it was the first opportunity these flight controllers have had to see the launch shuttle. During the actual ascent process they were of course diligently looking at cathode ray tube displays and scanning information readouts to ensure that everything was performing nominally. That first flight day turned into about a 14 hour shift for them and they have been at the consoles today for 10 or 11 hours and of course it has been a very busy day for them as well. Now that we have an hour and a half loss of signal and crew configuring from sleep period, this represented the first opportunity that the ascent team has had to look at the video tapes of the launch and enjoy the sense of awe that's associated with the space shuttle. Mission elasped time is 1 day 13 hours 24 minutes 11 seconds. This is Shuttle launch control.

PAO This is Shuttle Mission Control. We have just completed a pass over the ground station in Santiago, Chile. We are of course in the sleep period presently so there was natually no air to ground transmission between the crew and the capsule communicator. However downlink preliminatry data continues to come down and reveals no anomalous conditions aboard Columbia. Mission elasped time is 1 day 14 hours 23 minutes. This is Shuttle Launch control.

PAO This is Mission Control Houston at 1 day 16 hours, mission elasped time. The crew has about 5 hours remaining in their sleep period. Just recently flight director Tommy Holloway made the rounds in the Mission Control room with the flight controllers to assure that all the systems on board the Columbia are buttoned up for the night and that no alarms will sound during the night to wake the crew during their sleep period. The payloads people for the OSTA-1 payload in the payload operations control center have reported that they had a good day Friday in their data takes and that all the instruments are working well.

The payload pallet will be shutdown, secured, very early in the morning as we prepare for a planned entry tomorrow at Edwards. The weather at Edwards as of 11:15 Pacific time was 50 percent cloud cover and 12 to 20 knot winds with gusts to 20 to 30. Weather will need to be fairly good at Edwards for, for an entry or weather would need to be good at Northrup Strip, White Sands, New Mexico for an entry tomorrow. At 1 day 16 hours 1 mission elasped time, this is Mission Control Houston.

END OF TAPE

Mission Control in Houston, 1 day, 16 hours, 23 minutes, mission elapsed time. Off going silver team flight directors Neil Hutchinson, and Tommy Holloway are leaving and going to building 2 for their change of shift press conference briefing, which will probably begin in about 5 minutes. 1 day 16 hours 23 minutes, mission elapsed time, this is Mission Control, Houston.

This is Mission Control Houston at 1 day, 17 hours, 8 minutes, mission elapsed time. Flight director's in mission control are reviewing the status of the vehicle to see that Columbia is in good shape for entry later in the day. Wheather at both primary and alternate landing sites continues to be a concern as there are a lot clouds over Edwards Air Force Base, California, and a cloud system remains over the Northrup Strip at White Sands New Mexico. That situation will be monitored closely during the day and a decision will be made perhaps as much as two hours before the deorbit as to which landing site we will choose or the possibility that the flight controllers may decide that we'll extend another day to perhaps take advantage of some better weather on Sunday. Crew remains asleep and they have about 3 hours 50 minutes remaining in their sleep period here. Toward the end of the night, the payload, the OSTA 1 payload will be powered down and secured in preparation for entry later, which should occurr at about 3:30 tomorrow central time, or rather that's later today. 1 day, 17 hours, 9 minutes, mission elapsed time. This is Mission Control Houston.

This is Mission Control Houston at 1 day, 18 hours, 0 minutes, mission elapsed time. Columbia on it's 29th orbit around the Earth. Now out of contact and no data coming down at the present time. Flight controllers in mission control reviewing the condition of the systems onboard the vehicle to make certain that it is fully ready for its planned entry later in the day. Crew has about 3 hours remaining in their sleep time before they are awakened and begin make preparations for the planned entry. 1 day, 18 hours, mission elapsed time, this is Mission Control Houston.

This is Mission Control, Houston, 1 day, 19 hours, mission elapsed time. Bronze team, flight director Chuck Lewis is leading Mission Control flight controllers through and updating of crew activity plan to be used later in the day as the crew makes preparations for the expected entry and landing at Edwards Air Force Base. Columbia is on its 30th orbit of the Earth. Now within range of the Quito Ecquador tracking station on the western coast of South America, should be crossing over the coastline fairly shortly. Crew has about 2 hours remaining in their sleep cycle and they will early in the morning begin stowing items and aligning their IMU's, performing series of maneuvers and flight control system checkout activities in preparation for buttoning up the vehicle for their return trip later in the day. 1 day, 19 hours, 1 minute, mission elapsed

time. This is Mission Control Houston.

This is Mission Control Houston, 1 day, 20 hours, 0 minutes, mission elapsed time. Columbia on its 30th orbit, now passing over Central Australia. Flight controllers in Mission Control continue making the detailed updates to the flight plan for entry later in the day and the crew has slightly less than 1 hour remaining in their sleep period. 1 day, 20 hours, no minutes, mission elapsed time. This is mission control Houston.

This is Mission Control Houston, 1 day, 20 hours, 53 minutes, mission elapsed time. We're about to acquire signal with Columbia over Madrid. Approaching the end of the crew's sleep period and flight controllers in Mission Control will undoubtedly have an unusual wake up greeting for them this morning. Still watching the weather situation at Edwards for an entry and landing later today. Standing by to acquire signal at Madrid.

CAPCOM Columbia Houston, good morning, we're with through Madrid for 6 minutes.

CAPCOM Columbia Houston, with you through Madrid for 6 minutes.

SPACECRAFT Good morning, Jim, how ya doing this morning?

CAPCOM Hey, we're doing real fine. How ya'll?

SPACECRAFT Doing super.

CAPCOM Ok, we're going have a state vector coming up to you this morning. When you get a chance, you probably know that we got a lot of teleprinter messages that have come up over the night. One we'd like you to look at first, is message 35 Alpha. That's the CAP update, and there's some information that you're going to need here in the next 20 minutes or so.

SPACECRAFT Roger Jim, even as you speak, we're looking at 35 Alpha and trying to mark it into our CAP.

CAPCOM Ok, mighty fine, if there's someone close by that could give us a SM spec 1, we've got some variable parameter changes that we'd like to do, if it's convenient, we need a spec 1, SM.

SPACECRAFT Ok, CRT 3.

CAPCOM Ok, CRT 3, thank you.

CAPCOM And while you're doing all that, we've got some morning music for you and a few words from the crew of the swine trek.

SPACECRAFT OK, send them up.

CAPCOM Ok, it's on its way, (music)

end of tape.

a good part of the approach so we will be fairly loose outside of 200 feet during those portions. Airspeed, we'll be holding 285 through the majority of that approach, 285 knots. Ken Baker in the TV bird, of course his job of course is to put his airplane where the camera can do the most good, so he's going to be about 500 feet off.

Dick Pollard, Gannett News Service Is... I don't remember the emphasis on still photos around the outside particularly underside from the first mission. I may be wrong but is that to check the damage whether...how much of the damage was from rocks and things kicked up on landing?

Kathy That's basically our goal. We had the same objectives on flight 1. The photography was not quite as good as we had hoped to achieve. The join up was a little late and they came out the underside without without mapping the entire bottom of the vehicle. The problem is exactly that, separating damage that can be identified on the tile that occurred presumably during the ascent phase and then survived the reentry heating and being able to distinguish that from post-landing or rollout damage. Also again, to have a look at the bottom before we open the sealed cavities such as the nose gear doors, the main gear doors, and so forth.

Walter Sullivan, New York Times You referred to a speed brake sweep on the descent. What is that? Is it a maneuver of some sort?

Gibson It's, again this flight of the orbiter trying to get a whole of aerodynamic data and that is exactly what it is. It's taking the orbiter speed brakes and opening them and closing them at a specific angle of attack and what they are attempting to do by doing that is separate out the speed brake effect from any other effects that they may have been seeing on the last approach. So what they are after is, they are after an aerodynamic coefficient known as, well essentially speed brake effectiveness is what they are looking at.

Gibson Somewhat like flaps. Of course the speed brakes we use to slow the orbiter down, whereas flaps would have a slightly different purpose.

Thank you very much. This concludes the press briefing.

END OF TAPE

CAPCOM Stand by. Yes you are go for circ pump.

SPACECRAFT Okay.

CAPCOM Columbia Houston we have two minutes left in this pass. You have a new state vector onboard now. And Richard we concur with the messages you received at the time you turned the DFI PCM container 2 off and and we would like to get that FPA back and we recommend that you change the power down procedure to leave the DFI PCM container 2 MDM dedicated signal conditioner main alpha and bravo both on. Over.

SPACECRAFT Wilco

CAPCOM Columbia Houston 20 seconds left here at Santiago. We will see you at Botswana at 11 plus 26. Over.

SPACECRAFT See you then.

PAO This is Shuttle Mission Control we've had loss of signal. We will reacquire in 15 minutes 30 seconds at Botswana for a pass of 6 minutes 48 seconds. During that pass we heard that Joe Engle was in the process of changing CRT number 1 on the flight deck. The replacement for that defective CRT would be the, one of the two CRT's in the aft flight deck. The crew has not been through a change out procedure before although they have been familiarized with the parts in the process and have walked through it on a table top checkout in the past. It's expected that the CRT change out should take Joe Engle about 1 hour to 1 hour and a half to accomplish. Mission elasped time is one day 11 hours 12 minutes. This is Shuttle Mission Control.

PAO Shuttle Mission Control, in less than a minute we will have acquistion of signal at Botswana, South Africa. Duration of this pass will be 6 minutes 47 seconds. Only about an hour and a half remaining until the crew goes to sleep for the night. Mission elasped time is 1 day 1 hour 26 minutes and we should have air to ground communications shortly. This is Shuttle Mission Control.

CAPCOM Columbia Houston on UHF through Botswana. Over.

CAPCOM Columbia Houston UHF through Botswana. Over.

SPACECRAFT Roger T. J. Stand by just a second.

CAPCOM Roger.

SPACECRAFT We're in RCS jet test on page 9-7 and presently firing the plus YAW pulses.

CAPCOM Roger

SPACECRAFT And Houston PLT we're the circ pump is off, we're into the second cycle now.

CAPCOM Roger we copy Richard.

CAPCOM Columbia Houston we have one minute left here at Botswana and we will be AOS at Indi station in about 2 minutes. Over.

SPACECRAFT Okay.

PAO This is Shuttle Mission Control. We've had loss of signal at Botswana and just in a little over a minute we will acquire again as the vehicle proceeds within range of the Indian Ocean station. Site Columbia on its 25th orbit of the Earth. We will have reacquisition of air to ground transmission again momentarily. Mission elasped time is 1 day 11 hours 34 minutes. This is Shuttle Mission Control.

END OF TAPE

CAPCOM (garble) sight. Columbia on its 25th orbit of the Earth. We will have reacquisition of air-to-ground transmission again momentarily. Mission elapsed time is 1 day, 11 hours, 34 minutes. This is Shuttle Mission Control.

CAPCOM Columbia Houston. We're AOS at Indi station and we have a couple of reminders for you Richard when you have a second to listen.

SPACECRAFT Okay, please hold off just a second while I garble reconfigure garble this RCS jet test is complete. Hang on just a second.

SPACECRAFT And T. J., we just finished the RCS jet test. The forward CRT, CRT 1 is loose. We haven't pulled it out yet and we're going back to get to the aft one right now.

CAPCOM Roger. We copied you.

SPACECRAFT And Houston PLT, the RCS jet test is complete. Why don't you look at page 523 and see if there is any of that on the left side that should be deleted. My book doesn't have any of it deleted.

CAPCOM Roger. Standby.

SPACECRAFT Thank you T.J. And I'm ready to copy your notes whenever you get them.

CAPCOM Columbia Houston. You're go for all the tests even though we're going LOS here in about 3 minutes and you're also go to reselect F5R and also a reminder that the OEX recorder power will be required.

SPACECRAFT Roger T.J. Where is that in the procedure?

CAPCOM Roger. The OEX power is under your PLT column.

CAPCOM Roger. It gets turned under the PLT column at 11 plus 25.

SPACECRAFT Ah hah. Okay. Well, before you go over the hill, look at 1140 and it says that we require some ACIP data via SPC or RTC at that point. Is has that been accomplished or should we stop there?

CAPCOM We copy. Standby.

SPACECRAFT Roger.

CAPCOM Richard, the ACIP is on and we'll leave it on until we can command it off at Hawaii and you're go for all those tests. One further reminder, the IMU alignment attitude that's required will be the one in message 9 echo. Over.

SPACECRAFT Okay. I think we've got that Terry.

CAPCOM And Columbia, one more. We'd like to

SPACECRAFT (garble) and see you at the next station.

CAPCOM Roger. We have 1 plus 30 here and we need to give you some information on the upcoming water dump which will be before Hawaii. Over.

SPACECRAFT Roger. Go ahead.

CAPCOM We'd like you to dump tanks Charley through Fox Trot to 73 percent. That will require about 1 hour of dump and you will recall that in the procedure you will be deleting steps 1 and 4 doing only steps 2 and 4, 2 and 3, rather, because of our tank configuration. Over.

SPACECRAFT Roger T.J. It's tanks Charley through Fox Trot to 73 percent and just like we did before, delete steps 1 and 4.

PAO You got it. We've got 30 seconds left here and we'll see you at Hawaii at 12 plus 12. Over.

SPACECRAFT Roger.

CAPCOM This is Shuttle Mission Control at loss of signal and once again we are in a rather lengthy period before we have another acquisition, almost half an hour now before we acquire it in Hawaii. During this period the pilot, Dick Truly, will be deactivating the NOSL experiment and has just completed some RCS jet testing. There will be a manual water dump during this loss of signal period and some hydraulic pump purging. Pilot Commander Joe Engle is still working on a change out of that cathode ray tube, an IMU maneuver and IMU inertial measurement unit maneuver and alignment, also planned before the crew begins presleep after which .....

END OF TAPE

Music ("Columbia the Gem of the Ocean" by Flight Operations own Contraband)

Recording played to crew: Well Lee, today is the day for the Columbia to end its mission.

I'm going to miss them. It was nice having company.

Ah ha. In a little while they will reentering the atmosphere of Mother Earth.

Well, they've solved their problems with those heat tiles.

At least they've got tiles.

Yeah. We've got shingles.

Whoever heard of putting shingles on a spaceship? It looks silly.

I think it's quaint. We look like a floating hunting lodge.

You'd love it Joe Henry.

Anyway, we wish the Columbia happy landing. We will be staying here in the outer reaches of space. Our mission is not complete.

Tell them why our mission is not complete.

Yes. Tell them why we're staying in space.

Well, it's because we don't know how to get down. Oh Joe, Dick, which button do you push?

Well, it certainly isn't the cute little red one.

Hey Joe, if I did a barrel roll to final, would that work?

Oh no garble

Be thankful that you don't have to turn in tomorrow for Pigs in Space.

SPACECRAFT Hey, that was okay Jim.

CAPCOM Yeah, that was mighty fine wasn't it? We've got about a minute and half left in this pass.

SPACECRAFT Sounds like an awful lot of good familiar talent in on that one.

CAPCOM And I think you probably recognize the music by our own Contraband back here.

SPACECRAFT You bet we do. Yeah Hank, and we miss those guys.

CAPCOM Columbia we're through with the CRT. It's yours and we'll see you at Yaragadee at 21:27.

SPACECRAFT Okay Jim, I'll see you then.

CAPCOM Shuttle Control Houston, 1 day, 21 hours mission elapsed time. Crew entertained this morning by a special skit performed by the muppets for their benefit and a rendition of Columbia, Gem of the Ocean by the Flight Operations Directorate Contraband. Crew is starting into a very busy day today as the flight controllers here in mission control have been busy through the night updating the flight plan and the activities in preparation for today's proposed reentry and landing at Edwards Airforce Base in California. Earlier report this morning from the National Oceanic and Atmospheric Administration, the weather people on the current conditions at Edwards show that it was overcast at 25,000 feet with scattered clouds at 12,000 and the conditions as just of about an hour ago...those were the conditions about an hour ago. The forecast for the proposed entry time was broken clouds at 25,000 feet, no rain, and winds were predicted not to be in excess of the limits that are considered desirable for landing. 1 day, 21 hours, 1 minute mission elapsed time. This is Mission Control Houston.

END OF TAPE

PAO Mission Control Houston. 1 day 21 hours 27 minutes mission elasped time. Standing by for acquisition of signal through Yarragadee tracking station in western Australia. Columbia now on its 32nd orbit.

CAPCOM Columbia Houston we're with you through Yarragadee for 8 minutes.

SPACECRAFT Okay, you're sounding, read you loud and clear Jim.

CAPCOM Roger and if you could give me a short count we can adjust the squelch on the ground and it will help us out a little bit.

SPACECRAFT Okay. Coming with a short count 1, 2, 3, 4, 5, 4, 3, 2, 1, Columbia out.

CAPCOM Okay, that's a little bit better. If there's one of you available I need to make some changes in the orbit ops book on page 5-6. If you got some time to get that out let me know.

SPACECRAFT Okay, stand by. Okay, Jim we've got the orbit ops checklist and say again the page.

CAPCOM Roger that's page 5-6. Heater reconfig.

SPACECRAFT Okay, we're looking at it.

CAPCOM Okay, to optimize the heater configuration for power consideration we going to ask you to reconfigure the heaters to the opposite heaters that is go to the B heater configuration with the following exception and it you're ready to copy, I'll give those exceptions to you.

SPACECRAFT Okay, go ahead.

CAPCOM Okay the exceptions to the B config. are for L2 the flash evap. feedline heater A/B supply, parenthesis two we would like that one on A12 and the APU heater gas generator/fuel pump 3 to A auto. The APU heater cool boil line parenthesis 3 to A auto. And the tank fuel line water system 2 Bravo to auto. Also on A12 the hydralic heater fuselage, AFT fuselage A to off, B to auto.

SPACECRAFT Okay, Jim and the last one that you read there is the way that it is printed on page 5-6.

CAPCOM Okay, pressing on on A14, the RCS/OMS heater left pod, B auto, and RCS OMS heater, right pod to B auto and that's it.

SPACECRAFT Okay. We got them Jim, thank you. Jim, PLT

CAPCOM Go ahead PLT.

SPACECRAFT Okay, help me out, I was not looking at this (garble) when you read me this last number. Are RCS crossfeed lines, do you mean the ones left and right that you want to Bravo auto?

CAPCOM Roger those are the left and right pods, B auto.

SPACECRAFT Okay Jim, I got it. Thanks a lot.

CAPCOM Okay.

CAPCOM Columbia Houston if you got someone back by A12, there's an error on what I read up to you on the heater reconfig. If someone can get back there I'll give you the correct heater.

SPACECRAFT Okay, stand by Jim, I've already put my book up now.

PAO Shuttle Control Houston, Capcom James Buckley discussing configuration of the variety of switches with astronaut Dick Truly on the setup of the systems in Columbia's flightdeck. One day 21 hours 33 minutes mission elasped time. Currently in contact with Columbia over Yarragadee, Australia.

SPACECRAFT Okay, Jim. Go ahead on A12.

CAPCOM Okay, what the change is, is we would like the APU heater gas gen/fuel pump 3 to A auto and gas generator fuel pumps 1 and 2, you can leave in B auto.

SPACECRAFT Okay, I understand you want the gas generator fuel pump 3 to A auto and 1 and 2 to B auto. Is that affirm?

CAPCOM Yes sir that is correct. Okay and also for the lube oil line we would like that same configuration.

SPACECRAFT Okay, I'm afraid you cut out on that one, could you say that last translation again.

CAPCOM Roger, the APU heater for the lube oil line, we would like 3 to A auto and 1 and 2 to B auto.

SPACECRAFT Okay, understand.

CAPCOM Okay we'll see you at Orroral at 21:36.

SPACECRAFT Good.

PAO Shuttle Control Houston, 1 day 21 hours 35 minutes, mission elasped time. Loss of signal through Yarragadee, western Australia and will acquire only about 25 seconds through the

Orroral tracking station. This is Shuttle Control Houston.

SPACECRAFT Houston, PLT.

END OF TAPE

CAPCOM Columbia Houston, we're with you through Orroral for 4 minutes.

SPACECRAFT Okay. Loud and clear Jim.

SPACECRAFT Houston PLT, how are you reading me?

CAPCOM Okay. I'm reading you loud and clear.

SPACECRAFT Okay. Thank you.

CAPCOM Columbia Houston, we'd like you to get the Z startracker on at this time for warmup and if someone's near L-1, we'd like the high-load evap duct heater to bravo and that's in anticipation of a possible FES test over the states.

SPACECRAFT Okay Jim. The you want the topping evap heater duct to bravo?

CAPCOM No. That's the high load evap duct heater to bravo.

SPACECRAFT Okay. High load duct heater to bravo.

CAPCOM Columbia Houston. We're 1 minute from LOS. We'll see you stateside at 2211.

SPACECRAFT Okay. We'll see you then.

PAO Mission Control Houston.

CAPCOM One day, 21 hours going over the hill. We'd like you to select DAP A for the maneuver.

SPACECRAFT Okay Jim.

PAO Mission Control Houston. About to lose signal with Columbia through the Orroral tracking station in Australia. Columbia on its 32nd orbit of the Earth and we'll be reacquiring at the Mila tracking station over the US in off the Atlantic, over the eastern US in about 30 minutes. One day, 21 hours, 41 minutes mission elapsed time. This is Mission Control Houston.

PAO Mission Control Houston. Now having contact here momentarily with Columbia through the Mila tracking station. 1 day, 22 hours, 11 minutes mission elapsed time. This is Mission Control Houston.

CAPCOM Columbia Houston. We're with you for 11 and 1/2 minutes through the states.

SPACECRAFT Roger Jim. Hello and when we get a chance, Joe and I got a couple of questions for you.

CAPCOM Okay, go ahead.

SPACECRAFT Okay. On that power down for the loss of 1 fuel cell and it says to go through group 1 to maintain KW's of 16 and the KW when I looked at it was varied in between about 14.6 and 15.1, so, so far I haven't done anything. Also, Joe and I in our bookkeeping cannot at the moment find message 22 echo and so if you could tell us what that is or resend it, we'd appreciate it.

CAPCOM Okay. We'll sure do that.

SPACECRAFT And the fuel cell purge has been done. Joe, I think, has done IMU alignment and he's got the data for you.

CAPCOM Okay.

SPACECRAFT Jim. How long is this pass here?

CAPCOM Oh, we got 10 and 1/2 minutes yet.

SPACECRAFT Okay. You want the IMU data now?

CAPCOM Yeah, go ahead, Joe.

SPACECRAFT Okay. -Y was 21, -Z, 17, angle error 0.01. For IMU 1, X - 0.04, Y + 0.00, Z + 0.11. For IMU 2, X - 0.20, Y + 0.09, and Z - 0.00. For IMU 3, -X is -0.02, Y + 0.10, and Z - 0.09. Execute time was 1 + 21 + 55 + 00. We are in attitude and DAP is BR vernier.

CAPCOM Okay. We copy all that.

SPACECRAFT And Jim, I do have threshold verification check on both those stars and acquired a threshold of three for both 21 and 17 in the -Y and -Z, respectively.

CAPCOM Okay, real fine, we got that. Okay, and if you got nothing else I'd like to give you an overview of what this flash evap test is gonna be.

SPACECRAFT Okay, you bet.

CAPCOM Okay, the intention of the tests is to just see what we have for controllers primary A, primary B, and secondary. And what we're going do is we're going to bypass the radiators and then we're going to when the temperature gets greater than 60 we'll turn on primary A, if it looks like it controls less than 60 we'll switch over to secondary, if it works we'll stay on that for about 5 minutes, then we'll go over to primary B and we'll see if that works and if it works we'll stay on that for about ten minutes and then we'll go back to rad flow.

That's kind of an overview and I've got a detailed procedure that we can go through if someone

END OF TAPE

CAPCOM We're going to bypass the radiators, then we're going to, when the temperature gets greater than 60, we'll turn on primary A, if it looks like it controls less than 60, we'll switch over to secondary, if it works, we'll stay on that for about 5 minutes. Then we'll go over to primary B, and we'll see if that works and if it works we'll stay on that for about 10 minutes then we'll go back to rad flow. That's kind of an overview and I've got a detailed procedure that we can go through if someone is ready to copy it.

SPACECRAFT Yeah, I'm ready to copy it, Jim, go ahead.

CAPCOM Ok, on R12 L, we'd like you to check supply water crossover valve open, talkback open, that's so we can use the water from tanks C, D and F. On L1 check flash evap controller primary A off, primary B off, and secondary off, and check that you got A supply. We'd like to make sure the high load evap is enabled, and we'd like you to go rad bypass valve mode, two of them to manual, rad bypass valve manual select 2 to bypass, and after 3 seconds should get the talkback to bypass. Ok, then, what we'd like you to do is watch for the evap out temp to get greater than 60 degrees, and we want you to wait 90 seconds. Correction, standby. Ok, we'd like you to wait 90 seconds and then take the rad controller loop 2 to off, and then when the evap out temp is greater than 60 degrees, we'd like you to take the flash evap controller primary A on. Ok, if the flash evap controller primary A shuts down, we're going to ask you to take primary A off and put the secondary on. And if you've copied us so far, let me know.

SPACECRAFT OK Jim, we got a copy of you're, actually you cut out there a couple of times. Right after at the start there, when we turn flash A off, B off, and secondary off. There was one word in there before, one line in there I think I missed before turning the high load evap to enable.

CAPCOM That was check that you have A supply.

SPACECRAFT Oh, okay, check and we're on A supply, Roger

CAPCOM Okay

SPACECRAFT Okay, I understand we're going to go to bypass on the rads and the evap out temp gets greater then 60 degrees. Guess I want you to help me out on this, you wanna turn RAD controller loop two off?

CAPCOM Negative, what we'd like you to do Joe, is turn both loops off, and wait for 90 seconds and that will allow the RAD controller to sequence, Okay?

SPACECRAFT Okay, both loops to off and wait 90 seconds, Roger

CAPCOM Okay Joe, we want to make sure that what we're trying to do there is to get the RAD controllers off, we need to wait for 90 seconds there, to make sure we get the RAD controller to sequence properly before we go to primary A, and we also want to make sure that the temperature is greater than 60 degrees, so that primary A will kick on, so we can see it.

SPACECRAFT Okay, I think I understand Jim, and if your ready to start it, we can start it right now and you can watch.

CAPCOM Okay we can go ahead and start it on, up to that point at this time and then we can go through the rest of it.

SPACECRAFT Okay Jim, I'll go ahead and get these configured and then we can press on from there, I was checking back on R12, and water supply crossover valve is open.

CAPCOM Okay, mighty fine.

SPACECRAFT Okay Jim, we got all the flash evaps off, both radiators are in bypass and waiting the 90 seconds and the evap out temps are climb slowly, if you want to start pressing on, I've got a timer going and I'll go ahead and turn flash evap A on at 90 seconds.

CAPCOM Okay Joe, you can just wait to see the evap out temp get greater than 60 degrees, then you can bring primary A on.

SPACECRAFT Yes, okay, you betcha, we're showing about 47 now.

CAPCOM Okay now Joe, if primary A shuts down we'd like you to take primary A off, and go to the secondary controller. And we'll just stay there for about five minutes, and we'll see you at Madrid.

SPACECRAFT Okay mighty fine.

CAPCOM And we'd like primary A on at this time.

SPACECRAFT You bet, it's on Jim.

CAPCOM And Columbia, we're about a minute from LOS if primary A doesn't shutdown, if it does shutdown we'd like you to go to secondary and leave it on secondary when we get to Madrid, if primary A seems to control properly just leave it on primary A and we'll see you there in that configuration in Madrid.

SPACECRAFT Okay, thank you Jim, we sure will.

PAO This is Shuttle Control Houston, one day 22 hours 23 minutes, mission elapsed time. At loss of signal through the Mila tracking station and we'll pick up in a few moments at

Madrid, Spain station. The flight controllers are working with Commander Joe Engle to isolate a problem in the Orbiters flash evaporator cooling system, and pilot Richard Truly reported earlier that they had completed a fuel cell purge. At one day 22 hours 24 minutes, mission elapsed time, this is Shuttle Control Houston.

END OF TAPE

PAO Shuttle Control Houston. One day 22 hours 28 minutes mission elapsed time. Standing by for reacquisition of signal through the Madrid tracking station.

CAPCOM Columbia, Houston. We're with you through Madrid for five minutes.

SPACECRAFT Okay, Jim we're on clear and it looks like flash evap A is holding both loops at about 40 degrees.

CAPCOM Oh, that's outstanding. Okay, we'd like you to take A off and go to primary B on.

SPACECRAFT Okay. And Houston, PLT, let me ask you something about that theodolite.

CAPCOM Go ahead.

SPACECRAFT I don't know if you around during right after we got on orbit but things we had so many little things going on that we were afraid that we would get behind that go for orbit timeline and so we essentially did not get any of the theodolite data on day 1, I did get a couple of points but every time we'd start doing it two other messages was come up, and so essentially we have no baseline data from the few hours after liftoff. With this fact, do you want me to go ahead and try to get the theodolite measurements that we're supposed to get in the PDP or not and I don't need an answer right this second.

CAPCOM Okay, we'll get it for you a little later.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, it looks like primary B is working, what we'd like you to do is let primary B control for about two minutes after LOS, then we'd like you to go to secondary and let it try to control for about five minutes. If it doesn't maintain less than 62 degrees or after five minutes we'd like you to return to rad flow and the configuration we'd like you to wind up in is the rad bypass valve mode 2 to auto, that's both loops, and rad bypass control loops to B auto and then get the high low duct heater off.

SPACECRAFT Okay, Jim, understand you want to try the secondary and see if it will control and if it does, leave it there until the next AOS, if not we'll go back to rad flow?

CAPCOM Ah, negative. Try secondary for five minutes is all, Joe, and then go back to rad flow.

SPACECRAFT Okay, I understand, thank you.

CAPCOM And Joe, when you do go to secondary if the temperature starts going up above 62 and it doesn't seem to control and keep it down below 62 then you can go to rad flow at that time and not worry about keeping it there for five minutes.

SPACECRAFT Okay, Jim, thank you.

CAPCOM Columbia, Houston, we're about 1 minute from LOS. IOS is next at 2246 and we have resent teleprinter message 22 echo to you.

SPACECRAFT Thank you Jim.

PAO This is Shuttle Control Houston. One day 22 hours 34 minutes mission elapsed time. We have loss of signal through the Madrid tracking station and will acquire over Indian Ocean station in about 12 minutes. Crew still going through some procedures, attempting to isolate some difficulty in the flash evaporator system, and they will be working on that between now and the next communication pass. At one day 22 hours 34 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 1 day 22 hours 45 minutes mission elapsed time. Columbia coming up on acquistion through the Indian Ocean station.

CAPCOM Columbia, Houston, with you through Indian Ocean for 7 and 1/2 minutes.

SPACECRAFT Okay, Jim, reading you loud and clear. And Jim I've been we've been getting stuff stowed here I have not pressed on with that flash evap - I'm going to. Let's see you want secondary on next, don't you?

CAPCOM That's affirmative. Just a quick question. Was B working alright?

SPACECRAFT Yes sir, B is holding good and steady at 40 degrees.

CAPCOM Oh, okay, we would like a checkout on secondary please.

SPACECRAFT You bet. Secondary's on now.

CAPCOM Columbia, Houston, if someone is close to panel 08 we've noticed a switch out of configuration.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, it's the left OMS tank iso A, we'd like it to open.

SPACECRAFT Roger, Jim, I noticed that it is in close and I'm not sure why.

CAPCOM Okay, Dick, we think it might have just gotten bumped sometime prior to sleep.

SPACECRAFT Okay, Okay it's open now and I guess you're right, I'm pretty sure that when I reconfigured after using OMS it was still in open.

CAPCOM Roger, then. Okay, and I've got a one liner change to teleprinter message no. 34, it's first line of step 1 and all we're asking to do.

SPACECRAFT Standby in a minute, standby for a minute Jim.

CAPCOM Sure.

SPACECRAFT Okay, Jim, why don't you just tell us what it's about and we'll accomplish it.

CAPCOM Okay, all it is, Dick, is the first line reads at we'd like some av bay fans reconfigured at TIG-6 after pallet deactivation and we'd like you to change that to TIG-4 after pallet deactivation.

SPACECRAFT Okay, Jim, understand not you want the av bay fan reconfiguration at TIG-4.

CAPCOM That is correct.

SPACECRAFT Okay, and Jim, would you say again that message number, please.

CAPCOM Roger, that was message thirty-four, 34.

SPACECRAFT Okay, 34, thank you.

CAPCOM Columbia, Houston, we're through with the flash evap controller checkout so we'd like to return to rad flow at this time and we'd like you to take the rad bypass valves to auto, the rad bypass controller loops, to auto B and to make sure you got the high load duct heater to off.

SPACECRAFT Okay.

END OF TAPE

CAPCOM ...auto B and to make sure you got the high load duct heater off.

SPACECRAFT Okay. The mode's to auto, the controllers are auto B and the high load duct heater is coming off.

SPACECRAFT And Jim, also, you want the flash evap controller, secondary controller off at this time, is that correct?

CAPCOM Yes sir. We take secondary off and take primary B back on if you would please.

SPACECRAFT Okay.

CAPCOM And we had one error Joe. We'd like to ask you to turn the high load duct heater back on until we get to Orroral.

SPACECRAFT Okay high load duct heater is back on Bravo.

CAPCOM Roger that.

CAPCOM We're about 35 seconds to LOS. Yarragadee is next at 2301. That's it for the Bronze Team. We sure enjoyed working with you. It's been a real pleasure. And we'll see you back here on the ground.

SPACECRAFT Okay Jim. Nice working with you. Thanks a lot for all the help.

CAPCOM And that was just a super show on that FES checkout that really helped us a lot Joe.

SPACECRAFT Okay mighty fine. One more quick question Jim. You want the high load evap enable left in enable or to off.

turned on.

PAO This is Shuttle Control. Columbia is out of range at the Indian Ocean station now. Coming up next at Yarragadee Australia in 7 1/2 minutes. The Crimson Team of flight controllers preparing to relieve the Bronze Team. Crimson Team flight directors are Don Puddy and Harold Draughn. CAPCOMs on the on-coming Crimson Team Rick Hauck and Steve Nagle. We don't have an estimate yet on Bronze Team Flight Director Chuck Lewis's change of shift briefing. It will be held in room 135 of the JSC news center and at an estimated time of 9:00 a.m. Central Standard Time. Change of shift briefing 9:00 a.m. Central Standard Time room 135 building 2 the JSC news center. At one day 22 hours 55 minutes Mission Elapsed Time this is Shuttle Control Houston.

PAO This is Shuttle Control at one day 23 hours 1

minutes Mission Elapsed Time. Columbia coming up on the southwest coast of Australia. We'll have communication shortly through Yarragadee followed by the Orroral Valley station.

CAPCOM Columbia, Houston through Yarragadee for 7 minutes 50 seconds over.

CAPCOM Columbia, Houston through Yarragadee for 7 minutes and 40 seconds over.

SPACECRAFT Hello Houston, just caught the tail end of that, this is Columbia do you read?

CAPCOM Roger we read you okay with a little bit of background noise.

SPACECRAFT Okay Rick. You're still cutting in and out a little bit but, we can hear you okay. And good morning.

CAPCOM Good morning. Number one we'd like to give you a time update for the Edwards deorbit. When you're ready.

CAPCOM That'll be a garbled 17 + 05 + 13 + 15 over.

CAPCOM Columbia, Houston. We did not hear most of that.

SPACECRAFT Rick you cut out some just a second and we'll take the update, what page is that?

SPACECRAFT Okay go ahead Rick we're ready to copy.

CAPCOM Roger the Edwards TIG item 17 + 05 + 13 + 15 over.

SPACECRAFT Okay 05 + 13 + 15.

CAPCOM Okay that's a good readback.

CAPCOM And we recognize that you're working real hard to stay on the timeline. We do have a few notes that we'd like to pass to you but none of them critical.

SPACECRAFT It they're not critical, let's save them. We've got a 8 foot teleprinter message here and trying to get squared away.

CAPCOM Okay Richard.

PAO This is Shuttle Control. Orroral Valley will have acquisition in about a minute.

CAPCOM Columbia, Houston through Orroral 4 1/2 minutes and we'll just be standing by.

SPACECRAFT Okay thank you Rick. And we're deactivating the pallet now.

CAPCOM Roger we do have one note if you're back on the if you're back in the back of the bus on the RMS.

SPACECRAFT Go ahead.

CAPCOM Okay RMS heaters, RMS port heaters should be off. We saw the power come off but not the RMS port heaters.

SPACECRAFT Okay must be a gremlin because I thought I remembered getting that one but it's now off.

CAPCOM Okay thank you.

END OF TAPE

SPACECRAFT Okay, must be a gremlin cause I thought I remembered getting that one but it's now off.

CAPCOM Okay, thank you. And Columbia, Houston, is there someone in the left seat now?

SPACECRAFT Yes sir, there sure is.

CAPCOM Hey, Joe, after the flash evap test and we went back to rad flow apparently we got an under temp shutdown on loop 2. I wonder if you'd take the rad controller on loop 2 and cycle it to off and back to auto B.

SPACECRAFT Okay. Okay Rick that's done. I noticed that loop 2 did stay in bypass, would you want me to take it to rad flow manually?

CAPCOM Wait one Joe.

SPACECRAFT Okay.

CAPCOM Joe, it'll take the 90 second timeout after activation of the switches. We'll keep an eye on it.

SPACECRAFT Okay, fine.

CAPCOM Columbia, Houston, in the update on the APU to be used for the checkout, APU #2.

SPACECRAFT Okay, understand use APU 2 for the FCS checkout.

CAPCOM That's affirm and before we go LOS in thirty seconds, I'll just call your attention to steps 4 and 5 of the powerdown for loss of 1 fuel cell in that orbit pocket checklist and there were some steps on the powerdown to be done prior at just about this time, so we'll look for those as we see you over the states in about 26 minutes.

SPACECRAFT Okay, remind me, please, cause I asked a question on the last shift whether we whether or not we should do any powerdown or not and I never got an answer so we've ignored it.

CAPCOM Okay, Richard, please do steps look at steps number 4 and 5 and ignore the pen and inks for the time being.

SPACECRAFT Okay.

PAO This is Shuttle Control. The Orroral Valley has loss of signal. Columbia starts a long pass over the Pacific Ocean now, the next station will be at Tula Peak, New Mexico in 25 and 1/2 minutes. Columbia in the next few minutes will enter its 33rd orbit. Crew appears to be pretty well on the

timeline. Joe Engle reporting during this pass that they were deactivating the pallet in the payload bay. At one day 23 hours 17 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 1 day 23 hours 41 minutes mission elapsed time. The change of shift briefing with flight director Chuck Lewis has been delayed until 9:15 a.m. today. Change of shift briefing will be at 9:15 a.m. in room 135 of the Johnson Space Center News Center. Columbia is about 30 seconds away from acquisition through Tula Peak, we'll standby. This is Shuttle Control. The crew will be conducting the flight control system checkout over this pass over United States in preparation for entry. Clock counting down now 5 hours 30 minutes to ignition.

CAPCOM over the states through Tula Peak. We'll be with you for 14 minutes, over.

SPACECRAFT Roger, Rick, stay with us just a couple seconds and we'll be ready to start. We just went to got the attitude and just went to update.

CAPCOM Okay, good enough. And Columbia, Houston, we do have a different tail sun attitude for you, we'll get with you in a bit, maybe on a message you didn't get to.

SPACECRAFT Okay, thank you Rick, we'll standby just a second. and Houston, I can't start a maneuver to that now if you want to just go right back to OPS 2, start the maneuver and come back to 8 if that's your option.

CAPCOM We copy and I'll get right back to you.

SPACECRAFT Okay.

CAPCOM Columbia, Houston, no problem, stay in the present attitude.

SPACECRAFT Wilco.

CAPCOM And Columbia, Houston, on the right side there, Richard, if you could take in tank 1 of both the cryo 02 and H2, both sets of heaters in tank 1 off.

SPACECRAFT I'm sorry Rick, say again please.

CAPCOM Roger, cryo 02 and H2 tank 1 both sets of heaters off.

SPACECRAFT to off, O F F

CAPCOM That's right, O F F

SPACECRAFT Okay, thanks a lot. Okay, Houston, sorry for the delay, but I've now done the prestart and I'm ready to crank APU #2 if you are?

CAPCOM Okay we're ready to do that, Richard, go ahead.

SPACECRAFT Okay. And Houston, we do not have any of DFI recorders on at this point. Did we misinterpret or is this the proper configuration.

CAPCOM We copy and get right back to you. Roger, Richard, bring the DFI wideband on the continuous record, please. Correction, PCM.

SPACECRAFT Roger, PCM is continuous record and I'm ready to start.

CAPCOM Roger, we got static data right now.

SPACECRAFT Okay, you want me to hold off.

CAPCOM Ah, go ahead.

SPACECRAFT Houston, PLT, do you want me to delay the start until you get your data back.

CAPCOM Ah, negative Richard, you can go ahead.

SPACECRAFT Okay, it's in work. Okay.

CAPCOM We've got good data and the APU looks good, Richard.

SPACECRAFT Roger, Okay. and Houston, PLT, we're just to the end of the negative stimulus check and we're waiting on your go to shut down of the APU.

CAPCOM Roger, and you're go for shutdown of the APU.

SPACECRAFT Wilco, it's in work. Hey, Rick, we're headi g onto page 3-12

APCOM We're following you.

END OF TAPE

SPACECRAFT Houston, PLT we're turning to page 3-13.

CAPCOM Okay Richard, and recognizing that you might not of entered all the pen and inks in the books, now is a good time to turn off your Tacans' Radar Altimeters, and MLS.

SPACECRAFT Okay, that's in work.

SPACECRAFT And that's accomplished.

CAPCOM Roger.

PAO This is Shuttle Control, Flight Director Chuck Lewis is en route to the JSC newscenter for his change of shift briefing.

SPACECRAFT And Houston, we're going on to page 3-14.

CAPCOM Roger.

CAPCOM And Columbia Houston, we're one minute to LOS, we'll be picking you up next at Madrid in six minutes and we see no pen and ink changes to pages 3-14, 3-15, 3-16, or 3-17, over.

SPACECRAFT Okay, thank you, a lot Rick we'll see you next pass.

CAPCOM Roger.

PAO This is Shuttle Control, Bermuda has loss of signal. Columbia's next acquistion will be through Madrid in five minutes. During this pass over the United States astronauts Engle and Truly have been checking out Columbia's flight control system, part of that test involves the starting one of the APUs the Auxillary Power Units, APU number two was started and ran for about four minutes without any problems We're five hours 14 minutes and 36 seconds from the deorbit maneuver. At one day 23 hours 58 minutes, mission elapsed time, this is Shuttle Control Houston.

PAO This is Shuttle Control at two days two minutes mission elapsed time standing by for acquistion through Madrid.

CAPCOM Columbia Houston, through Madrid, we'll be with you for about three and a half minutes, over.

SPACECRAFT Roger, and you can help us out cause we've got a couple of failures declared. First of all, on the, we did the test the first time through and the forward jets, four of the forward, maniford four and five jets failed. Then we did it for the left and right and got failures of the manifold one jet, we didn't repeat it, the test for the forwards with an item 12 with the forward, parden me with the vernier driver off, and at that

we got a whole slew of fail off, which show up on Spec 20, we looked at the MAL book and it said to consult MCC.

CAPCOM Okay Richard. We'll be looking at that, do you have any other notes?

SPACECRAFT Say that again Rick?

CAPCOM Roger, we're looking at the RCS did you have any other notes?

SPACECRAFT Negative, I'm sorry, everthing else since LOS has gone just fine.

CAPCOM Okay, while we're looking at that Richard, or if Joe could get on the left panel there the hi load evaporator to off, and the hi load duct heaters off, why we'd appreciate that.

SPACECRAFT Okay Richard.

CAPCOM Roger.

CAPCOM And Columbia Houston, be aware, we're going to have a keyhole in this pass in about 45 seconds, so if we'e talking, or your talking we may drop in and out.

SPACECRAFT Okay.

CAPCOM Columbia Houston, looking forward in the timeline, we'd like to have that hi load duct heater back on, over.

SPACECRAFT Okay, hi load duct heater is back on to bravo.

CAPCOM Boy you sure are easy to work with Joe, thank you.

CAPCOM Columbia Houston, on the RCS if you could repeat the test with the driver power off and we'll be interested in the results at Indian Ocean in 14 minutes.

SPACECRAFT Okay Rick, we'll do it, and we'll see you there.

CAPCOM Roger, we understand the messages with the driver power on, we'll be interested with it OFF.

SPACECRAFT Say that again Rick.

SPACECRAFT The forward jets were declared fail off if that was the question.

PAO This is Shuttle Control, Columbia is out of range at Madrid now, the next station is Indian Ocean in 13 minutes. Dick Truly reporting on this pass that he got several fault messages

when he was doing the forward reaction control system test. We're looking at that problem here on the ground, we've asked him to repeat that test in a different configuration and we'll await word on that at next acquistion. At two days eight minutes MET, this is Shuttle Control Houston

PAO This is Shuttle Control at two days 20 minutes mission elapsed time Columbia will be within range of the Indian Ocean station shortly.

CAPCOM Columbia Houston, IOS for five and a half minutes, over.

SPACECRAFT Okay, Rick we're reading you loud and clear we're on we're in the display dedicated display in the flight test on 3-17 and the only anomaly so far has been on the right RHC trim, Richard had only one right trim contact show up.

CAPCOM Okay we have

SPACECRAFT It was the number two contact that did not come back and we repeated that entire test and driver test again and we had no failures.

CAPCOM Okay that's good word, and let me confirm you have right RHC trim number two contact only, is that correct?

SPACECRAFT Negative, that number two contact is not there, the number one contact was the only contact that was made.

CAPCOM Okay, and in which direction is that?

SPACECRAFT Roll right.

CAPCOM Okay thank you.

END OF TAPE

CAPCOM ...look at a couple of cycles on that switch.

SPACECRAFT Okay.

SPACECRAFT Okay Rick. On CRT 1 okay this time we've got both contacts.

CAPCOM We've got whizzards down here at the GNC console.

SPACECRAFT Good. What ever they did we appreciate it. Keep around Rick.

CAPCOM Okay. Good enough and I'm looking ahead in the flight plan. We do have one pen and ink on 3-20 that was just a reminder that we'll pass to you when we get there.

SPACECRAFT Okay Rick. Appreciate it.

SPACECRAFT And Rick we've completed the FCS checkout now.

CAPCOM Okay understand FCS checkout is complete. When you have a chance back on panel R11, Row echo, DFI wideband mission power to off over.

SPACECRAFT Okay.

CAPCOM And, Columbia, Houston. The reminder is that purely that when you do your radiator stow we just want to make sure that all of the circuit breakers down on MA73 Charlie that you pulled when you stowed that single radiator are reset.

SPACECRAFT Okay Rick thanks for the reminder. We sure will.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead for 2 more minutes.

SPACECRAFT Okay, let me just make sure that I understand what you said about the radiators. You want to select them all otherwords have all the circuit breakers closed and then drive the switches closed even though the port radiator is already there. Is that correct?

CAPCOM That's correct, Richard, and one item we see you using 3 CRTs if you need them that's fine. When ever you find you do not need them, if you could take one of them to standby we'll just keep the loads down a little.

SPACECRAFT Okay we'll take CRT 3 off now Rick. We just had them on for the FCS checkout. Thank you.

CAPCOM Okay and that can be in the standby vice off

position.

SPACECRAFT Okay got it thanks.

SPACECRAFT Houston, Columbia. We're ready to go into page 3-21 now and Rick we're on flash evap pri B now. Would you like to leave pri B on or do you want to go to pri A per page 3-20?

CAPCOM We see that, let's go to pri A.

SPACECRAFT Okay we'll do it.

CAPCOM And you will probably have to cycle that off then on after the radiator bypass just to restart the flash evap.

SPACECRAFT Okay got you thanks for the reminder Rick.

CAPCOM Columbia, Houston. 30 seconds to LOS with a possibility we might have you a bit longer before we go LOS you can go back to auto and back to top sun attitude.

SPACECRAFT Okay and you'd like to send that new top sun attitude for the teleprinter is that correct?

CAPCOM Correction, tail sun and that's correct.

SPACECRAFT Okay thank you.

CAPCOM Columbia, Houston. Are we still with you?

PAO This is Shuttle Control. The Indian Ocean Station has loss of signal. Next acquisition through Yarragadee Australia in 10 minutes. Pilot Dick Truly reporting over the Indian Ocean Station that he had repeated the forward reaction control system test and had no failures. At 2 days, 27 minutes Mission Elapsed Time this is Shuttle Control Houston.

PAO This is Shuttle Control at 2 days 36 minutes Mission Elapsed Time. Columbia coming up on acquisition through Yarragadee we'll standby.

CAPCOM Columbia, Houston through Yarragadee for 6 minutes over.

SPACECRAFT O (garbled).

CAPCOM And Columbia, Houston. I think I heard a response however we apparently lost the signal. We don't have anything pressing other than you do have a GO for payload bay door closing.

SPACECRAFT Roger Rick and how do you read now?

CAPCOM Okay you're in the weeds but we can read you clear go ahead.

SPACECRAFT Okay Rick. We're on our way to the tail to sun attitude and the flash evap A did trip off but it did reset okay and is controlling nicely now at about 40 degrees.

CAPCOM Okay that's good to hear and we'd like to chat with you a little bit about theodolite if you have the time now.

SPACECRAFT Okay Rick. Go ahead.

CAPCOM Okay Richard, three part message. Number 1 is if you number 1 is it's okay to turn on the lights for this exercise. The load power load level does permit that and first all if you can get those aft cal points, we'd like you to press on with the theodolite. If you cannot get the cal points, or the theodolite, we'll terminate theodolite OPS right there over?

SPACECRAFT Okay Rick understand and we'll do our best thank you.

CAPCOM Okay, one more note on that, targets Bravo and Charlie we feel are the priority targets with Delta being second priority and Alpha being last priority. Over.

SPACECRAFT Roger Rick. I understand that thank you.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead.

END OF TAPE

SPACECRAFT And, Houston, PLT.

CAPCOM Go ahead.

SPACECRAFT You can tell GNC there were a number of fail off jets when we back to OPS 2, but it was just a 1/2 second or second delta between after the system initialized normal jets with the drivers off. So we have cleaned up the Spec 23.

CAPCOM Okay that's good to hear Richard. Thank you.

CAPCOM Columbia, Houston. 2 more minutes in the Yarragadee pass. At Orroral which will be about a minute after LOS, we'll be looking for Spec 1 on a GNC machine if you can give it to us for some variable parameters.

SPACECRAFT Okay understand you want Spec 1 on the GNC. Coming at you on CRT 2.

CAPCOM Roger, we don't need that until Orroral. That's about 3 minutes from now.

SPACECRAFT Okay, understand you do not need it Rick we'll standby.

SPACECRAFT Houston the CO2 absorbers have been removed and stowed.

CAPCOM Okay thank you.

CAPCOM Columbia, Houston. 30 seconds to LOS we'll pick you up at Orroral in just under 2 minutes.

SPACECRAFT Ok Rick we'll see you there.

PAO This is Shuttle Control. Yarragadee has loss of signal. Orroral will acquire in about 1 minute. Crew has been given a go for closing the payload bay doors. That operation will be conducted by Joe Engle while Dick Truly takes sightings through the Theodolite. He has been told he can turn on the payload bay lights to assist him in that operation. He had problems seeing marks on launch day after they achieved orbit when they were opening the doors. It was dark in the bay before the doors were opened. He couldn't see the marks very well. So they can turn on the flood lights in the bay for that and he's also been told that if he can't get the aft calibration points to terminate theodolite operations. We have acquisition through Orroral now.

CAPCOM Columbia, Houston through Orroral now. 4 1/2 minutes. And, if you have that GNC Spec 1 up we'd appreciate it.

SPACECRAFT Okay Rick it's up on CRT 2.

CAPCOM Roger we also have some TMBUs coming up to you for your water quantities and we've got an IMU gyro bias for number 2 in the X axis coming.

CAPCOM Columbia, Houston. The CRT is yours we're complete with that.

SPACECRAFT Roger Rick. Thank you.

CAPCOM And Columbia, Houston. We've done an audit of our teleprinter messages down here and as I suppose you have to the extent that we could tell you a certain number of those that can be discarded just because they are past in the timeline. We can do that we could we are also prepared to advise you in advance of any pen and inks that you may not of had a chance to get in well in advance of those times. Over.

SPACECRAFT I propose we take option number 2. We the last teleprinter message was 6 or 7 feet long and with those things going on we just didn't have a time to look at it so if you will help take care of us and when we can get to those we'll get squared away.

CAPCOM Okay we'll do.

PAO Gyro bias is onboard.

CAPCOM Columbia, Houston. The TMBUs are on board and you have a go for taking your APU fuel pump valve fuel switches two of them off and your controller power off.

SPACECRAFT Okay Rick I'll get that...

CAPCOM Columbia, Houston. One minute to LOS. We see the PLTs controller power on. We believe it should be off.

SPACECRAFT Thank you Rick. We got it.

CAPCOM Columbia, Houston. 20 seconds to LOS. We'll see you next through Buckhorn in 23 minutes.

SPACECRAFT Okay Rick. We'll see you there.

PAO This is Shuttle Control. Columbia is out of range of Orroral. Next station Buckhorn in California in 22 1/2 minutes. Columbia is 4 hours 22 minutes 16 seconds away from deorbit maneuver. Retrograde maneuver will take place over the Indian Ocean on orbit 36 using both the orbital maneuvering system engines. Flight Dynamics Officer Willis Bolt presently expects that maneuver to change the velocity by 295.7 feet per

second. Time of the burn 2 minutes 47 1/2 seconds. Mission Elapsed Times of succeeding events include entry into the Earth's atmosphere at an elapsed time of 2 days 5 hours 40 minutes 37 seconds, begin blackout 2 days 5 hours 43 minutes 23 seconds, end blackout 2 days 5 hours 59 minutes 36 seconds and expected landing at 2 days 6 hours 12 minutes 43 seconds. At 2 days 52 minutes Mission Elapsed Time, this is Shuttle Control Houston.

NASA 946 Houston NASA 946 radio check over.

COMTECH NASA 946 this is Houston over.

NASA 946 Roger, going ahead with the weather check.

COMTECH Roger, we're standing by.

NASA 946 Okay there's a low scattered layer bottoms 8 tops 9,000 feet and it's less than 2/10. There was an intermediate layer less than 2/10 at 20,000 feet scattered. There is a layer right now that starts at 30,000 feet.....

END OF TAPE

NASA 946 Okay, there's a low scattered layer bottoms 8 tops 9,000 feet and it's less than .2. There was an intermediate layer less than .2 at 20,000 feet scattered. There's a layer right now that's starts at 30,000 feet goes to 35,000 feet, it's overcast but you can see through it and it's going to blow out of here and be clear because it's over in the west it's clear.

CAPCOM Roger.

NASA 946 And the winds are right now at the surface 24010 gusts of 15 at 7, 270 at 25, at 20 255, at 56, at 30 255, at 92, at 35 252, at 97, at 370, 270, and 90. So that means, Joe oughta turn the inside of the HAC of course.

CAPCOM Okay, we copy that, John.

NASA 946 The only thing the only weather around here that looks bad is over the mountains in the valley and if that keeps dissipating why it'll be okay.

CAPCOM Okay, and we'll pool the room and see if there are any other questions off of that.

NASA 946 It could be bad. We have to keep an eye on that all day, I think.

CAPCOM Roger, John, we'd appreciate you shooting an approach to runway 15 and giving us an evaluation on the crosswind conditions now.

NASA 946 Okay, we're going to do that right now.

CAPCOM Okay, and we're in a eighteen minute LOS period so you should feel free to give us a call back whenever.

NASA 946 Okay Sir. Okay, we're going to keep an eye on this weather. We'll be up here for a couple of hours and then fly the other airplane for a couple of hours and should keep an eye on it. The only the only possible problem we could have would be if this low cloud deck on the other side of the valley blows in here. Because it's got 8 to 9,000 deck but over in the valley it's broken.

CAPCOM Okay, we understand that, John, and we'll be interested in the trends.

NASA 946 I think what happens is blows cross the hill and dissipate just like we know it's always done for many years out here.

CAPCOM Okay. And John, since you will be airborne at the time we'll have another LOS period at around 09:10 your time and

we'll initiate that call to you, to see what the status is then.

NASA 946 Roger, that.

PAO This is Shuttle Control. That was the astronaut John Young airborne in the Shuttle training aircraft in the Edwards Air Force Base area providing a weather report for that area.

CAPCOM 946, Houston over

PAO This is Shuttle Control at 2 days 1 hour 13 minutes. We're standing by for acquisition through Buckhorn.

CAPCOM Columbia, Houston through Buckhorn now. We'll be with you for 18 and 1/2 minutes.

SPACECRAFT Ok, Houston, we're reading you loud and clear and we're working through the timeline on page 3-23.

CAPCOM Roger, 3-23, I do have a pen and ink note for you at the bottom of that page if I can pass it to you.

SPACECRAFT Please do, go ahead.

CAPCOM Okay, you might even be able to just do it real time. It's on panel L1, it's av bay reconfig. We'd like av bay fan 2, fan A off and fan B on and in av bay 3 we'd like fan A on and B off, over.

SPACECRAFT Roger, Rick, that is accomplished.

CAPCOM Okay, and we do not see any other pen and inks until we get over to the bottom of 3-27, there is a new attitude that we'll pass to you sometime during this pass.

SPACECRAFT Do you have it now?

CAPCOM Roger

SPACECRAFT Break, Break Rick, is that 3182,1011 and 2980?

CAPCOM You've got it. That's good.

SPACECRAFT Okay, thank you.

CAPCOM And Columbia, Houston, there are some additional powerdown items we'd like to call your attention to in the orbit pocket checklist sometime during this pass.

SPACECRAFT Standby just a second. Okay, Rick, go ahead.

CAPCOM Okay, I'll refer you to page 10-10 and when you're there let me know.

SPACECRAFT Okay, go ahead.

CAPCOM Okay, on the bottom of the page, steps 6 through 17 we have virtually accomplished the majority of those. The only item I'll call your attention to there is step 8 we are still trying to use only two CRT's with the third one in standby. You are cleared you have a go to use both instrument powers, DDU's, and flight controller powers whenever required. The remainder of that page has already been done or will be picked up in your entry switch list verification so you can ignore the rest of it. I'd like you to flip to page 10-11 now.

SPACECRAFT Okay, go ahead.

CAPCOM Okay, we'd like to insure that the step 24 which is a pen and ink to call you your attention to doing your DFI equipment config is noted in your PDP and we'd also like you to make the pen and inks to the entry check list listed as steps 25 and 26.

SPACECRAFT Okay, understand the 25 and 26, I'm not sure I understand what you said about step 24?

CAPCOM Okay, step 24, when you get as you see right above that when you get over to page 3-35 in the PDP in that preingress config in the bubble that reference is wrong, it should be bubble 2. We would like you at that point to come back to this page 11-12 and set up you DFI equipment as indicated on page 11-12.

SPACECRAFT Rick, you cut totally out must have been a handover right in the middle. I'm locking at page 3- well tell me the page again in the PDP.

CAPCOM Okay, 3-35, Richard, do you read me now?

SPACECRAFT Yes, sir. Loud and clear and I'm looking at 3-35.

CAPCOM Okay, under the DFI ACIP heater step on the right center

SPACECRAFT Okay, I've got it.

CAPCOM Underneath OEX power if you'll add in

END OF TAPE

SPACECRAFT Clear, and I'm looking at 3-35.

CAPCOM Okay, under the DFI ACIP heater step on the right center.

SPACECRAFT Okay, I've got it.

CAPCOM Underneath OEX power if you'll add a note to perform the DFI equipment config for entry critical data and the reference is page 11-12 of the orbit pocket checklist.

SPACECRAFT Roger, Rick I've got that working on that.

CAPCOM Okay, you'll find the pen and inks to the entry checklist, listed on the orbit pocket 10-11 has a wrong page reference but if you do that at TIG-5 you won't go wrong.

SPACECRAFT Okay, thank you.

CAPCOM Okay that complete from us, we'll be with you for 13 more minutes.

SPACECRAFT Okay super.

SPACECRAFT Okay.

CAPCOM Columbia Houston, we've got a state vector to come up to you.

CAPCOM Columbia Houston, a question on a switch on panel F1.

SPACECRAFT Okay go ahead Rick.

CAPCOM Okay Richard, in our bookkeeping to make sure that a previous message had asked you to turn off the DC utility power main B you may or may not of gotten to that message, but we now would like to have that on and leave it on and we'll, those of course drive your DAC cameras for landing and we feel we can afford that power usage.

SPACECRAFT Okay, thank you Rick.

CAPCOM Columbia Houston, we do have a state vector to send up to you.

SPACECRAFT Okay sir, shoot her on up Rick.

CAPCOM On the way.

CAPCOM Your new state vector is onboard.

SPACECRAFT Thank you sir

SPACECRAFT Houston, PLT

CAPCOM Go ahead, two more minutes, over.

SPACECRAFT Roger Rick, I'm afraid I'm going to have to recommend that we don't get these Theodolite measurements, it's not a matter of time but the, just there's a little jiggle in the instrument, or at least in the mounting bracket that was not in it as I recall when we did this test down at the Cape, but for whatever reason there's a jiggle that accurate measurements that just can't be, you can make one measurement that the (garble) knock it off you know, I think that they probably would be invalid and since we are just about even on the timeline, I would recommend that we scrub the Theodolite and talk about it for the next flight.

CAPCOM Okay, we concur with that recommendation, press on.

SPACECRAFT Thank you Rick, and I'm sorry about that.

CAPCOM No problem.

CAPCOM We're one minute from LOS, our next contact will be at Dakar in five minutes.

SPACECRAFT Alright Rick, we'll see you there.

PAO This is Shuttle Control, Columbia is beyond Bermuda's range now. Next station is Dakar in four and a half minutes. Pilot Dick Truly doing this, the end of this pass recommending that we scrub the Theodolite measurements, that the satellite mounting bracket is not stable enough to get accurate measurements. Flight Director Don Puddy concurred and that operation has been terminated. At two days one hour 33 minutes, mission elapsed time this is Shuttle Control Houston.

PAO This is Shuttle Control at two days one hour 56 minutes, mission elapsed time. Columbia almost within range of Dakar.

CAPCOM Columbia this is Houston, through Dakar, for seven minutes, over.

SPACECRAFT Roger, and the port door is closed and latched.

CAPCOM Okay, that's good to hear.

CAPCOM Columbia Houston, we have a request on the OMS to RCS interconnect, over.

SPACECRAFT Just a second Houston.

SPACECRAFT How long do we have in this pass Rick?

CAPCOM We have five minutes and this is deferable.

SPACECRAFT Okay, the starboard door is coming closed and I want to at least get it close and stop it and get things off.

CAPCOM Okay, that sounds good Richard.

SPACECRAFT Okay Rick, the starboard door is in the proximity to the closed position and while we got AOS why don't I just tell you where it is? Okay?

CAPCOM That sounds good.

SPACECRAFT From my vantage point it looks like both doors are perfectly straight, and I can't really pick a latch that's going to come closest to hitting first, possibly these up here in the forward number two, or maybe three.

CAPCOM Okay, we copy that.

SPACECRAFT Chart on page 5-24 is that the latches are in a, you should put a mark on the bottom scale at the 2.0 inches, is where I would say they're going to hit.

CAPCOM Okay.

END OF TAPE

SPACECRAFT ...is that the latches are going to you should put a mark on the bottom scale at the 2.0 inches is where I would say they are going to hit.

CAPCOM Okay we've got that Richard.

SPACECRAFT Okay with that why don't you go ahead and talk to us about the OMS RCS.

CAPCOM Okay it's purely a matter of conservation of aft RCS fuel. We'd like to at this time interconnect from the right OMS to both RCS. Over.

SPACECRAFT Okay. Right OMS to RCS. Standby. Rick one minor thing our old crossfeed to bravo on the left OMS the switch is in GPC but we both know it's closed and so I'm going to keep pressing per the checklist.

CAPCOM Roger we understand and concur.

CAPCOM And, from what you described on the payload bay doors that looks just super.

CAPCOM We're 30 seconds from LOS. Richard as we go over the hill, on an SM machine when you have a chance an item 48 will get rid of a cam light bit that is set so that it will not declare against CRT 3 before the DPS config. We'll see you next at Botswana in 10 minutes.

PAO This is Shuttle Control. Columbia out of range at Dakar. Next station Botswana 10 1/2 minutes. Report during this pass that the port payload bay door was closed, starboard door almost closed. Neither door latched yet. Dick Truly taking sightings as these doors were closing. Visual observation of where it looked like the latches might strike. The here on the ground the engineers are pleased with the reports that he gave them on the payload bay door closing. At 2 days 1 hour 45 minutes Mission Elapsed Time, this is Shuttle Control.

PAO This is Shuttle Control at 2 days 1 hour 54 minutes Mission Elapsed Time. Botswana is about to acquire Columbia.

CAPCOM Columbia, Houston through Botswana 3 1/2 minutes. Over.

SPACECRAFT Okay Houston. We read you loud and clear. The doors are closed and we're into the bubbles one and two on page 3-27.

CAPCOM Roger, we copy that. See you guys are ahead of the timeline that's super.

CAPCOM Columbia, Houston. As went over the hill at Dakar, perhaps you didn't hear me, in the freeze dry machine there is a vote fail, fail vote flag set so, prior to the DPS reconfig, an Item 48 on the SM machine will clear that. Over.

SPACECRAFT Okay Rick. Thank you much. And that's been done Rick.

CAPCOM Roger.

CAPCOM Columbia, Houston. I'm looking ahead in the PDP, we see no more pen and inks until you get to page 3-32 and I believe you probably have already made those to the IMU star align pads.

SPACECRAFT Yes sir that's correct Rick. Thank you very much for the reminder.

CAPCOM Roger.

CAPCOM Columbia, Houston. We're 1 minute from LOS our next contact at Yarragadee in 14 minutes.

SPACECRAFT Okay sir we'll see you there.

CAPCOM Roger.

PAO This is Shuttle Control. Columbia out of range at Botswana. Next station Yarragadee in 12 1/2 minutes. About that time Columbia's crewmen will start donning the pressure suits they will wear during entry. Reported during this pass that payload bay doors are closed and latched. At 2 days 1 hour 59 minutes Mission Elapsed Time, this is Shuttle Control Houston.

NASA 946 Houston, NASA 946 over.

CAPCOM NASA 946 loud and clear. Go ahead John.

NASA 946 Okay the 8 to 10,000 foot deck gets to about Rosemont and then dissipates. It's coming over the hill there. That would be the only one I would worry about. There's an upper deck here but it's in and out and it's very ten garbled.

END OF TAPE

NASA 946 ....that would be the only one I would worry about. There's an upper deck here, but it's in and out and is very tenuous. I'd say it's scattered. The upper deck from 30,000 to 35,000 is very thin. But, the main thing that I think that you should pass to Joe Henry is with those winds he ought to be flying the HAC manually to stay inside the turning circle and you know we got some winds here at 10,000 there 260 at 40. 25,000 at 250 at 85. So, if he's not if he's not inside the HAC that will keep him the automatic system just won't do that he'll have to do it.

CAPCOM Okay we understand that John. Let me make sure I understand what you said on the lower deck. You're saying that that lower 8 to 10,000 foot deck is dissipating at Rosemond so, it's bordering on that part of the lakebed now is that correct?

NASA 946 Yeah, I don't think it will be a problem, but we'll keep an eye on it.

CAPCOM Okay. Any problem at all going into 23?

NASA 946 No problem at all at 23 or 15. The wind in 15 has been running from the tower the last run was 240 at 12 and they're both okay.

CAPCOM Okay the question I guess John is any problems anticipated with an auto flight around the HAC at 23?

NASA 946 Yeah, the wind is blowing it'll blow you outside the HAC you know. Put you into the 2g limit. One way or the other.

CAPCOM Okay we just wanted to verify that that comment applied to both 23 and 15. Do you have any comments on your crosswind approach to 15?

NASA 946 Well that's pretty standard crosswind. It is that wind is blowing so hard crosswind near the surface so that well Joe Henry knows how to do that.

CAPCOM We're interested in the gust levels also John as to whether you see any problems with those.

NASA 946 No gusts.

CAPCOM No gusts. Understand. We understand then that you think it is presently acceptable for a crosswind landing at 15 is that correct?

NASA 946 We'll keep watching it. They predicted the winds are supposed to die off.

CAPCOM Okay we'll be interested in an update on that

later. Thank you very much.

CAPCOM NASA 946 from Houston over.

NASA 946 Go ahead.

CAPCOM Okay if you could give me an idea of what your plan is now for I understand you'll probably be landing the STA shortly and can we expect a report from you at about 11:05 local what are you flying a T-38 is that correct?

NASA 946 I'll be flying another G2 and give you another report at 11:05 local.

CAPCOM Okay thank you John.

PAO This is Shuttle Control. That was John Young again reporting Edwards Air Force Base weather. Astronaut Young is in the Shuttle Training Aircraft making approaches to both runways 23 and 15 at Edwards. He did recommend that Joe Engle fly the big sweeping turn around the heading alignments circle, HAC he referred to manually rather than automatic as had been programmed. The winds are strong enough that the automatic mode might exceed the g loads. That we're looking for. John Young will give another weather report from the STA in about 2 hours. 2 days 2 hours 7 minutes this is Shuttle Control.

PAO This is Shuttle Control at 2 days 2 hours 11 minutes Mission Elapsed Time. Yarragadee will acquire Columbia in about 30 seconds.

CAPCOM Columbia, Houston through Yarragadee for 7 minutes over.

SPACECRAFT Roger Houston. Read you loud and clear Rick and Rick I got one item for you on bubble one on page 3-27.

CAPCOM Roger we're there.

SPACECRAFT Okay Rick. Just at the 4 minute point, in reconfiguring the radiator controllers the loop 1 bypass did go back to did return to 1 bypass and I took I took them both their in bypass now and they were configured as per the bottom of bubble one and I just wanted to let you know that.

CAPCOM Okay we've got that Joe. Appreciate that.

CAPCOM Columbia, Houston. I have one verification would you verify that that was loop 1 and loop number 1 that bypassed.

SPACECRAFT That's correct Rick. That was loop 1.

CAPCOM Okay Joe that is not a suprise to us and of course we'll be looking forward to the second half of the test.

SPACECRAFT Okay. You bet you. And it happened just about at the end of the 4 minute wait Rick.

CAPCOM Okay. Good enough. We've got 5 1/2 more minutes in this pass and we see you'll be getting into your suits here.

SPACECRAFT Roger. We're starting that right now.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead.

SPACECRAFT Rick confirm. We did say that was loop 1 that returned to bypass is that correct?

CAPCOM That's affirm. We copied that.

SPACECRAFT Okay.

CAPCOM Columbia, Houston. Two minutes.

END OF TAPE

CAPCOM Columbia Houston, two minutes to go in this pass. One question we are generating any additonal changes that we're coming up with through the entry switch list verification, and just as a note of interest, we're wondering if you had already entered the message changes into your entry switch list verifications.

CAPCOM And if your busy getting into the suits don't bother answering.

SPACECRAFT I havn't done anthing about physically changing the books.

CAPCOM Okay good enough. We've got a variety of deltas to that, we'll have that all organized for you with plenty of time to go on that.

SPACECRAFT Okay.

CAPCOM Columbia Houston, 40 seconds LOS we'll be coming up at Dakar in about one minute, and we will not neccessarily expect a response from you, Correction at Orroral Valley, a response from you there because of your suit donning.

SPACECRAFT Okay thank you Rick, and we're in the process of doing that right now.

CAPCOM Roger

CAPCOM Columbia Houston, talking to you through Orroral, two and a half minutes.

SPACECRAFT Okay, we copy.

SPACECRAFT And your right Pick, we are suiting up and we'll be with you as soon as we can.

CAPCOM No problem, we have nothing to pass until at least Hawaii at least as of this time.

SPACECRAFT Okay, we'll try and be ready for you there Rick, and thank you.

CAPCOM Roger.

CAPCOM Well, I spoke to soon, when you have a chance if someone upstairs, DFI PCM recorder to hi sample, over.

SPACECRAFT Okay Rick I'll get right up there and get it.

CAPCOM Thank you.

CAPCOM Columbia Houston, 15 seconds to LOS see you next at Hawaii in 15 minutes and we do not have anything pressing for you in Hawaii.

SPACECRAFT Okay Rick, mighty fine, we'll try and be back on the Comtech here and meet you back up there at Hawaii.

CAPCOM Okay.

PAO This is Shuttle Control, Columbia out of range of Orroral, next station Hawaii in 14 minutes. At two days two hours 23 minutes mission elapsed time, this is Shuttle Control.

PAO This is Shuttle Control at two days two hours 36 minutes mission elapsed time. Columbia doing acquistion through the Hawaii station, we don't intend to give them a call at this station, we believe they'll be busy suiting up, and we'll stand by for their call if they want to talk to us, but we won't disturb them at the Hawaii station. We'll stand by.

CAPCOM Columbia Houston, we're 50 seconds from LOS, Hawaii, no acknowledgment required, we'll see you next over the states in two and a half minutes.

PAO This is Shuttle Control we've went through the Hawaii pass without talking to the crew while they're busy getting into their pressure suits. Buckhorn will acquire in two minutes, for a pass over the Continental United States, we'll stand by for that.

SPACECRAFT Houston Columbia, do you read?

CAPCOM Got you loud and clear Richard, 11 and a half minutes to go in the pass.

SPACECRAFT Houston Columbia, if you answered you were garbled and unreadable.

CAPCOM How do you read me now?

SPACECRAFT Try one more time Rick

CAPCOM Okay one more time (simo) if this doesn't work I'll come up single.

SPACECRAFT Okay, sounds good.

CAPCOM Okay, we've got 11 minutes to go in the pass, we do have a few notes for you at your convienence.

SPACECRAFT Okay, just one second.

SPACECRAFT Okay Rick, please go ahead.

CAPCOM Okay Richard, we have got your preliminary del pad and a portion of the target pad that you were interested in, and also the OMS propellant pad, over.

SPACECRAFT I'll tell you what Rick, please save those pads for the next site unless you need to get them, is there anything else you need to get from us?

CAPCOM No Richard, just a reminder that we do have the entry switch list modifications, we'll be prepared to give to you and that certainly does not have to be at this AOS.

SPACECRAFT Okay, and when do we come AOS again, how long do we have LOS?

CAPCOM In between Bermuda and

END OF TAPE

CAPCOM ...No, Richard. Just a reminder that we do have the entry switch list and modifications we'll be prepared to give to you and that certainly does not have to be at this AOS.

SPACECRAFT Okay and when do we come AOS again. How long do we have LOS?

CAPCOM Inbetween Bermuda and Dakar after we lose you in 10 minutes there'll be about a 4 minute 3 minute LOS period till we pick you up at Dakar.

SPACECRAFT Okay Rick we'll be there. See you there.

CAPCOM Good enough.

CAPCOM Columbia, Houston. 6 1/2 minutes to go in the pass. We would be interested in the rad heat sink DTO AOS...

SPACECRAFT Roger Rick we'll get that and then we'll settle down and talk to you.

CAPCOM Okay good enough.

SPACECRAFT Houston, PLT.

CAPCOM Go ahead.

SPACECRAFT Roger Rick. Joe's doing the rad heat sink why don't you read me that pads real quick and I'll copy them.

CAPCOM Okay the Del pad follows 138, 355, 013, 140, - 002, 313.4, 255, 200, 140 140, 81, 61, dump to oxidizer 00, 1095.1, + 0.1, 202, 195, 035, 3 bank right 000, EI - 07, EI - 01, 30.11, 05, 45, 44, 203, 04 left turn Edwards runway 15, with a crosswind at DTO. I'll pass the target when you're ready.

SPACECRAFT Okay standby just a second. Okay Rick I'm ready to copy.

CAPCOM Roger Item 10 TIG will be 002/05, 13, 15.0, 15905, C2 is - 0.6387, HT is 65.832, 110.863, + 6684 over.

SPACECRAFT Okay. And would you like a read back.

CAPCOM Okay let me give you the OMS propellant pad left is 10 percent and right is 19, that's 19 percent and a reminder that you should use the fuel quantities as cues. The fuel quantity lag should catch up after about 70 seconds over.

SPACECRAFT Okay I've got that Rick.

CAPCOM Okay we've got about 2 minutes. Why don't you go

ahead and readback.

SPACECRAFT Okay real quick on the Del pad 138, 355, 013, 140, - 002., 313.4, 255 200, 140, 140, 81, 61 oxizider equals 0., 1095.1, - 0.1, 202, 195, 035,000, 07, 01, 3011, 05, 45, 44, 20, 30, 4 left turn runway 15, and we'll get the crosswind.

CAPCOM That's affirm and one correction bottom left hand side the Y,CG is a positive 0.1.

SPACECRAFT A ha. I had written that down and read it wrong.

CAPCOM Okay go ahead we got about a minute left.

SPACECRAFT Okay maneuver pad. TIG is 002, 05, 13, 15, 15905, - 06387, 65.832, 110.863, way stands we have a propellant that's positive 6683. Pardon me 6684.

CAPCOM Okay those are good readbacks and the prop pad cue.

SPACECRAFT Okay 10 percent left and 19 percent right and use the fuel.

CAPCOM Okay that's good. 4 seconds LOS you have a go for the OPS 3 transition. We'll see you at Dakar in 4 minutes.

SPACECRAFT Okay Rick. See you later.

PAO This is Shuttle Control. Columbia is out of range of Bermuda. Next station Dakar in 3 1/2 minutes. CAPCOM Rick Hauck passed up the information on the deorbit burn just then. The time of that ignition has not changed, the values of the Delta V values and the duration of the burn have changed slightly. We're two hours 5 minutes and 30 seconds away from that deorbit maneuver which will occur over the Indian Ocean at a Mission Elapsed Time of 2 days 5 hours 13.....

END OF TAPE

PAO The time of that ignition has not changed the values of the the delta V values and the duration of the burn have changed slightly. We're 2 hours 5 minutes and 30 seconds away from that deorbit maneuver which will occur over the Indian Ocean at a mission elapsed time of 2 days 5 hours 13 minutes 15 seconds. Change in velocity will be 313.4 feet per second. It's a retrograde maneuver. Sloving down by that much. The duration of the burn 2 minutes 55 seconds and its targeted to produce a orbit with a perigee of 141 nautical miles, an apogee of 141 nautical miles and a perigee of -2 nautical miles. Following that, we expect entry interface at a mission elapsed time of 2 days 5 hours 40 minutes 37 seconds. Communications blackout will begin at 2 days 5 hours 43 minutes 23 seconds and the blackout will end at 2 days 5 hours 59 minutes 36 seconds with the landing projected at 2 days 6 hours 12 minutes 43 seconds. We're about a minute and 1/2 away from acquistion at Dakar. We'll standby for that pass.

CAPCOM Columbia, Houston, through Dakar, we're with you through Dakar and Ascension for 11 minutes and just one reminder when you're through with the rad heat sink DTO the DFI recorder of PCM is a high sample, over.

CAPCOM Columbia, Houston, through Dakar, over.

SPACECRAFT Roger, Houston, read you loud and clear and we're just starting to maneuver.

CAPCOM Okay, we copy that and I don't know if you heard me. Since we're in no data at this site a reminder that after the rad heat sink DTO is complete the DFI recorder PCM the high sample.

SPACECRAFT Yes sir, thank you for the reminder, Rick, the rad heat sink is complete and we are in high sample.

CAPCOM Roger, and from that report can we assume that that worked out alright?

SPACECRAFT You sure can.

CAPCOM Okay. Okay, Joe, we'll, of course, be planning on using the rads during the entry then.

SPACECRAFT Okay, sounds good.

CAPCOM And Columbia, Houston, I do have a list of four teleprinter messages that do have pen and inks to your publications that we think you probably want to complete prior to the entry and we'll be glad to read that list to you when you're ready.

SPACECRAFT Go ahead, I'm ready to copy.

CAPCOM Okay, that's message 21 alpha which has a few entry pocket checklist changes. Message 29 echo which has entry switch list checks changes. Message 30 alpha which has both entry and entry pocket changes and I think from what our communications have given us you probably done message 34 which has the deorbit PDP changes, over.

SPACECRAFT Okay, it's 21 alpha, 29 echo, 30 alpha and 34.

CAPCOM That's affirm, Richard. Columbia, Houston, a note on panel A12 switch, over.

SPACECRAFT Okay, go ahead, Rick.

CAPCOM Roger, on the bottom line of the hydraulic heater aft fuselage B switch to off O F F, over.

SPACECRAFT Okay, I guess I missed that one switch, thanks for catching it.

CAPCOM Roger, and we've got targets and vectors to come up to you when you're ready. Three minutes to [illegible]n this pass.

SPACECRAFT Why don't you send them up, Rick.

CAPCOM On the way.

END OF TAPE

SPACECRAFT Okay I guess I must of missed that one switch, thanks for catching it.

CAPCOM Roger and we got targets and vectors to come up to you when your ready, three minutes to go in this pass.

SPACECRAFT Well why don't you send them up Rick.

CAPCOM On the way.

CAPCOM Columbia Houston, the state vector and targets are on board.

SPACECRAFT Okay Rick thank you.

CAPCOM Columbia Houston, one minute to LOS, next contact at Botswana in five minutes.

SPACECRAFT Okay understand, and the IMU alignment's in progress Rick.

CAPCOM Roger.

PAO This is Shuttle Control, loss of signal through Ascension Island now, next station is Botswana in three and a half minutes. At two days three hours 22 minutes mission elapsed time tnis is Shuttle Control Houston.

CAPCOM Columbia Houston, through Botswana for just under seven minutes, over.

SPACECRAFT Okay Rick, loud and clear, we gotten a good alignment and we're going to the verifications.

CAPCOM Okay, I copy that and a reminder that we do have some changes to that entry switch list verification and also some switches to voice up to you on that, and we'll pass that to you probably best either here or at Yarragadee maybe even Quam, over.

CAPCOM Correction, only opportunities probably would be Botswana here and Yarragadee.

SPACECRAFT Houston PLT, do you read?

CAPCOM Loud and clear Richard.

SPACECRAFT Okay, would you, first of all let me ask you a question. Are there any middeck switches that are not as printed in the pictorals?

CAPCOM The answer is negative.

SPACECRAFT Thank you, then I'll do the middeck switch verification just as it's printed. During this pass if you could point out to me any switches that need to be in a different configuration that you know that are out of configuration I'll sure try to get them out.

CAPCOM We had no data here at Botswana if you're looking for us to look at the data, over.

SPACECRAFT Negative not data, the changes to the switch list.

CAPCOM Okay Richard, if I understand you correctly I can refer you to message number 29 echo and we do have some deletions off of that list.

SPACECRAFT Well what bothers me is that one of our long messages that had several come up with it had about two or three feet of garbage which I thought that I reported, but I'm not sure that it came aboard, I can not find it in my, you know in the place that I'm keeping the messages now.

CAPCOM Okay, I understand you do not have 29 echo on board, I don't think that's a real problem we can read you the changes.

SPACECRAFT Okay, I think that's the best line of attack so go ahead.

CAPCOM Okay, it probably be best if you had your switch verification list out in section five, and we'll work from that, over.

SPACECRAFT Okay standby.

SPACECRAFT Okay Rick, go ahead with the A.

CAPCOM Okay page 5-3 panel L1 the deltas are, the Flash Evap Controller Power, primary A should be off, primary bravo should be on, Cabin Fan alpha should be ON, bravo, OFF, the AV bays we just configured shortly ago basically two Cabin Fans, correction AV Bay Fan and two A is OFF, bravo ON and in AV Bay three A is ON and bravo is OFF, break.

SPACECRAFT Okay got all that

END OF TAPE

CAPCOM Bravo, OFF. The av bays we just configured shortly ago. Basically, two cabin fans correction av bay fan in 2A is off bravo on and in av bay 3A is O N and bravo is O F F break.

SPACECRAFT Okay, got all that, thank you.

CAPCOM Okay, next one is on page 5-11, five dash eleven.

SPACECRAFT Okay, Rick, go ahead.

CAPCOM Alright, panel 08 the left OMS crossfeed bravo should be in GPC talkback close, over.

SPACECRAFT Go ahead.

CAPCOM Page 5-13.

SPACECRAFT Okay. Go ahead.

CAPCOM Ok, the cryo heater configuration is 02 tank 1 heater alpha tank 0 is off O F F as should be tank 2 heater bravo and also H2 tank 1 heater alpha should be O F F and H2 tank 2 heater bravo O F F , over.

SPACECRAFT Ok, I have all of those, Rick, go ahead.

CAPCOM Roger, There are a variety of switches on panel R1 having to do with fuel cell 1 that is shut down. I will not bother you with those switch changes, over.

CAPCOM Next one, page 5-16, over.

SPACECRAFT Okay, go ahead.

CAPCOM Roger, on R11, at the top of R11 the DFI freon pump select should be off O F F and a verification on the IECM position 2 that's T W O. Then on row echo DFI wideband mission power should be off O F F and then on row foxtrot circuit breaker DFI wideband ascent equipment main charlie should be open and the recorder main charlie should be open, break.

SPACECRAFT Okay, can I open those now?

CAPCOM Yes, that's affirmative. Row golf DFI TCM pressure transducers should be off O F F.

SPACECRAFT Roger, and it is.

CAPCOM Okay, on R12, supply water tank alpha inlet talkback should be closed and bravo inlet should be closed and bravo outlet should be closed, over.

SPACECRAFT Roger, they are.

CAPCOM Okay, on page 5-17.

SPACECRAFT Go ahead.

CAPCOM Okay, Richard, 10 seconds LOS will pick up a very few remaining ones at Yarragadee in about 12 minutes.

SPACECRAFT Thanks alot Rick, we'll be there. Appreciate your helping us, I think that's a lot more efficient.

CAPCOM Roger.

PAO This is Shuttle Control. Botswana has lost the signal. Next station Yarragadee in 12 and 1/2 minutes. At 2 days 3 hours 33 minutes mission elapsed time. This is Shuttle Control Houston.

PAO This is Shuttle Control. The video on the monitors in the news center is from a helicopter at Edwards Air Force Base.

PAO This is Shuttle Control at 2 days 3 hours 45 minutes mission elapsed time. Columbia is coming up within range at Yarragadee now.

CAPCOM Columbia, Houston, through Yarragadee will be with you for 7 and 1/2 minutes, over.

SPACECRAFT Okay, Rick, reading you loud and clear and we're marching along through the checklist here.

CAPCOM Okay, good enough, I do have only three more switch items for you in that entry switchlist verification if you want to do that now.

SPACECRAFT What pages are they? Just start....

CAPCOM Roger, page 5-17, over.

CAPCOM I may have cut you out, that's page 5-17.

SPACECRAFT Standby.

END OF TAPE

CAPCOM ...verification if you want to do that now.

SPACECRAFT What pages are they?

CAPCOM Roger. Page 5-17 over.

CAPCOM I may have cut you out that's page 5-17.

SPACECRAFT Standby. Okay go ahead.

CAPCOM Roger on R15 Road Delta all circuit breakers should be open and row Echo the starboard and port RMS tv circuit breakers 6 of them should all be open over.

SPACECRAFT Okay. copy that row Echo all open and the starboard and port RMS tv circuit breakers 6 of them all open.

CAPCOM Okay that's not quite correct. R15 row Delta should all be open and then the RMS was correct over.

SPACECRAFT All right. garbled Delta is all open and all 6 RMS tv circuit breakers open. Thank you.

CAPCOM Okay. Last one is page 5-21 on Panel Alpha 12 over.

SPACECRAFT Okay go ahead.

CAPCOM Hydraulic circ pump power 2 should be the main Charlie over.

SPACECRAFT Okay. It is there hydraulic circ pump 2 is to main Charlie.

CAPCOM Okay Joe that completes the Deltas to that switchlist. We'll be getting a weather report from John in the STA after this pass at Yarragadee and we'll be passing it to you at Hawaii.

SPACECRAFT Good. Thank you Rick.

CAPCOM Columbia, Houston. On the MPS prevalves they will be open for entry. Over.

SPACECRAFT Okay I understand open all prevalves for the entry. Is that right?

CAPCOM That's correct.

SPACECRAFT And Rick could we confirm that 6 switches LO2 and LH2?

CAPCOM I'll confirm that late.

SPACECRAFT Okay.

CAPCOM That is correct all 6 all 6 prevalves.

SPACECRAFT Okay. All of them open. Thank you Rick.

CAPCOM Columbia, Houston. One minute to LOS. Our next contact is in Hawaii in just under 20 minutes.

SPACECRAFT Okay Rick we'll see you there and we'll be ready to talk to you about the weather.

CAPCOM Roger.

PAO This is Shuttle Control. Columbia out of range at Yarragadee. Hawaii is next in 18 minutes. At Edwards Air Force Base the convoy is getting organized. We'll be standing by for landing there. We're 1 hour 18 minutes 56 seconds away from the deorbit burn. At 2 days 3 hours 54 minutes Mission Elapsed Time this is Shuttle Control Houston.

CAPCOM NASA 946 this is Houston standing by for your weather report over.

NASA 947 Roger. This is NASA 947 now. The weather is there is no lower decks of clouds. The upper deck is just starts at 30,000 and goes to about 33,000. It's scattered to broken and you can see through it. I estimate the percent at less than 60 you can see the aim points of the you can see your ground track off the off the 270 180 and 90 degree positions and the aim points are visible all the way down. The winds are right now the surface winds are about 220 at 12 up to 12 to 14 knots. The 7,000 foot winds are 265 at 30.240 at 20,000.240 at 50. At 30,000 270 at 75 knots and at 35,000 270 at 90 knots at 37,000 270 at 88 knots. So the situation of the controls fixture and around the heading alignment circle is to stay on the inside of the heading alignment circle still exists. The crosswind is within limits and the tuburlence is slight. Over.

CAPCOM Okay we copied all of that John. Our present targeting is to runway 15 for the crosswind and we appreciate that thorough weather report. We'll canvas through them and see if there are any more questions.

NASA 947 Okay we're going to keep an eye on this wind it's up and down and it might force us an increase .....a great deal more to go back to 23.

CAPCOM Roger understand you were referring to the surface wind is that correct?

CAPCOM Okay we'll be interested in your take on that as

time progresses. We have no further questions. We'll keep the loop up for about 5 more minutes in case of any developments.

NASA 947 Roger that.

END OF TAPE

CAPCOM Okay we'll be interested in your take on that as time progresses.

CAPCOM We have no further questions, we'll keep the loop up for about five more minutes in case any develope.

NASA 947 Roger that.

CAPCOM Columbia Houston, could you give us an idea of your fuel endurance and the implications for later weather reports, over.

NASA 947 Houston, 947 we're going to stay up here till after Columbia has landed.

CAPCOM Roger 947, thank you.

CAPCOM 947 this is Houston, we would be interested in one more approach to the designated runway in about four zero minutes, 40 to 50 minutes, that would be in between our Bermuda and Ascension AOS times and we'll give you a call for the update on the cross wind of the evaluation.

947 Okay, we'll do it.

CAPCOM Thank you.

PAO This is Shuttle Control at two days four hours 11 minutes mission elapsed time. Hawaii will have acquistion of Columbia in about 15 seconds.

CAPCOM Columbia Houston, we're with you through Hawaii for six and a half minutes. We see you in OPS 3 and everything looks fine. Anything for us, over.

SPACECRAFT (garble) Yes Rick, just a second I got a question on this powerdown procedure.

CAPCOM Go ahead. And Configure AOS, over.

CAPCOM We have TMU's to send up to you while we're talking.

CAPCOM Columbia Houston, go ahead.

SPACECRAFT Houston, stand by just a second Rick.

SPACECRAFT And Houston, Rick I got a question on the powerdown procedures and the orbit pocket on page 11-12.

CAPCOM Roger, wait one.

CAPCOM Go ahead. Go ahead.

CAPCOM Columbia Houston, go ahead.

SPACECRAFT Okay Rick on step, I've completed down through step 6 and step 7 says to wait for MCC instructions, and I'm waiting for your go to press on with that and then to rewind the recorder.

SPACECRAFT And Houston Columbia, what did you say again Rick, you were a little (garble) on that one.

CAPCOM Roger, complete the rewind procedure and then we'd like to make sure that, disregard, just complete the procedure.

SPACECRAFT Okay, I'll complete the procedure on page 11-12, steps 8 and 9 and then go through the rewind procedure.

CAPCOM One moment Joe, would you stop the recorder and will need to talk to you about that.

SPACECRAFT Okay Rick the recorder is stopped right now.

CAPCOM Okay, do I understand that your going through the procedure in the top half of the page, is that correct?

SPACECRAFT That's correct.

CAPCOM While we're talking about that, on 3-34 would you make sure that the MTS H2 purge prep is complete? And configured as per that level? Over.

CAPCOM We're looking specifically at the Helium ISOLs two of them left of GPC and pneumatic Helium ISOL to GPC.

SPACECRAFT Okay, stand by just a second. Okay Rick let me tell you what happened. I had done the purge prep previously, prior to you telling me to, we were going to enter with the pre-valves open and I thought that was just three switches you wanted. If you want me to reconfigure, I'll come up here and say again the switches.

CAPCOM Okay Richard, if you'll just do the switches as listed on page 3-34 R2 and R4 panels that should do it.

SPACECRAFT Okay Rick, and Rick I see what happened on page 11-12, and I'll back out of this procedure and walk down to the entry criticals.

CAPCOM We believe that the entry switch verification should of set you up for the entry critical Joe.

END OF TAPE

SPACECRAFT ...Okay Rick. And Rick I see what happened on page 11-12 and I'll backout of this procedure and walk out through the entry critical.

CAPCOM We believe that the entry switch verification should have set you up for the entry critical Joe. Let us get back to you on the repositioning.

SPACECRAFT Okay.

SPACECRAFT And Houston, PLT. Got to ask you question on 334 Rick.

CAPCOM Go ahead one minute.

SPACECRAFT Okay you said to complete the procedure in the bubble. Does that include inside the astrisks?

CAPCOM Negative.

SPACECRAFT Okay I have previously completed those switches on R2 and R4 which are not inside the astrisks.

CAPCOM Okay we do not see the helium isols in GPC. Would you verify they are in GPC both helium and the pneumatic.

CAPCOM Columbia, Houston. 10 seconds LOS. We'll pick you up next at Buckhorn in 3 minutes.

SPACECRAFT Okay. See you there Rick. Okay Rick a....

PAO This is Shuttle Control. Hawaii has loss of signal. Buckhorn next in just under 3 minutes. Columbia's crew has put OPS 3 into the computer. That's the landing program for the onboard general purpose computers. We'll standby for acquisition at Buckhorn.

CAPCOM Columbia, Houston through Buckhorn. We'll be with you over the states for about 18 minutes. How do you read?

SPACECRAFT Read you loud and clear Rick. And, I have back out of the top half of that page and then to the entry critical data and infact I'm finished that and I'm rewinding the PCM recorder now.

CAPCOM Okay that sounds good Joe. We presume you're using the procedure on page 3-35 at TIG-1 hour 20 minutes and verify configure to AOS.

SPACECRAFT Yes sir you're correct.

CAPCOM Okay. Should be no problem.

SPACECRAFT Okay Rick. Let's talk about the MPS on page 3-34.

CAPCOM Go ahead.

SPACECRAFT Okay I had configured per bubble 2 there ignoring the astrisks prior to you saying that we intended to fly with the prevalves open. At that time I opened the prevalves.

CAPCOM Roger.

CAPCOM Columbia, Houston. How do you read?

SPACECRAFT Houston, PLT. Loud and clear.

CAPCOM Okay Richard. Let's go ahead and close the prevalves. Over.

SPACECRAFT Okay the prevalves are closed.

CAPCOM Okay that's good. I think that completes our request on the booster side.

SPACECRAFT And Rick the PCM recorder is rewound and it looks okay.

CAPCOM Okay Joe that's fine. We'll have plenty of tape there for the entry. I do have several more items to pass to you when you have a chance.

SPACECRAFT Okay go ahead.

CAPCOM Roger. I've got the APU start plan for you. The plan is to start APU #3 pre TIG and we'd like to move that to TIG-5 vice TIG-3. Over.

SPACECRAFT Roger. Start APU 3 TIG-5.

CAPCOM Okay and then if that should not start then we try number 2 as the alternate APU. If that one is unsuccessful we'll take the APU's to start override auto shutdown inhibit and attempt to start APU 3 again and APU 2 again. If all of that is unsuccessful, we'll waive off. Over.

SPACECRAFT Roger. I'm sure that will cause some delay in TIG although I know we don't intend on that happening.

CAPCOM Roger and I've got a weather report from John from you.

SPACECRAFT Okay Go ahead. Rick.

CAPCOM Terminate fuel cell 3 purge if you can and the

weather follows. This is as of about 20 minutes ago. John reported only a high scattered variable broken deck 30,000 to 33,000. He said there was no problem seeing through it. And that the aim points were all visible. Let me give you the winds if you got your wind pad handy.

SPACECRAFT Okay go right ahead.

CAPCOM All righty. 50,000 265 at 60, 40,000 275 at 80, 30,000 260 at 90, 20,000 260 at 60, 7,000 270 at 30, surface 240 at 15 John reported seeing about 12 to 14 knotts out of 20 actually on that one Joe. Over.

SPACECRAFT Okay got it. Sounds great Rick. Sounds like we're going to get that cold front in.

CAPCOM Yes sir and we have a couple of recommendations on that. Due to the wind level, we're.....

END OF TAPE

CAPCOM Keep it at 7000 270 at 30, surface 240 at 15, John reported seeing about 12, 12 to 14 knots out of 220 actually on that one Joe, over.

SPACECRAFT Okay, got them, sounds great Rick sounds like we're going to get the cross wind in.

CAPCOM Yes sir and we have a couple of recommendations on that. Due to the wind level, were recommending CSS around the HAC and probably shading your turn inside the HAC, also we'll probably recommend delaying the speed brakes sweep to ensure that your energy remains within your nominal boundaries as we have worked before, over.

SPACECRAFT Alright Rick it sounds like a great plan.

CAPCOM Okay one more note for you, well for both of you, but Joe on your PTI entry maneuver card running this particular REV deorbit I think your going to find that the first roll reversal is going to be a little bit early and the figures are at a velocity of 20,300 and that may crowd your first integrated maneuver a little bit, but I think you can plan for it, over.

SPACECRAFT Okay, thank you for the reminder Rick

CAPCOM Columbia Houston, we got two configurations on R11 for you, over.

SPACECRAFT Okay go ahead.

CAPCOM Okay wide band mission power should be off, OFF.

SPACECRAFT Okay that's off.

CAPCOM And over on R12, the fuel cell purge heaters should go off, OFF.

SPACECRAFT Okay they're off, thank you sir.

CAPCOM Check top sun attitude, and since your in the back we'd like you to on panel Alpha 14 the RCS OMS heaters, check the forward and aft RCS jets 1 2 3 and 4 heaters to Auto, over.

SPACECRAFT Okay the forward RCS jets 1 2 3 and 4 are to Auto.

CAPCOM Okay now check the aft RCS jet 1 2 3 and 4 to Auto.

SPACECRAFT Okay they're in Auto.

CAPCOM Okay that looks good, a reminder that prior to departing the state side pass we'd like you to come out of the interconnect and configure nominally.

SPACECRAFT Roger Rick, understand.

CAPCOM And Columbia Houston, could you check all three Tacan powers to off, OFF we'll pick those up at B=15K.

SPACECRAFT Okay, all three of them going off.

CAPCOM Columbia Houston, we've got targets and vectors coming up to the prime and a back up and a IMU drift comp, over.

SPACECRAFT Okay, mighty fine, And Rick I take it that you did get the IMU data from the last alignmnet?

CAPCOM Wait one. If you could just give us the time of the alignment that's all we need.

SPACECRAFT Okay, just a second.

SPACECRAFT Okay Rick, the time was 3 plus 22 plus 47.

CAPCOM Roger, 3 plus 22 plus 47.

SPACECRAFT And I can rip those numbers off if you need them.

CAPCOM Negative, thank you very much.

SPACECRAFT Okey-doke.

CAPCOM And Joe, if you could check top sun attitude we'd appreciate it.

SPACECRAFT Okay sure will.

CAPCOM And Columbia Houston, is there someone can do a switch reconfig in panel R11, over.

SPACECRAFT Yes sir we sure can Rick go ahead.

CAPCOM Okay Joe, we've got a change of heart on two circuit breakers on row gulf, if you could take the DFI PCM recorder, correction DFI PCM forward container Mux Tango, Main Charlie circuit breaker and close it, over.

SPACECRAFT Okay that's closed.

CAPCOM And the DFI PCM FM transmitter Main Charlie to close.

SPACECRAFT Okay Rick, let's see tell me what row that's on.

SPACECRAFT That's also on gulf, FM transmitter, Main Charlie.

SPACECRAFT Yes, FM Main Transmitter Main Charlie, okay they're both closed. And Rick could you read me up the inertial tail to sun attitude? Top sun attitude please?

CAPCOM We sure will, it's one, correction 198.8, 351.7 and 4.0, over.

SPACECRAFT Got it, thank you sir.

CAPCOM Okay Joe, we got seven minutes left in the pass. We'd like to remind you that we, if possible we'd like to see you in the deorbit burn attitude while were in Ascension, that does not mean to be there as we come AOS, but if you could start the maneuver at Ascension AOS you should be there by LOS and that would satisfy that requirement, over

SPACECRAFT Okay and how far are we from Ascension Rick?

CAPCOM Roger, we'll be at Ascension in about 15 minutes.

SPACECRAFT Okay, thank you.

SPACECRAFT And Houston PLT, I'm going to let Joe maneuver to this burn attitude and then reconfigure to the RCS feed.

CAPCOM Okay no problem Richard, thank you.

END OF TAPE

CAPCOM Roger, we'll be at Ascension in about 15 minutes.

SPACECRAFT Ok, thank you. And Houston, PLT, I'm gonna let Joe maneuver to the burn attitude and then reconfigure to the RCSP.

CAPCOM Okay, no problem, Richard, thank you. Columbia, Houston, about three minutes left in this pass, we see everything's looking good and got a go to get into the seats.

SPACECRAFT Okay, thank you Rick, we'll start doing that right now.

CAPCOM I missed the last statement, say again.

SPACECRAFT Yes Sir, we'll start doing that right now and thanks a lot.

CAPCOM Roger, thank you. Columbia, Houston, one minute to LOS here over the states. Your last look at the states after this mission. In the entry phase should you get IMU transient bites they probably reflect what you saw in ascent and you should ignore any transient IMU bites which you get during the entry, over.

SPACECRAFT Okay, thanks Rick, we'll do that.

CAPCOM And we're ready to load the targets with 30 seconds to go in the pass.

SPACECRAFT Roger, Rick, we understand we're in maneuvering in AUTO to the (garbled) retarget.

CAPCOM Ok, understand, thank you. We'll see you in about ten.

SPACECRAFT Okay.

PAO This is Shuttle Control. Bermuda has loss of signal. We're 32 minutes and 15 seconds away from deorbit maneuver. Astronauts Engle and Truly are getting into their seats. We'll target this landing for runway 15 that's the crosswind runway. But, they will have the ability to change that and go to runway 23 if the winds across on 15 exceed what we're looking for. Next station is Ascension Island in nine minutes. Two days 4 hours 41 minutes mission elapsed time. This is Shuttle Control.

CAPCOM LOS period and we're interested in what you find on this last weather for us.

NASA 946 Okay, we just looked at the groundtrack Bakers field is open right now. There is a deck of low clouds in the valley. It's no problem and we can see the lakebeds from 37 knots, from 30 miles out coming in but there's clouds over the 32, 30,000 foot layer is over the center of the lakebed. We haven't made our last pass to runway 15 yet we'll start down here pretty quick.

CAPCOM Ok, no rush on that we can pick up the report after the Ascension pass if you don't have it before the AOS, over.

NASA 947 Roger.

CAPCOM And 947, Houston, we do not want to push you on your limits, however, on remaining clear of the area as per the local directives.

NASA 947 Rick, we got about probably 4 hours of gas here so we're pretty good shape.

CAPCOM We understand gas is not a problem, we just don't want to push you into way 1. NASA 947, Houston, what I was trying to convey earlier was that we would expect that after your final run that you will pick up your holding area as per the local directive directives for the reentry.

NASA 947 .....

PAO This is Shuttle Control at 2 days 4 hours 50 minutes mission elapsed time. Columbia coming up on acquisition through Ascension.

CAPCOM You're coming in a little scratchy but should pick up better. We're with you here for about 7 minutes, over.

CAPCOM Columbia, Houston, we're with you through Ascension for five minutes. Configure AOS, over.

SPACECRAFT Okay, Houston, we thought maybe we were a little late coming AOS. We have stated the maneuver to the burn attitude, just now started it, Rick.

CAPCOM Okay, super Joe Henry, one thing we wanted to ask you was whether while you were in OPS 2 you selected the runway 15 on the alternate slot, over?

SPACECRAFT Affirmative, we sure did.

CAPCOM Okay, thank you, Richard. One item of interest we did run the current winds and the evaluation is such that we're

END OF TAPE

CAPCOM Okay. Superb Joe Henry. One thing we wanted to ask you is whether while you were in OPS 2 you selected runway 15 on the alternate slot over.

SPACECRAFT Affirmative we sure did.

CAPCOM Okay thank you Richard. One item of interest we did run the current winds and the evaluation is such that were if you were to remain in auto on the HAC that would result in about 1.9 g's.

SPACECRAFT Okay. Thank you Rick. We'll cut it a little early then.

CAPCOM Okay and we've got vectors to send up to you and once we tell you their up we'll probably ask you to reload the targets.

SPACECRAFT Sounds good. And Rick the APU fuel tanks valves are open if you would like to check them. We've got three grays.

CAPCOM Okay the APUs look good to us.

SPACECRAFT Okay Rick and if your ready I'll do a gimble check while you're looking.

CAPCOM Okay go ahead.

SPACECRAFT .....are working.

CAPCOM Roger.

CAPCOM The vectors on board in both the PASS and the BFS and at your convenience we'd like you to reload the targets.

SPACECRAFT Okay we'll do it.

CAPCOM Columbia, Houston. We have a go for the deorbit burn. 3 minutes remaining in this pass.

SPACECRAFT Super. Thank you Rick.

CAPCOM And Columbia, Houston. While we still have you here at Ascension, on your flip cards I might verify that you did get the pen and inks in the TIG-5 area on the topping of evap high load duct heater and humidity separator. Over.

SPACECRAFT I believe so Rick. Let me double check it.

CAPCOM Okay. That's top evap heater NOSLE 2 of them to off. The ducts two of them correction the duct heater off the high load duct heater off and the humidity separator two of them

off and that's all in the vacinity of TIG-5.

SPACECRAFT Okay Rick. You've got to read them again. You got a little ahead of me there.

CAPCOM Okay sorry about that. On L1 top evap heater NOSLE two of them to off. The top evap heater duct to off. The high load duct heater to off. And humidity separator two of them to off. And if you don't want to rush your APU start, do that previous prior to the APU start no problem. And I may have interrupted you on you gimble checks Joe. We've got a minute and 20 seconds remaining to look at the primary check.

SPACECRAFT Rick. I got all the comments on L1 on the heaters. You made some comment about the APUs though. Would you say that again please.

CAPCOM No comment on the APUs other than the APUs look good on the prestart. We'd like to do the primary gimbie check in the 50 seconds we have remaining in the pass.

SPACECRAFT Okay you got them coming now.

CAPCOM Okay thank you.

SPACECRAFT And Rick. Would you repeat one more time other than on L1 what other steps need to be done at TIG-5.

CAPCOM Just a reminder of the APU start was to be done at T-G-5 on APU number 3.

SPACECRAFT Okay. Got you thank you.

PAO This is Shuttle Control. Loss of signal at Ascension. One tracking station remaining before the deorbit maneuver. That's Botswana in 5 minutes. We're 16 minutes away from the deorbit burn which will be out of the Indian Ocean away from any tracking station. We'll get a report on that burn when Columbia makes acquisition through Yarragadee after the burn. Columbia maneuvering now to the deorbit attitude. The vehicle will be upside down and flying backwards at that burn. Crew got a go for the deorbit burn during this pass. 2 days 4 hours 58 minutes Mission Elapsed Time. This is Shuttle Control Houston.

CAPCOM NASA 947 this is Houston Over.

NASA 947 947 go.

CAPCOM Roger John. We've got a 4 minute LOS period now. I will be interested in your final run there.

NASA 947 Okay, we're at 20 k now...

CAPCOM Okay we'll standby.

CAPCOM 947 Houston. One minute to our AOS at Botswana. Do you have a 30 second report you can give us?

NASA 947 Roger we saw 209 at 19 knotts on the wind. And the turbulance is slight. And the tower is saying 210 at 12. I tend to think the wind is a little higher than that.

CAPCOM Okay we copy.

END OF TAPE

CAPCOM 947 Houston. 1 minute to our AOS at Botswana. Do you have a 30 second report you can give us?

NASA 947 Roger we saw 209 at 19 knotts on the wind. And the turbulance is slight. The tower is saying 210 at 12 I tend to think the winds a little higher than that.

CAPCOM Okay we copy.

CAPCOM Roger John and we're waiting for your call on crosswinds .....

NASA 947 The reason I say that is because it's picking up sand right where we're landing on the lakebed and it doesn't do that until it gets to 18 knotts or so.

CAPCOM Are we GO or NO GO for the crosswind landing Joe.

Standby one let me talk to him a second.

John come up on 138 45.

CAPCOM Columbia, Houston through Botswana for 4 minutes over.

SPACECRAFT Okay read you loud and clear Rick.

CAPCOM Okay we've got you the same Joe. We'll just sit back and look forward to the burn.

SPACECRAFT Roger that Rick.

CAPCOM For your information the gimble check looked good.

SPACECRAFT Hey that's good. Thank you.

SPACECRAFT Houston, Columbia.

CAPCOM Go ahead Joe.

SPACECRAFT Roger Rick. The switches on L1 reconfigured TIG-4. They have floated off. Could you give them to me again please.

CAPCOM Okay no problem Joe. The top evap heater NOSL two of them to off. The duct top evap heater duct to off. The high load duct heater to off. And the humidity separator two of them to off over.

SPACECRAFT Okay. Those are done. Thank you.

CAPCOM Roger.

CAPCOM Columbia, Houston. 30 seconds to LOS. Our next contact is after the burn at in 15 minutes. We'll look forward to that.

SPACECRAFT Okay Rick we'll see you there.

CAPCOM Roger.

PAO This is Shuttle Control. Botswana has loss of signal. We're 6 1/2 minutes away from deorbit maneuver. Next station is Yarragadee in about 14 minutes. Decision has been made to redesignate to runway 23 at Edwards because of wind conditions. It won't require any change in the deorbit burn or the only change required will be for Joe Engle to select the runway 23 display in the cockpit. At 2 days 5 hours 7 minutes Mission Elapsed Time. This is Shuttle Control.

PAO This is Shuttle Control. The deorbit maneuver should be starting now. Duration of that maneuver 2 minutes 55 seconds. Slowing Columbia enough so that it drops out of orbit for landing at Edwards Air Force Base. We've started the entry interface clock in the control center. It's reading 27 minutes to entry into the Earth's atmosphere for Columbia. We'll get a report on this deorbit burn when Columbia reaches the Yarragadee tracking station in Australia. We're about 7 minutes away from acquisition there. At 2 days 5 hours 14 minutes. This is Shuttle Control Houston.

PAO This is Shuttle Control. 2 days 5 hours 20 minutes Mission Elapsed Time. Yarragadee should have acquisition in about 40 seconds we'll standby.

END OF TAPE

PAO This is Shuttle Control, two days five hours 20 minutes mission elapsed time. Yarragadee should have acquistion in about 40 seconds, we'll stand by.

CAPCOM Columbia Houston, through Yarragadee, over.

SPACECRAFT Okay Houston, read you loud and clear and the burn was good.

CAPCOM Okay that's super Joe. One change to the plan, John's last weather flight indicated that our crosswind might be a little bit high, so we're going to ask you to reselect runway 23, your prime runway and we'll make a landing on 23, over.

SPACECRAFT You faded out. Understand that you want us to re-target to runway 23.

CAPCOM That's affirmative, runway 23, over.

CAPCOM And Columbia Houston, five minutes remaining in the pass how do you read, over.

SPACECRAFT Okay read you loud and clear now Rick, you did say, understand that you want us to re-target to 23.

CAPCOM That's affirmative the surface winds were a little bit too much for the crosswind, one note on that, the evaluation of the Auto maneuver around the HAC would result in a 1.6 z turn however, we're still recommending a CSS on the HAC probably slightly inside the HAC, right now your go for maneuvers. We have not ruled out Auto land and we'd like you to check your bio-med harnesses, over.

SPACECRAFT We'll do it.

CAPCOM And Columbia Houston, just as a matter of clarification we see as the only requirement is to select your primary runway on the spec in order to set up your guidance for 23, over.

SPACECRAFT Roger that Rick, will do.

CAPCOM And Columbia Houston, the roll reversals will still be as briefed they'll be so significant effect on that early turn on the first roll reversal, over.

SPACECRAFT Roger, understand, thanks Rick.

CAPCOM Columbia Houston, one minute to go in this period, we'll pick you up at Quam in seven minutes and you might give us an update on the forward RCS dump, over.

SPACECRAFT Okay Rick, the forward RCS dump is complete, and we are maneuvering to attitude now.

CAPCOM Okay thank you Joe, we're looking forward to seeing you in all your data over in Quam.

PAO This is Shuttle Control, Columbia is out of range at Yarragadee and just prior to LOS began orbit number 37, however, Columbia is committed to leave orbit now. A good burn reports (garble) we'll have communications through the Quam tracking stations in about six and a half minutes. And that will be the last time we'll be able to talk to the crew until Columbia approaches the coast of California. At two days five hours 27 minutes, mission elapsed time, this is Shuttle Control Houston.

PAO This is Shuttle Control at two days five hours, 33 minutes mission elapsed time, we're 30 seconds away from acquistion at Quam.

CAPCOM Columbia Houston, through Quam for five minutes, configure AOS.

SPACECRAFT Okay Rick, and we're in attitude.

CAPCOM Roger.

SPACECRAFT And Houston, we got three good APUs the surface drive is in effect.

CAPCOM Okay, very good.

SPACECRAFT And I was a little confused on the forward RCS the quantities went to zero prior to the time that was predicted, and I stopped dump when the quantities went to zero.

CAPCOM Okay we concur with that, thank you Richard.

SPACECRAFT And the conditioning is complete.

CAPCOM Roger.

CAPCOM And Columbia Houston, check the DFI PCM recorder and continuous record, over.

SPACECRAFT Okay, thank you Rick, it's in continuous record.

SPACECRAFT And Houston PLT, if you'd like I'll open the vent doors here.

CAPCOM Roger, go ahead.

CAPCOM And Columbia Houston, check the DFI PCM recorder and continuous record. Over.

SPACECRAFT Okay thank you Rick, its in continuous record. And Houston PLT if you like I'll open the vent doors here.

CAPCOM Roger, go ahead.

SPACECRAFT I'm sorry I will close the nose here.

CAPCOM Roger.

CAPCOM Columbia Houston you are cleared for all three CRT's up, your power level looks good.

SPACECRAFT Thank you Rick.

CAPCOM Columbia Houston there will be no delta T required.

SPACECRAFT Okay, very good Rick, thank you.

CAPCOM Columbia Houston, 20 seconds LOS. Can you confirm whether the OEX recorder was configured prior to seat ingress. Over.

SPACECRAFT I believe it was Rick.

CAPCOM Okay, thank you. We'll see you out of black out and looking forward to seeing you there.

SPACECRAFT Okay Rick and we're pretty sure the OEX recorder is on.

CAPCOM Okay, thank you Joe. See you in about 20 minutes.

SPACECRAFT Okay.

CAPCOM Columbia Houston configure LOS.

PAO This is Shuttle Control. Guam has loss of signal. Columbia now 36 seconds away from entering the Earth's atmosphere. And 32 minutes 47 seconds away from landing at Edwards Air Force Base. We're 20 and a half minutes away from being able to talk to the crew again. All three auxillary power units up and running, looking good as Columbia left out of range at Guam. The power level looked great, the guidance officer said he saw runway 23 selected into the CRT on the instrument panel. We've had an update on the entry elasped times entry interface remained the same, beginning blackout changed by and ending by about one second, that's now 2 days 5 hours 43 minutes 22 seconds. Blackout ending at 2 days 5 hours 59 minutes 37 second. And we're showing landing now at 2 days 6 hours 13

minutes 28 seconds. Velocity at entry interface is predicted to be 24,517 feet per second and the altitude 413,719 feet. At that point Columbia will be 4,470 miles from touchdown at Edwards Air Force Base. Coming out of blackout Columbia's velocity will be 12,315 feet per second, altitude 173,237 feet and range right at 500 miles. Columbia has a go to do the entry maneuvers. These are the aerodynamics stick inputs that will be commanded manually through the control stick and the program test inputs that are keyed into the computer keyboard and then performed through the computer. These are roll, pitch, yaw maneuvers at various, cued at various dynamic pressures and velocities designed to give us a better understanding of the orbiter air dynamic characteristics, including the center of gravity, angle attack, stability at various pressures, and speeds. These maneuvers will be flown at both hypersonic and supersonic speeds for the most part. It involves pitch, roll and yaw maneuvers in addition to the steep banks that are flown to manage the energy profile. We're seventeen minutes away from acquisition. And 29 minutes 9 seconds away from landing. At 2 days 5 hours 43 minutes mission elasped time. This is Shuttle Control Houston.

PAO This is Shuttle Control at 2 days 5 hours 51 minutes, mission elasped time. We're 9 and a half minutes away from acquisition of signal with Columbia. 21 and a half minutes away from landing at Edwards Air Force base. During this period

END OF TAPE

This is Shuttle Control at 2 days, 5 hours, 51 minutes, mission elapsed time. We're 9 1/2 minutes away from acquisition of signal with the Columbia. 21 1/2 minutes away from landing at Edwards Air Force Base. During this period crew aboard Columbia is performing a number of aerodynamic tests, flying small maneuvers both with the control stick, and through the computer keyboard. This is for a better understanding of the Orbiter air dynamic characteristics including center of gravity, angle of attack, stability at various dynamic pressures and speeds. These maneuvers are acudued by either dynamic pressures or speeds. Involves maneuvers at hypersonic and supersonic speeds, pitch roll and yaw maneuvers in addition to the steep banks that are flown to manage the energy. On the STS-1 landing, long range optics at Anderson Peak and Santa Uneze, in California, were able to pick up Columbia far out, however, we do not expect to be able to acquire Columbia with these long range optics today, because of heavy clouds along the west coast. We do expect some sonic booms in the Edwards Air Force Base area. Measurements were taken during the STS-1 entry and landing prior to that time projection was that there would be mild sonic booms. A mild sonic boom centered a few miles west of Edwards predicted overpressure was 2 pounds per square foot, measurements taken in that area showed that it was just slightly above that, it was 2.4 pounds per square foot, that's about half overpressure experienced when you slam the door of a closed car. We're seven minutes away now from acquisition. About 19 minutes, 10 seconds away from landing. At 2 days, 5 hours, 53 minutes, mission elapsed time. this is Shuttle Control Houston.

This is Shuttle control at 2 days, 5 hours, 55 minutes, mission elapsed time. We're 4 minutes, 55 seconds away from acquisition. Columbia is expected across the coastline of California in the big sur area right about San Simian, at an altitude of about 130,000 feet, and a distance at that point to Edwards of 198 nautical miles, volocity will be about 6400 feet per second. Ground track then takes it just a few miles south of Pasaroblaze at 176 nautical miles from Edwards, velocity at that point 5900 feet per second, at altitude of 24,000. Ground track comes on down southern portion of the San Waking valley, passing south of Taft, Maricopa, crosses interstate highway 5 at Grapevine grade at an altitude of about 96,000 feet, which point it's about 84 nautical miles from touchdown, velocity 3400 feet per second. And there's the terminal area energy management about 58 nautical miles from touchdown at 82,000 feet, about 2300 feet per second. Columbia will go into the heading alignment circle, widesweeping turn to line up with the runway at about 40,000 feet, Joe Engle will fly this manually, control stick steering, then he will go to the automatic landing system, taking back over manually at about 2,000 feet, just prior to preflare, and land in the control stick steering mode. We're 2 minutes, 39 seconds away from acquisition, we sometimes get C band radar contact prior to AOS, so we'll standby for our first contact. We have a

single C band radar contact, shows Columbia 188,000 feet, range of 653 miles and a velocity of about mach 15. We do not yet have telemetry, and won't for another minute or so, we're a minute and a half away from voice contact. The radar shows Columbia now at, coming out of 173,000 feet, at a range of 542 miles, mach 12.8.

end of tape.

CAPCOM We do not yet have telemetry and won't for another minute or so. We're a minute and 1/2 away from voice contact. The radar shows Columbia now coming out of 173,000 feet at a range of 542 miles mach 12.8. Telemetry coming in now.

CAPCOM Ces, this is Houston. Standby for a mark at 12. Standby. Mark.

Chase copy. APU's look good and energy is nominal. Navigational systems look good. We're about 25 miles south of the nominal ground track.

CAPCOM Columbia Houston through Buckhorn. Configure AOS. You're about 25 miles south of ground track. Your nav is good. Your energy is good. We'd like you to check your TACAN, MLS and radar altimeters on. Over.

SPACECRAFT Okay. Okay Rick. Good to hear you. And we're showing 10.5 mach and 165,000 feet now.

CAPCOM Okay. We concur with that Joe and did you get my call on the nav aids.

SPACECRAFT Okay. We got the call on the nav aids.

CAPCOM Roger. Everything is looking good. Your energy is very good. The nav is good. Out of 154,000 at 9.8.

SPACECRAFT Roger Rick.

CAPCOM Delta azimuth is 15 degrees.

SPACECRAFT Roger.

CAPCOM Range now 35 garble

SPACECRAFT garble and we just got the reversal.

CAPCOM Roger. Roll reversal is part of the energy management.

SPACECRAFT And Rick, the maneuvers have been going very good. The bird is real solid. Good solid bird all the way.

CAPCOM Well, we love hearing it. We requested GNC. I/O reset to bring the MLS's into the software. Over.

SPACECRAFT Wilco.

CAPCOM Out of 143,000 feet now.

SPACECRAFT garble is coming, mark.

CAPCOM Roger. He's calling out program test inputs. Those are the ones keyed through the computer.

SPACECRAFT Okay. Back to auto. PTR 2 is selected.

CAPCOM Roger. Mach 7.4.

CAPCOM Columbia Houston, your're go for TACANS.

SPACECRAFT Roger Rick. We can turn, I'll put them in.

CAPCOM Roger. Tactical air navigation information now being fed in. Roger Dick. This should bring Columbia onto the nominal ground track shortly. Not yet across the coastline still out. Mach 6.5, inch 200 miles coming out of 125,000 crossing the coast about now and beginning to converge onto the nominal ground track.

SPACECRAFT Okay Houston. PTR 2 at mach 5.8 mark.

CAPCOM Roger. We show you now out of 120,000 feet, 5.6 mach.

SPACECRAFT Okay. I'm configuring to garble evaps.

CAPCOM Roger. Columbia down over the San Waquin Valley now. 9 minutes away from landing. 115,000 feet, mach 5.3, range 148 miles. 110,000 feet.

SPACECRAFT Okay, roll reversal, right at 4.8.

CAPCOM Roger. Left roll reversal now at 108,000. Range 125 miles, mach 4.5.

SPACECRAFT PTR 2 mark.

CAPCOM Roger.

SPACECRAFT Not that was PTR 3 Rick. Sorry about that.

CAPCOM Roger.

SPACECRAFT That was a big one and it was completed by a 405.

CAPCOM Okay. We concur. Speed brake coming in now. 102,000 feet altitude, range 96. Edwards has visual acquisition on TV. Out of 100,000 feet, mach 3.6. You have positive seats.

SPACECRAFT Rick, you're a little garbled there. If you could say again. The pumps are coming out now at 3.4 and say again your last.

CAPCOM Positive seats.

CAPCOM Positive seats. Columbia now garble

SPACECRAFT garble PTR 4 mark.

CAPCOM Roger. 90,000 feet and a range of 74 miles, mach 2.9.

END OF TAPE

CAPCOM Positive seats, Columbia now garble

SPACECRAFT garble PTR 4 mark.

CAPCOM Roger. 90,000 feet and a range of 74 miles, mach 2.9.

SPACECRAFT Houston, Columbia air data looks good onboard.

CAPCOM Roger. We're looking at it. Columbia Houston, you can take the air data.

SPACECRAFT Wilco.

CAPCOM 82,000 feet, mach 2.5, range 57 miles.

SPACECRAFT And Houston, PTR 5 mark.

CAPCOM Roger. Everything is looking right on the money there Joe and we have a wind update for you and a weather update. You've got a very thin layer at 25,000. The winds airborne are as briefed and on the ground 220, 18 knots gusting to 24. Altimeters 30.07. You got 60 miles vis underneath. Over.

SPACECRAFT Very good. Sounds like a good old ready day.

CAPCOM Yes Sir. Out of 68,000, 39 miles range, mach 1.5.

SPACECRAFT garble PTR 6, mark.

CAPCOM Joe Engle continuing to fly the test maneuvers. 60,000 feet.

CAPCOM Columbia Houston, at your convenience transfer the state vector from the PASS to the BFS.

SPACECRAFT You're almost unreadable Rick. Say again please.

CAPCOM Roger. A state vector transfer. Pass to BFS.

SPACECRAFT Ah ha. Okay. Thank you very much.

SPACECRAFT -TR 7 mark.

CAPCOM 50,000 feet, mach 1. Range 27 miles.

SPACECRAFT PTR 8 mark.

CAPCOM Roger. You're tracking right down the line.

CAPCOM Columbia approaching the heading alignment circle

now. 42,000 feet, mach .8, 22 miles range.

CAPCOM Columbia Houston. We show you're intercepting the HAC and a reminder you've got the strong winds out of the west now out of 38,000 feet.

SPACECRAFT Okay. Thank you Rick.

SPACECRAFT And we've got a little bit of PTR 0 in but not too much.

CAPCOM Roger. Columbia making a wide sweeping turn now to get aligned up with the runway. Good television picture. 25,000 feet.

CAPCOM Columbia Houston, about 3,000 feet low now out of 24,000 feet.

SPACECRAFT Roger that. garble case we're showing 290 at 20,000.

CAPCOM Okay, we're about to be with you at 19.

CAPCOM Check. Body flap to manual.

SPACECRAFT Roger. Body flapped on manual.

CAPCOM 280 knots at 18,000 feet.

SPACECRAFT Okay, speedbrakes read starting now.

CAPCOM Roger. Still just slightly low on the energy. Looking okay. 9 miles range at 13,000.

SPACECRAFT Speedbrakes coming closed.

CAPCOM Roger. Slightly below glide slope. You're below the glide slope. You have a go for auto land.

SPACECRAFT Okay Rick. Thank you sir. Okay Rick. We're in auto.

CAPCOM Roger. 9,230. Check speedbrake auto.

SPACECRAFT Okay. Speedbrake bodyflap auto. Everything's all. Thank you.

CAPCOM We're about a minute away from touchdown. 220. 3500 feet, 250 knots.

SPACECRAFT Okay. 2500 feet. Speedbrakes are closed. We're at 270 knots.

Chase concurs.

garble Columbia is clear land, lakebed 23 wind 210 at 8.

SPACECRAFT Okay.

garble coming. 3 down. 100, 50, 30, 20, 10, 5, 3...touchdown. Nosegear 15. 10, 10, 5, 3, touchdown. Welcome home.

SPACECRAFT Thank you chase.

applause

CAPCOM This is Shuttle Control. The unofficial thouchdown time and mission elapsed time is 2 days, 6 hours, 13 minutes, 10 seconds.

END OF TAPE

This is Shuttle Control, the unofficial touchdown time and mission elapsed time is 2 days, 6 hours, 13 minutes, 10 seconds. Repeat that, mission elapsed time for touchdown 2 days, 6 hours, 13 minutes, 10 seconds.

SPACECRAFT Ok, Columbia has rolled to a stop and we're getting into the postlanding

CAPCOM Ok, Joe, it's a great day for the ace moving company, welcome home, we'll move over the Steve Nagle now.

SPACECRAFT Ok.

CAPCOM Columbia Houston, welcome home, we need landing gear one isol valve closed before we start.

CAPCOM Columbia, Houston, did you copy on the landing 1 isol valve to close, over.

SPACECRAFT Ok, it's closed, thank you Steve.

CAPCOM Roger, and I do have some deltas to the postlanding checklist, I'll not read all them to you now but I can give you the first couple of pages before we get into it now, over.

SPACECRAFT Ok, Steve, if you could standby just a second, till Richard gets his helmet on, we'll both be able to take them.

CAPCOM You bet.

PAO Astronaut Steve Nagle has releived astronaut Rick Hauk CAPCOM console, and will handle the power down procedures till crew egress.

SPACECRAFT Houston, Columbia, how do you read.

CAPCOM Loud and clear.

SPACECRAFT Roger.

CAPCOM Let me know when your ready to copy these changes.

SPACECRAFT Ok, just a second, and we'll be right with you Steve. Go ahead, Steve.

CAPCOM Roger.

SPACECRAFT Ok, Steve, you can go ahead with them.

CAPCOM Ok, Joe, first on page 5-5 under the RCS OMS safing valves, look under panel O8 left and right OMS under the crossfeed four open talk back open, add left OMS crossfeed bravo

GPC talk back open, over.

SPACECRAFT Ok, got that one.

CAPCOM Roger, and on the next page, page 5-6, under the block; deactivate left forward switches, we want to add the nav 8 powerdown which will be moved from 5-13 and that's enough to get you started.

SPACECRAFT Ok, thank you, sir.

PAO This is Shuttle Control, Dryden Flight Research Center, estimates there were 200,000 people in their viewing area when Columbia touched down.

CAPCOM Columbia Houston, you are go for the load test, over.

SPACECRAFT Roger, Steve.

SPACECRAFT Houston, I'm going to repeat this, that first low test point.

CAPCOM Roger.

PAO Convoy approaching Columbia. Technicians in protective suits, will check for any leaks in the Columbia's systems, and units will be hooked up to purge Columbia.

CAPCOM Columbia Houston we shall still show the (garble) logic on, over.

SPACECRAFT (garble).

CAPCOM Roger, and check flight controller power on the right side, over.

SPACECRAFT Roger, it is off, I thought I saw the services moving when I did the test however. Would you like to repeat it with a flight controller power on real quick?

CAPCOM That's affirmative.

CAPCOM Joe, We need the left engine OMS, OMS engines valves to off, over.

SPACECRAFT Ok, Steve, standby. Ok, thank you Steve, got it.

CAPCOM Joe, we need amonia A to secondary on, over.

SPACECRAFT Ok, amonia A secondary on.

SPACECRAFT OK, the load test is complete.

CAPCOM Roger, we copy.

SPACECRAFT (garble) Going to OPS 9.

CAPCOM Roger, we copy.

PAO The orbital maneuvering and the reaction control systems have been safed.

SPACECRAFT (garble) the OMS RSC safing is complete.

CAPCOM OK, Joe, thank you.

SPACECRAFT You bet.

PAO Technicians are using sniffers around the RCS engines now.

SPACECRAFT Houston, PLT, do I have a go to continue with the SSME repositioning?

CAPCOM Roger, you're go for the SSME repositioning.

end of tape.

Technicians are using snippers around the RCS engines now.

SPACECRAFT Houston, PLT. Do I have a go to continue with the SSME repositioning?

CAPCOM Roger, you're go for the SSME repositioning.

SPACECRAFT It's in work.

and Houston, Columbia, lets see Steve, Rick mentioned something about a Navaid power down that you might want right along in here. Do you have some switches you would like from there?

CAPCOM Roger, Joe thats on page 5-6, under your deactivation left forward switches, we want TACAN, MLS, radar altimeter, and the lights turned OFF.

SPACECRAFT Okay, I'll get on them now. This thing takes its own sweet time doesn't it Steve.

CAPCOM Roger and by the way Joe, we are seeing engine movement.

SPACECRAFT Roger and I've got a mode 3 in progress now.

CAPCOM Roger.

SPACECRAFT Okay, PFB 84 is complete and are you go for APU shutdown Houston?

CAPCOM Wait one.

SPACECRAFT Okay.

CAPCOM Columbia Houston we are go for APU shutdown. There is one change there, do not turn the hydraulic circ pumps on, we will call that to you.

SPACECRAFT Okay do not turn on the hydraulic circ pumps and I'm go for the shutdown, here it goes.

CAPCOM Roger. Columbia Houston we have a procedure for you with the LO2 prevalves whenever you can. Over.

SPACECRAFT You're unreadable Steve, say again. The APU shutdown is complete.

CAPCOM Roger I copy the APU shutdown is complete and I have a procedure for you with the LO2 prevalves whenever you're ready.

SPACECRAFT Okay, go ahead and read them to me and I'll get them.

CAPCOM Roger on panel R4, I need the LO2 prevalves 3 of them closed for 10 seconds and then open. Over

SPACECRAFT Okay the valves are closed and the switches have been closed so can I take them directly to open.

CAPCOM Roger wait for our go. Wait for our go.

SPACECRAFT Roger, standing by.

CAPCOM Roger Columbia you have a go for that we want them cycled open then closed twice with 10 seconds between cycles. Over.

SPACECRAFT That is in work Steve. And Houston Columbia the number 1 talkback remained closed the other two are open. And I'll try number 1 again.

CAPCOM Roger Columbia Houston on your last cycle of those LO2 prevalves we need them open.

SPACECRAFT Roger well I just attempted to close 2 and 3 and the talkbacks remained open so the configuration is the switches are in GPC, the left one indicates closed, pardon me the number 1 indicates closed, number 2 and 3 indicate open.

CAPCOM Roger that's on R4 Richard, the LO2 prevalves we need all 3 of them open. Over.

CAPCOM And we don't think there are talkbacks on those switches.

SPACECRAFT I see, I was operating the landing gear hydralic isolation valve. I got you.

CAPCOM Columbia we show those valves open now, thank you when you get to the vent door purge positioning, I do have some changes which you may already have I'll restate them.

SPACECRAFT Okay, stand by, I'm on the second cycle of the prevalve and I will leave them open this time.

CAPCOM Roger

SPACECRAFT Okay, Steve, the prevalve switches are open.

Flight director Don Puddy has given convoy commander a go to start working on hatch removal.

CAPCOM Columbia Houston, a couple of things, when you get to the vent door purge positioning I have those changes to read to you and when somebody is at the AFT station I have the switch on R11.

SPACECRAFT Okay, why don't you read me the changes and Joe is back in the back and then he can get the switches.

CAPCOM Okay, at the bottom of the vent door purge positioning under the line MM read item 2 execute, we have added after the message VFV 89 entering 30 minute delay, then do a cancel item 5 execute. Over.

SPACECRAFT Okay, after MM read item 2 execute when we receive victor Foxtrot baker 89 entering 30 minute delay then do a item 5 execute.

CAPCOM That's affirm. And the rest of the page on MCC go and under that is deleted.

SPACECRAFT Okay then we will not accomplish everything on that page underneath the title on MCC go.

CAPCOM That's affirmative and if Joe's back in the back, I'll give him that switch on R11.

SPACECRAFT Okay go ahead with R11.

CAPCOM Okay R11 upper the DFI freon pump to the number 1, Joe.

END OF TAPE

CAPCOM That's afirmative and Joe's back in the back. I'll give him that switch on R11.

SPACECRAFT Okay. Go ahead with R11.

CAPCOM Okay. R11 upper, the DFI freon pump to number 1 Joe.

SPACECRAFT Okay. DFI freon pump garble and Steve, we've got 3 of them, oh I'm sorry. Okay. Okay DFI freon pump is on 1.

CAPCOM Okay. Thank you. And one another thing on panel 017. Would you check the ATVC's and MEC's off.

SPACECRAFT Okay.

CAPCOM And there is a 2 second delay between MEC 1 and 2 in powering those down.

SPACECRAFT Roger that.

SPACECRAFT Okay Steve, I've completed the modified vent door purge positioning.

CAPCOM Roger. It looks good from here.

CAPCOM Columbia Houston. When convenient, we'd like hydraulic circ pump number 1 on.

SPACECRAFT Roger Houston. It's on. And Houston, I'm configuring OPS 9 to GPC only.

CAPCOM Roger.

SPACECRAFT Okay. Coming down the 2, 3 and 4.

CAPCOM Roger.

CAPCOM The ground purge and cooling units are moving into place now, will be hooked up to Columbia. Columbia Houston. We would now like circ pump, hyraulic circ pump number 2 on.

SPACECRAFT Roger Houston. It's on. Okay Houston. CDR and I'm waiting till ground calls it a cooling is activated. I'm ready to start 514 on your call.

CAPCOM Okay. Roger. We'll wait one on that. Columbia Houston. If you can spare some CRT's, we'd like some power down.

SPACECRAFT Okay. 2 and 3 are off.

CAPCOM Thank you.

CAPCOM Columbia Houston. We'd like hydraulic circ pump number 3 on now.

SPACECRAFT Roger Steve. All 3 of them are on now.

CAPCOM Okay. Thank you.

CAPCOM Columbia Houston. We now have ground cooling. You're cleared to bypass the rads and I have one additional step to give you that's a change. I need panel L1, the humidity separator A to on after you bypass the rads.

SPACECRAFT Okay. You want humidity step A to on after we bypass it.

CAPCOM That's affirmative.

SPACECRAFT Okay. Mighty fine. We'll do it Steve.

CAPCOM Columbia, this is garble roger I copy.

SPACECRAFT Calling Columbia. We read you loud and clear.

CAPCOM Roger.

CAPCOM Columbia Houston. I have some switches for you on A12.

SPACECRAFT Okay. Go ahead Steve.

CAPCOM Okay. Panel A12, the gas generator fuel pump, 3 of them to off.

SPACECRAFT Okay. Sorry about that Steve. garble to be auto.

CAPCOM Roger. And also the same panel, the lube oil line 3 to off.

SPACECRAFT Yes, I've got them too. Thanks a lot.

CAPCOM Okay. Thank you.

CAPCOM Columbia Houston. We would like hydraulic circ pumps 1, 2 and 3 off. Over.

SPACECRAFT Wilco. They're coming off Steve.

CAPCOM No problem there Richard. The hydraulic temperatures are stabilized.

SPACECRAFT garble OTC garble

CAPCOM Columbia, did you call Houston?

SPACECRAFT Houston, garble the CDR's on.

CAPCOM Roger. Columbia Houston. KSC does not have telemetry at the present time and Houston will maintain control until they do get telemetry.

SPACECRAFT Okay.

CAPCOM Columbia Houston. On the right side, could you check on panel R1 the payload aft main B switch off.

SPACECRAFT Okay, standby. Okay, payload aft main B is on. Do you want to turn it off? Houston, Columbia.

END OF TAPE

CAPCOM Columbia Houston, on the right side could you check on panel R1, the payload aft main B switch off.

SPACECRAFT Ok, standby, Ok, panel main B is on, do you want them turned off?

SPACECRAFT Houston, Columbia.

CAPCOM Roger, off O F F.

SPACECRAFT Ok, paylaod aft B coming off.

CAPCOM Thank you.

PAO Crew is coming out of the (garble), being greeted by George Abbey, director of flight operations, at the Johnson Space Center. They're taking a look at the exterior of Columbia.

SPACECRAFT And Houston flight Columbia, we have a master alarm.

PAO This is Shuttle control here in the mission control center, the STS-2 crew patch has just been hung on the wall. Joining the patches of all the other missions that have been flown from this mission operations control room on the second floor. Mission Control Center, the crimson flight team has handed over control of Columbia to the Kennedy Space Center representatives at Dryden.

end of tape.

END

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