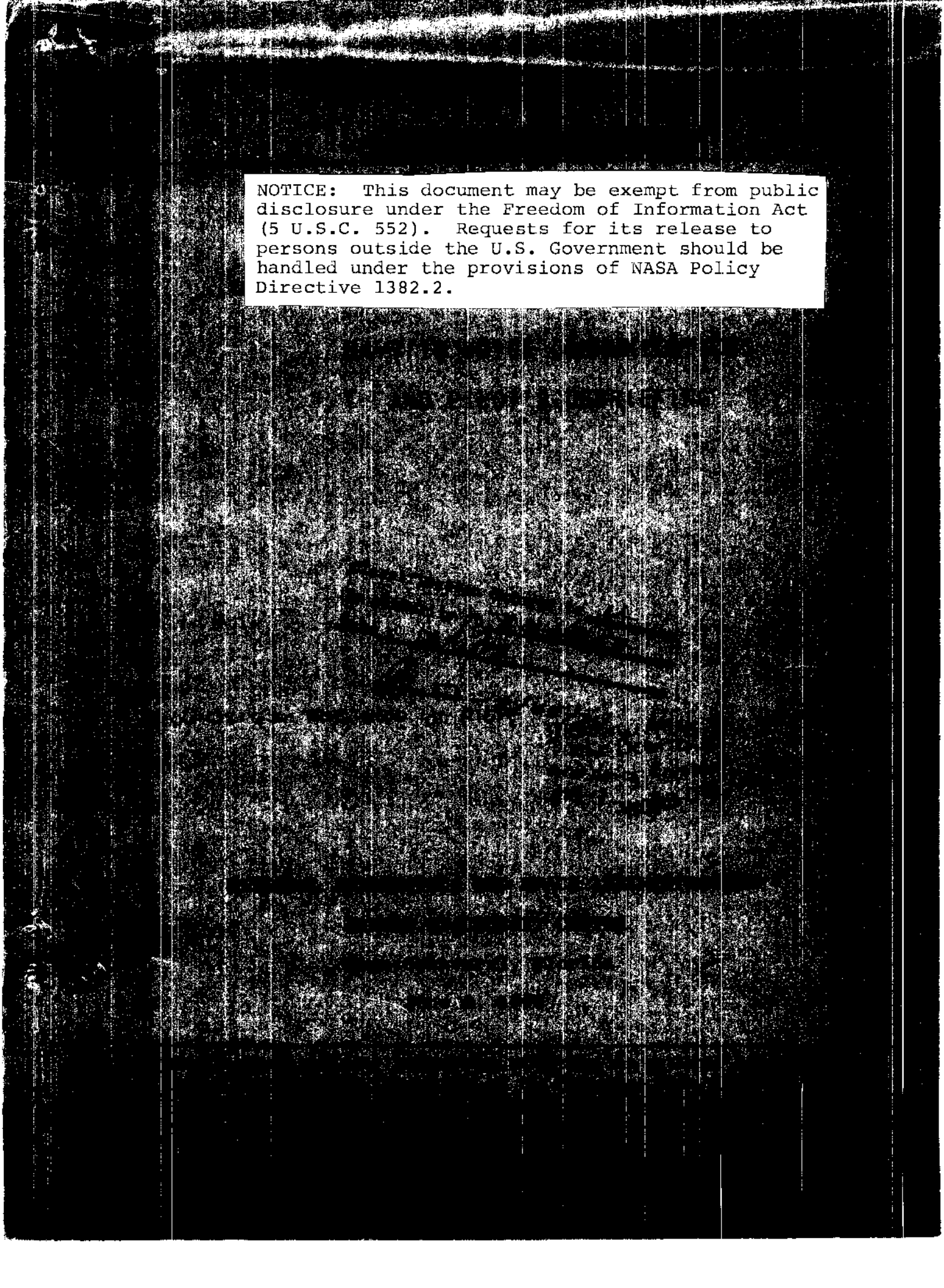

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# MA-7/18 VOICE COMMUNICATIONS

# AND PILOT'S DEBRIEFING

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CONTENTS



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# 1.0 INTRODUCTION

## 1.1 Content

This document consists of four parts: (1) A communications transcript made from the onboard voice tape, (2) the shipboard self-debriefing of the pilot which he recorded shortly after arrival on the aircraft carrier USS Intrepid, (3) the Flight Operations debriefing and (4) the General Flight Activities and Information Debriefing. The debriefing sessions in (3) and (4) were conducted at Grand Turk Island, British West Indies, during the three days following the flight.

The communications transcript contains all of the communications between the astronaut and the ground stations, as well as some astronaut inflight comments while in a record-only mode. All communications and comments are accurately referenced with regard to time from launch (GET).

The shipboard debriefing consists of the pilot's general impressions of the flight from lift-off to the beginning of retrosequence and a more detailed account from retrosequence through normal egress from the spacecraft.

The Flight Operations debriefings consisted of two separate sessions, each having lasted approximately two hours. The first was held late in the afternoon of the day following the flight. The second was held late in the morning of the second day following the flight.

The General Flight Activities and Information Debriefing was held at the beginning of the third day after the flight (12:10:00 am to 02:15:00 am). Between the Flight Operations and the General Flight Activities and Information debriefing periods, the astronaut refreshed his memory by listening to a recording of the communications tape made during the flight. When not in a debriefing session, the astronaut's time was also taken up by postflight medical examinations, rest, and some recreation.

The procedure followed in the technical debriefings was to have the astronaut read the answer, one-by-one, previous questions prepared prior to the flight. However, in many cases, in order to save time and his voice, the astronaut did not actually read each question aloud: in these cases the applicable questions have been inserted in the present text for the convenience of the reader. Also, because of the

unforeseen events which occurred in the MA-7 mission, the debriefing team found it desirable to ask additional questions more pertinent to this flight in order to get a more accurate account of the pilot's experiences. No distinction is made between such on-the-spot questions and the previously prepared questions in the text.

## 1.2 Editorial Policy

The editing of the material presented in this volume is consistent with the practice adopted on flight reports to date. The communications transcript has been left verbatim and essentially unedited. Since the voice tape is printed verbatim some communications are repetitive or broken, as is typical of normal voice communications. The debriefing was recorded initially during the pilot's oral debriefing. This material has been more heavily edited than the voice tape. It has been the editor's intent to smooth the conversational replies without changing the content of the answer.

# 3.0 SHIPBOARD DEBRIEFING

## 3.1 Introduction

The following is an essentially unedited transcript of the self-debriefing of Astronaut Carpenter which he conducted shortly after arriving onboard the recovery aircraft carrier, Intrepid. This shipboard debriefing consists of the pilot's general impressions of the flight from lift-off to the beginning of the retro-sequence. From that point through normal egress of the pilot from the spacecraft, the pilot describes his activities in considerable detail.

## 3.2 Shipboard Debriefing

I would like to give a good debriefing at this point while the events of the flight are still fresh in my mind. I will be able to cover only the high-points. I can not really do the flight justice until I review the voice tape to refresh my memory.

As a whole, I was surprised that the sensations at lift-off, and throughout the launch phase, were as slight as they were. In retrospect, it was a very, very short period. As a matter of fact, the whole flight was very short. It was the shortest five hours of my life.

My general impression of the flight right now is that I am happy to be back. I feel that I brought back some new information. I hope that the pictures turn out because they are photographs of truly beautiful sights. I think that the MIT film was properly exposed. I hope it brings back some worthwhile information. I realize now that a number of the MIT pictures were taken while the spacecraft was in a $90^{\circ}$ roll attitude and the filter in the camera was not oriented properly. So there are a few pictures that may be of no value.

I feel badly about having squandered my fuel and I feel badly about the error in impact. I know that there was an error in pitch and I think there was an error in yaw in the gyro attitude presentation from somewhere in the second orbit on. Because the control fuel supply was low, I did not want to evaluate the ASCS problem until just prior to retrofire when I thought it would probably clear up. I thought for some time that the problem in pitch might have been just a scanner error. Now, as I look back at it, it seems to me that that was wishful thinking,

because I alined the gyros correctly and the spacecraft was holding orbit attitude when I first selected ASCS. Later, however, when I would recheck attitude the spacecraft would be pitched way down, about 20°. So ASCS was holding orbit attitude in yaw and roll but pitch attitude was not right. It did not agree with the window and it did not agree with the periscope. I say 20° down when I think of the periscope, but when I think about what I saw in the window when the ASCS was holding retroattitude and indicating 34°, I would say that it might be something like 30° down. I noticed the same problem on the second orbit, or maybe it was the very beginning of the third orbit. I also noticed this prior to retrofire.

I think that one reason that I got behind at retrofire was because, just at dawn on the third orbit, I discovered the source of the fireflies. I felt that I had time to get that taken care of and prepare for retrofire properly, but time slipped away. It really raced during this period, as it did through the whole flight. I really needed that time over Hawaii. The Hawaii Cap Com was trying very hard to get me to do the preretrograde checklist. I had previously been busy with the fireflies. Then I was busy trying to get alined in attitude so that I could evaluate ASCS. I got behind. I had to stow things haphazardly. I think everything was stowed, but not in the planned places. Food crumbling gave me a bad problem because I couldn't use that bag for the camera. As it was, I had to carry the camera with me and almost dumped it in the water.

At retrofire I still had the problem in pitch attitude. I did not have any confidence in ASCS just prior to retrofire. So I told the California Cap Com that the ASCS was bad and that I was committing to a fly-by-wire retrofire. By this time, I had gone through part of the preretro checklist. It called for the manual fuel handle to be out as a backup for the ASCS. I selected the fly-by-wire control system and did not go off of the manual system so that attitude control during retrofire was accomplished on both the fly-by-wire and manual control systems.

I feel that attitude control during retrofire was good. My reference was divided between the periscope, the window, and the attitude indicators. At retroattitude as, indicated by reference to the window and the periscope, the pitch attitude indicator read -10°. I tried to hold this attitude on the instruments throughout retrofire but I cross-checked attitude in the window and the periscope. I have commented many times that you can not divide your

attention between one attitude reference system and another, and do a good job in retrofire on the trainer. But that was the way I controlled attitude during retrofire on this flight. I did not notice any gross errors in attitude that persisted throughout retrofire. There was some wandering, but I feel that it was balanced out pretty well.

The initiation of retrofire was just a little bit late, although retrosequence came on time. I got the countdown from the California Cap Com. I waited one more second, which was 99:59:59 and did not get retrofire. I punched the manual retrofire button and one or two seconds after that I felt the first retrorocket fire.

I expected a big boot from the retrorockets. But the deceleration was just a very gentle nudge. The sound of the rockets firing was just audible. Retrorocket Two fired on time, Retrorocket Three fired roughly on time. Each rocket gave me a sensation, not of being pushed back toward Hawaii as reported by John Glenn, but of being slowed down in three increments. So that by the time the retroacceleration was over, I felt that there was just enough deceleration to bring the spacecraft to a stop. I felt that, if I looked down, I would see that the obvious motion that I had seen through the window and the periscope before retrofire had stopped. But, of course, it had not.

I put three 'arm' switches on at this time. Retropack jettison occurred on time and the periscope came in on time. At this time I noticed my appalling fuel state, and realized that I had controlled retrofire on manual and fly-by-wire. I went to rate command at this time, and tried manual and rate command, and got no response. The fuel gage was reading about 6 percent, but it was empty. This left me with 15 percent on the automatic system to last out the ten minutes to .05g and to control reentry.

If the California Cap Com had not mentioned the retroattitude bypass switch, I think I would have forgotten it, and retrofire would have been delayed considerably longer. He also mentioned an Aux Damp reentry which I think I would have chosen in any case, but it was a good suggestion to have. He was worth his weight in gold for just those two items.

The period prior to the .05g was a harried one, because I did not know whether the fuel was going to hold out. The periscope

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was retracted. The attitude indicators were useless. The only attitude reference I had was the window. I did not have much fuel to squander at this point holding attitude. I did use it, gingerly, trying to keep the horizon in the window so that I would have a correct attitude reference. I stayed on fly-by-wire until .05g. At .05g I think I still had about 15 percent reading on the auto-fuel gage.

I began to get the hissing outside the spacecraft that John Glenn mentioned. I feel that the spacecraft would have reentered properly without any attitude control. It was alined within 3 or 4 degrees in pitch and yaw at the start of the reentry period. My feeling is that the gradual increase of aerodynamic damping during the reentry is sufficient to aline the spacecraft properly.

Very shortly after .05g, I began to pick up the oscillations on the pitch and yaw rate needles. At this time I think roll rate was zero, or possibly one or two degrees. The spacecraft oscillated back and forth about zero, just the way the trainer would do at a -.1* reentry. From this I decided that the spacecraft was in a good reentry attitude and I selected Aux Damp.

I watched the rate indicator and the window during this period because I was beginning to see the reentry glow. I was beginning to see a few flaming pieces falling off the spacecraft, although the window did not light up as John Glenn reported. It was just a noticeable increase in illumination. I did not see a fiery glow prior to peak g as John Glenn did.

I noticed one thing during the heat pulse that I had not expected. I was looking for the orange glow. I also saw a long rectangular strap of some kind going off in the distance. It was at this time that I noticed a light green glow that seemed to be coming from the cylindrical section of the spacecraft. It made me feel that the trim angle was not right, and that some of the surface of the recovery compartment might be ablating. I think it must have been the beryllim vaporizing. The fact that the rates were oscillating evenly strengthened my conviction that the reentry was at a good trim angle. The green glow was really brighter than the orange glow around the window.

* -.1 damping coefficient set into the trailer computer.

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I heard Cape Cap Com up to the blackout. He told me that blackout was expected momentarily. I listened at first for his command transmission, but it did not get through. So I just talked the rest of the way down.

Acceleration peaked at about 6.7g. At this time, oscillations in rate were nearly imperceptible. Aux Damp was doing very, very well. The period of peak g was much longer than I had expected. I noticed that I had to breathe a little more forcefully in order to say normal sentences.

The accelerometer read 2½ to 3g when the spacecraft passed through a hundred thousand feet. At around 80 or 70 thousand feet, we may have run out of automatic fuel. I do not remember looking at the fuel gage but the rates began to oscillate pretty badly, although the rate needles were still on scale.

I put in a roll rate earlier and after we got down around 70 or 80 thousand feet, I took the roll rate out. So I did have fuel at that point. I took the roll rate out at a point where the oscillations carried the sun back and forth across the window. My best indication of the amplitude of the oscillation was to watch the sun cross the window, and try to determine the angle through which the spacecraft was oscillating. I remember calling off about 40 or 50 degrees. This was around 60,000 feet. At about 50,000 feet, the amplitude of the oscillations increased. I could feel the deceleration as we would go to one side in yaw or pitch. I would feel the spacecraft sort of stop, and then the rate would build up in the other direction. I felt that I had a pretty good indication of the variation in attitude from this change in acceleration. I switched the drogue fuse switch on at about 45 thousand feet. At about 40 thousand feet, I began to feel that the spacecraft oscillations were going past 90°. I would feel a deceleration as the spacecraft would go past the vertical. I knew from the amplitudes that I had previously extrapolated, that the spacecraft attitude had reached at least 90°. Then the spacecraft would apparently slip past 90°. I am convinced that the attitudes were diverging, and that there were times when the spacecraft was 30 or 40 degrees small end down. This I remember occurring two or three times. Each time it was worse. I reported that the oscillations were getting too bad and said, "I'm going to have to chance the drogue now." I did deploy the drogue parachute manually at around 25,000 feet.

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Although I did not make a concerted effort to deploy the drogue parachute when the spacecraft was properly alined in attitude, I think that it did come out when the spacecraft was in normal attitude, because there was no marked snap on deployment. There was a sudden shock, but I do not think that it dragged the spacecraft around from bad yaw or pitch angle. The spacecraft moved maybe 10 or 20 degrees. I could see the drogue pulsing and vibrating. It was visible against a cloudy sky. I saw no blue sky at this time. All was grey. The drogue was pulsing and shaking much more than I had expected. I watched the parachute for a while along with some other material that came out at this time.

After the drogue parachute was deployed, I operated the snorkel manually. The rate handle did come up but I reached over and pushed it up, too. I did not notice any more cooling at this time. I also did not notice the suit fan cutting down so I assume it continued to run.

I got the main fuse switch at 15,000 feet and waited for the main parachute to deploy. It did not, and I manually operated the main parachute deploy switch at about 9,500 feet. It was just a little below 10,000 feet. It came out and streamed. It was reefed for a little while. Boy! There is a lot of stress on that parachute! You can see how it is being tried. The parachute unreefed and it was beautiful. I could see no damage whatsoever.

Rate of descent was right on 30 feet per second. Incidentally, prior to retrofire the rate of descent indicator was reading about six or seven feet per second. I was convinced that the main parachute was good and selected the auto position on landing bag switch and the bag went out immediately. I went through the post reentry, post-10K, and post landing checklists and got everything pretty well taken care of.

The impact was much less severe than I had expected. It was more noticeable by the noise than by the g-load. There was also a loud knock at impact. I thought "We have a recontact problem of some kind." I was somewhat dismayed to see water splashed on the face of the tape recorder box immediately after impact. My fears that there might be a leak in the spacecraft were somewhat confirmed by the fact that the spacecraft never did right itself on the water. It continued to stay in a $60^{\circ}$ attitude on the water.

[redacted]

The direction of list was about halfway between pitchdown and yaw left. That is the attitude it maintained on the water.

I got everything disconnected and waited for the spacecraft to right itself. We do not have a window in the egress trainer, but the level of the water on the window seemed to be higher than I had expected. The list did not change.

I knew that I was way off track. I had heard the Cape Cap Com transmitting blind that there would be an hour before recovery. I decided to get out at that time and went about the business of egressing from the spacecraft.

Egress is a tough job. The space is tight and egress is hard. But everything worked properly. The small pressure bulkhead stuck a little bit. Pip pins and initiators came out very well. I easily pushed out the canister with my bare head. I had the raft and the camera with me. I disconnected the hose after I had the canister nearly out.

I forgot to seal the suit and I did not put the neck dam up. I was aware at this time that the neck dam was not up. It should have been put up right after impact, but I had forgotten it. I think one of the reasons I did not was that it was so hot. However, it wasn't nearly as hot as I expected it to be. I think after impact I read 105 on the cabin temperature gage. I was much hotter in orbit than I was after impact. I did not notice the humidity. I felt fine.

I climbed out. I had the raft attached to me. I placed the camera up on top of the recovery compartment so that I could get it in the raft with me if the capsule sank. I did not want to take it with me while I inflated the raft.

I slid out of the spacecraft while holding on to the neck. I pulled the raft out after me and inflated it, while still holding on, to the spacecraft. The sea state was very good. Later on the swells may have increased to eight or nine feet. But at impact the swells were only five or six feet. I got in the raft upside down. It was attached to the spacecraft.

The rest of the debriefing I can do later. This is the only part I really need to talk about now. The rest will come back in much clearer detail when I get the voice tapes.

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# 4.0 FLIGHT OPERATIONS DEBRIEFING

## 4.1 Prelaunch

4.1.1 Insertion and Countdown.- Starting back at the hangar, things went right on schedule. We actually picked up time in the hangar. We waited a little while to get the word to go to the van, and waited a little while in the van. The Weather Bureau representative came down. We did the weather briefing at the pad. We had forgotten to synchronize the standby clock and standby wrist watch. We did this at the base of the gantry. When the word came to go up, I went on up and climbed in with very little delay.

4.1.1.1 Comment on insertion procedures: The insertion went without a hitch, except for one item. The helmet visor seal bottle hose was not properly restrained out of the line of vision by the new velcro tabs on the survival kit flap. This made it necessary to bring the visor seal hose underneath the shoulder strap and out to only 2 of the 3 pull-downs provided on the survival kit. It was not well restrained and it needs to be improved. Threading the hose through the shoulder harness allows it to work its way out directly in front of the chest mirror as you move around in the seat, so the hose may have partially obscured the mirror.

4.1.1.2 Comment on countdown procedures: The count went perfectly until the weather hold. We held 45 minutes for that, picked up the countdown at T-10 minutes, and it proceeded perfectly again until lift-off.

4.1.2 Communications.- I have no comment on the communications other than that they were excellent throughout the prelaunch period.

4.1.3 Prelaunch Period.- There were not any moments of confusion in my mind, at least, during the prelaunch period. During the weather hold, I managed to get a call off to my wife and the children. It went very smoothly. There were no problems other than the visor hose.

4.1.3.1 Comment on the length of the prelaunch period: During the prelaunch period I had no problems. The couch was much more confortable with the comfort liner in it. The liner is left off until X-1 day, because it is fragile and gets torn up with people climbing in and out. I had no pressure points. I did

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not even have to stretch my legs up toward the small end. I moved the left leg out and crossed it over the right one, but I was very comfortable and could have stayed there quite a bit longer. I had thought about the heat pulse, and that I might forget to drink during the flight, so I wanted to make sure I had a lot of water before lift-off. In addition, I was just plain thirsty before I got in the spacecraft and I drank a lot of water. Which I soon regretted, because I had to use the urine collection device three separate times before launch. As you know, I had never tested it in the centrifuge that full. It was full, and I also thought it was leaking. As it turned out, it did not leak, but I thought it was leaking, and this concerned me some. The length of the prelaunch period was not bad at all. I think I could have gone at least twice as long. I did exercises. I strained against the couch, against the restraint harness, and worked against the seat. That helped.

4.1.3.2 Did you suffer from physical discomfort during the prelaunch period: No. I cannot think of anything.

4.1.3.3 Were you adequately trained in prelaunch operations which involved you: Yes. I got a lot of training from MA-6 and I received more during MA-7.

## 4.2 Launch and Powered Flight

4.2.1 Sensations.

4.2.1.1 What were your predominant sensations during powered flight: At firing signal, everything became very quiet and I expected to feel the launch vehicle shake, or some machinery start, or the lox valve make some noise. Incidentally, during the whole prelaunch period the launch vehicle was much more dormant than I had expected it to be. I did not get a lot of the clatter that John Glenn had mentioned. Once I felt the engines gimballing, but I don't recall hearing the boiloff valve. I was relieved to get down to 18 seconds but everything was very quiet. I expected to feel the verniers light off, but I did not. Nothing happened until zero. Then I began to feel the vibration. At this time, you get some idea of the force you're on top of. There's a little bit of shaking. Lift-off is unmistakable. I called lift-off and time zero before I heard it on the radio. There's no mistaking lift-off. I remember starting the clock, and I remember most of the reports. All the instrument indications were just what I had

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expected them to be. The reports, as I remember, went off pretty much as they had in the trainer. I reported the cabin sealing. I took off with the mirror down so I could watch roll programing, but I did not see it. Very shortly after that, I moved the mirror out of the way so I could see the pitch attitude. I did look out of the window. I could see one contrail and an airplane making another contrail at about 35,000 feet, just slightly off to the right. At around 00:01:30, the sky changed in brightness rather suddenly. It didn't get black, but it wasn't a light blue anymore. It was a dark blue and the change was sudden. Maximum q was not nearly as bad as I thought it would be. There is a lot of noise anyway. I could hardly believe we were through maximum q. It is something you would not notice unless you were looking for it. BECO is very gentle and you hear a noise. Three seconds later staging occurs. There's no mistaking staging. There are 2 very definite noises at this point; one is accompanied by the drop in acceleration, and the other is associated with staging. I think I called staging since I felt it. The VOX linger was a little too long at this time. It cut out some of Cape Cap Com's transmissions. I heard him say something about "staging". I called back again and said, "Do you confirm staging?" This time I got all the transmission saying that Mercury Control Center confirmed staging. At staging you get a wisp of smoke or a change in the light outside the window. The sky looks as it did down lower. All of a sudden, there is more atmosphere around you. It becomes hazier outside the window. It is gone in a second, just a passing thing. I waited for tower jettison. This is unmistakable. When the tower goes, you get a bigger jolt than staging. I looked out and saw the tower rotating about 20 RPM, way off in the distance. I could barely see it. I saw just a bit of the horizon at this time and smoke still trailing out of the three nozzles. It was headed straight for the horizon. I went through the BECO check and went back to watching the gages. Just prior to BECO, from about 00:01:45 on, a cyclic yawing at about one cps had occurred. It was not sinusoidal; it was jerky. This picked up again after BECO, at maybe three minutes, and increased very gradually until SECO. At SECO there was a gentle dropoff in acceleration and you hear two separate bangs; a little one that was the clamp ring and another bang which was the posigrades. And Cap Sep was green, of course. The thing that really is your best due is the weightlessness. That just sort of surrounds you all at once.

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It's silent, too. It's the silence you notice. I went to fly-by-wire.

4.2.1.2 Relate the above sensations to your previous piloting experience: I cannot. The only things to relate it to are the Centrifuge and Procedures Trainer. I cannot think of anything in an airplane that is similar.

4.2.2 Vibration.-

4.2.2.1 Did you notice vibrations at lift-off: I did, but I wonder if you do not notice the noise more than the vibration. You notice some vibration, too, but the noise is predominant.

4.2.2.2 Did you notice vibrations at maximum q: Yes. There was a slight buildup, but I don't remember that it was much greater at maximum q than it was at lift-off. I did not look out of the window to see if the tower was shaking. Maybe one of the reasons I did not, is that I did not expect it to be. There was not enough vibration, as far as I could tell, to shake much of anything.

4.2.2.3 Did vibrations interfere with instrument readability: Which ones? Describe: Not at all.

4.2.3 Telelights.-

4.2.3.1 Did all telelights operate correctly through turnaround:

4.2.3.2 Which ones did not?

4.2.3.3 Describe your corrective action: Of course, you normally have two on at that time and they were on. I did not notice when they went off. They should have gone off at 00:10:05. I did not notice it and did not report it.

4.2.4 Communications.-

4.2.4.1 Comment on the quality of voice communications from lift-off through turnaround: Excellent. They did drop off from the Cape. I could tell when Cape Cap Com went to Bermuda transmitters. It was much clearer and I commented on this.

4.2.5 Noise.-

4.2.5.1 Identify major sources of background noise at various

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times: You hear the engines. You hear staging; this was very audible. You hear the tower. You hear the clamp rings, and you hear the posigrades.

4.2.5.2 Did background noise interfere with communications or your performance: Which noises? When: Not at all. The only problem was with the VOX linger. I set it the best I could, but I think it was a little toc long. It cut out some prelaunch communications and some launch communications with the Cape Cap Com.

4.2.6 BECO.-

4.2.6.1 Describe launch vehicle engine cutoff and tailoff characteristics: It is not a sharp cutoff. It is just about what I had expected. The noise associated with BECO is about the same level as that at staging.

4.2.6.2 How did you discern BECO: BECO is unmistakable because of the noise, and the reduction in acceleration.

4.2.7 Tower Jettison.-

4.2.7.1 Comment on tower separation: It is sudden and certain. You get a slight deceleration. I always thought of it as deceleration, but it is a jerk -- something you feel and hear.

4.2.7.2 Did you see it separate: I didn't see it separate. It happened too fast. The tower looked to me as though it was a half mile off by the time I looked up to see it.

4.2.7.3 Did you see the exhaust: I didn't notice the exhaust at tower jettison. I could see the exhaust, well after burn-out. The smoke was streaming out as the tower rotated.

4.2.7.4 Did the window cloud up: I did not notice that the window was fogged. I noticed no change in the window before and after tower jettison.

4.2.8 SECO.-

4.2.8.1 Describe sustainer engine cutoff and tailoff characteristics: There is a gentle reduction in acceleration followed quickly by two noises; the firing of the clamp ring and the posigrades.

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4.2.8.2 How did you discern SECO: By the change in acceleration, the silence of the launch vehicle engine, and the other two events that follow so closely.

4.2.9 Cap Sep.-

4.2.9.1 Did you discern separation of the spacecraft clamp ring? How? Did seperation occur immediately? How did you know: You don't really know, but you do hear the clamp ring fire. Then you hear the posigrade rockets firing. The most immediate sensation is the weightlessness.

4.2.9.2 Describe sustainer motion in pitch, yaw, and roll at Cap Sep: The spacecraft was oscillating one or two degrees (4° double amplitude) in yaw at SECO. This stopped and I did not notice any motions in roll.

4.2.9.3 Did you detect posigrade rocket firing? Describe: You do detect it by the noise. I do not remember feeling any acceleration during the posigrade firing at all.

4.2.9.4 Describe spacecraft motions at separation: There were none as far as I can remember.

4.2.9.5 What were your cues to spacecraft motions: I had none. I started the turnaround and wondered why I did not feel anything. You do not feel the rates and you see nothing out the window at this point. You have to go to the instruments to see how you are doing. It is like the trainer. You follow the needles and soon there is the horizon. It stops you, boy, it stops you when you see the horizon! You should have about 30 seconds with nothing to do here so you can drink this in and take account of what has happened.

4.2.6 Turnaround.-

4.2.6.1 Describe the turnaround maneuver: It went just like in the trainer. You are distracted somewhat by this odd sensation of weightlessness. I do not remember rate and attitude during turnaround. I remember it seemed to go at a pretty good pace. I went to ASCS right after that. I started talking to Cape Cap Com about the 'GO' and the retrotimes and so forth.

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## 4.3 Orbital Phase

4.3.1 Sensations.-

4.3.1.1 What were your sensations from spacecraft motion: None. You do not have any. I got into some pretty high rates. The needles were on the pegs a number of times. You can't tell unless you can see something. If you do not look out the window, you do not know which way is up and you care less. You can assign your own up. That is how simple it is.

4.3.1.2 Could you feel angular accelerations during spacecraft motions? Compare with ALFA Trainer: No. The ALFA Trainer provides a good simulation of what you see through the window when looking at the stars, but nothing can simulate this lack of sensation that you have in the weightless condition. The ALFA Trainer very closely approximates the spacecraft rates that you get looking up at the stars. This is very realistic. There is one thing I would like to mention before I forget; when I picked up the launch vehicle, it moved down the window exactly the way it was supposed to. I described its tumbling rates. It was very slow, not rolling. It was pointing away from me with the sustainer engine down. I could see what looked like little ice crystals spewing out of the sustainer nozzle. They seemed to be visible for two or three times the length of the launch vehicle, in a gradually expanding pattern. It is quite bright and easy to see. It crossed the horizon very early. I expected it to be against the sky longer than it was. I took the camera out, with the long lens on, and got what I hope are some good pictures of the launch vehicle. It was farther away than I had expected it to be at this time. It was so far away, I knew it was going away, but at this distance, our relative motion was hard to determine.

4.3.1.3 Were you ever disoriented? When? How did you reorient yourself: You have to define disorientation. I always knew where to go to see the window. So, with respect to the spacecraft, I never lost orientation. I knew where everything I wanted was. There were times when I did not have any idea where the earth was, but it did not matter at all. There were times when I could look out and not see anything. I couldn't determine which way I was looking, or what my rates were. At these times the rate needles are the only reference that you have. If you want to call this disorientation, then I was

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disoriented. But it's not important. You can get to everything you need. You know where things are, and pretty soon the earth will show up. All you need to do is to start a rate and it will come around. The periscope is very useful in this respect, because you have such a wide field of view. But, if you did not have that, the window would suffice. You also have a very good idea of rates through the window, if you can see anything at all.

4.3.2 Communications.-

4.3.2.1 Comment on the quality of voice communications from turnaround through retrosequence: I think they were very good. I did not get any transmissions through to Indian Ocean Ship on the first orbit. I heard the Cap Com calling and answered a number of times, but he did not hear me. Then Cape Cap Com said that Indian Ocean Ship's voice communication was out, on the second orbit, I believe. The only other problem I had was with Hawaii. I called them and heard them calling me a number of times on the first orbit, but they never read me. When I was within range, everybody said they could hear me, and I heard very well. At one point the Muchea Cap Com made the comment that I was still loud and clear and I got the idea that he had expected a loss of signal long before then. Communications were excellent.

4.3.3 Noise.-

4.3.3.1 Identify major sources of background noise during orbit: The major source of noise during orbit is the noise you get through the headset when the VOX is keyed. Outside of that, noise is conspicuous by its absence. It is very quiet and this is one of the things you notice most at SECO.

4.3.3.2 Did background noise interfere with communications or your performance? When: The noise level changed 2 or 3 times and I thought perhaps something had stopped running. As a matter of fact, I swept through all the inverters once because there was a change in noise level and I thought maybe an inverter had stopped operating. It may have been the programer or the camera, but it did not sound like the camera. Once a noise started that had not been present before. Again a noise stopped that had been present for a long time.

4.3.3.3 Was the noise level annoying: The noise level was not annoying at all. In fact the silence was welcome. The headset

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was very quiet, too, no static. I got emergency voice loud and clear every time. You can tell when you get R and Z Calibration through the rate needles. I noticed them jump when R and Z Calibration was sent. The rate needles are the only indication of R and Z Calibration. I did not notice attitude needles jump.

4.3.4 Weightlessness.-

4.3.4.1 Describe weightless flight briefly: It is exactly what I expected it to be from my brief encounters with it before. It is very pleasant. It is a great freedom, and a situation that you adapt to very quickly. It becomes as natural to let go of the camera in mid air because you know it is going to stay there, as it is to put the camera on the table. It also becomes natural to stick heavy items on the velcro on the hatch. In the trainer, they droop down and fall off. Up there they don't. I did everything with my head that the suit and helmet would allow, and could get no sensation which differed from what I would experience here. I shook my head violently in every direction I could think of, and there was no unusual experience.

4.3.4.2 Were the controls easier or harder to reach and operate under zero g: Everything is easier.

4.3.4.3 Were there any floating objects in the cabin during weightless flight: I noticed one washer that appeared and reappeared a number of times because I didn't have any good place to put it. It kept leaping out of the glove compartment. It bounced around until it could find a hole in the glove compartment and then it would slide out. I think it was the same washer each time. When I started to eat the first meal, I noted that the food had all crumbled. The food in a bag is hard to handle, especially when the bag is not transparent. It was only translucent and you could not open it up and know whether you would find things on the bottom where you would have to reach in to get them, or clustered right at the top. Every time I opened the bag some crumbs would come floating out. There were crumbs all over. I ate one of the little bite size pieces. It was hard to get down past the mikes; I should have moved the mikes and put it in. I had to sort of feed it in over the mike. I was aware that it might get away and was very careful to get it into my mouth right. As soon as it is in your mouth it is just like eating anywhere else -- no problem. As John Glenn said,

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"You've got a positive displacement system working for you and once it is in your mouth your problem is over." I put the food back in the bag and did not bother with it anymore until I ate the Xylose pill. At that time I had some difficulty with the crumbs. A lot more got out. The rest of the food had either crumbled or melted.

4.3.5 Cabin Lighting.-

4.3.5.1 Was cabin lighting satisfactory during daylight? During darkness: During daylight, yes. During darkness, no. If you were well night adapted, you could read every instrument by the light from the time correlation clock. It was difficult to dark-adapt. I'm not sure that dark-adaptation does any good, anyway, because even in the dead of night through the window I could not see as many stars as could be seen from the airplane coming back from the carrier last night. I think it is useless to waste time counting stars in a given area to determine if your visibility has increased outside the atmosphere. The window is more restricting than the atmosphere. The little fingertip lights are very helpful. I think we should have red filters over the photo lights, as well as the cabin lights. More red light is needed to see everything well. I had to shine my red fingertip lights on a number of the instruments in order to read them. This was particularly true in the case of the clock, because digital windows are recessed and the numbers are not lighted well with the red cabin lights. The star charts are not legible under red lighting, because of the shiny surface of the plastic. There are so many reflections that you can't read them without either the cabin lights, the photo lights, or the fingertip lights. Even with the fingertip lights, there is so much glare that it is hard to see the small numbers on the side showing elapsed time. The star charts are hard to use under night lighting.

4.3.5.2 Did sunlight effect the visibility of the instruments or controls? If so, how did you compensate for this: The sun went right down the window on the first orbit. As long as it was coming straight in the window, there was a bright glare, so bright that I felt like shielding my eyes, and I did. I held my hand up to shade my eyes and then I could see alright. When the sun is shining directly on your face through the window, it is very bright. The light is scattered by the window. The sun is not a little tiny point but produces a great white glare on the window. You tend to shade your eyes or change the spacecraft attitude so you can get the sun out of the window.

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4.3.6 Control System.-

4.3.6.1 Could you hear operation of the control system? (thrusters, solenoids, control linkages, etc.): Yes. You can hear the solenoids, both low and high, on fly-by-wire. The manual thrusters can be heard but you do not hear the clicks that are associated with solenoids. You can hear and feel rate command, you can hear the manual solenoids click. You do not hear the control linkages but you do hear the solenoids. You can hear the thrusters, and you can feel the rate command system kick in.

4.3.6.2 Could you see the exhaust from the pitchdown thrusters: You can see the pitchdown thruster exhaust. It is faint and transient little "v's" of steam coming right up by your window. You don't see anything moving, you just see this little "V" appear and disappear. It is white, it looks just like steam. It is very vaporous, but visible even at night.

4.3.6.3 Comment on the quality of the manual control system for each control mode used: For maneuvering in orbit, there is no need for the 24-pounders. I feel that they should be wired out in orbit. All the control systems worked perfectly throughout the flight. The manual proportional was very smooth and I still prefer it. Manual proportional is exactly what you want. If you touch the controller very gently, you get the rate you want and you can vary it gradually. With the fly-by-wire low thrusters you get very imperceptible needle movements and you must wait to pick up the desired rate. Once you know the low thruster is operating, you hold the stick in position until you have gotten the desired rate. If you want as much as three degrees per second, it requires either a long wait on the low thrusters or use of the high thrusters. On manual you can get three degrees per second in just about the time you need it. To my mind, manual proportional was very good. I used rate command once, possibly two or three times, and was not aware of the 'boot' you get in yaw right, pitchdown, and roll right. As far as I am concerned, the 'boot' was not present. The 'boot' is supposed to make you overcontrol, but I think that this little gas pocket disappeared in flight because there was no tendency to overcontrol. Rate command is a good mode for reentry or for retrofire but is no good in orbit. You do not need that type of control. I much prefer the manual system. For normal maneuvers, fly-by-wire low thrusters are the best system. For a tracking task, it would be best to have manual

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proportional. The fly-by-wire high thrusters, the rate command, and auxiliary damping systems are not needed in orbit as far as I'm concerned. I was very pleased by the performance of all the manual control systems. They were effective. There was no backlash; slop was not noticeable, no binding or lag. The rates produced by the low fly-by-wire thrusters are so imperceptible that you can go past low and not know that you have activated them, particularly if you are doing something else, such as talking, at the same time. I think we need another stick for fly-by-wire low. Then there would be no danger of overshooting and using the high torque thrusters. I did this a number of times. I overshot and activated the high thrusters because it's a natural thing for me to do. If, for instance, you want to roll left, you move the stick to left. If the rates are not exactly what you want, the natural tendency is to increase the displacement of stick, as you do in an airplane. Soon you overshoot and activate a high torque thruster and then you have too much thrust. I would like to get rid of the high torque thrusters when maneuvering in orbit. Another problem is that you do not really get a chance to get a good feel of the control system on the ground, because you can't operate the valves dry. It would be good to be able to tell by feel when the thrusters are ready to come on. A pencil stick would be very good for this. When you get to the stop on each side you've got fly-by-wire low thrusters. I think that would be good.

4.3.6.4 How did the performance of the various control systems compare with what you expected as a result of training on the Mercury simulators: I think that fly-by-wire low rates were a little bit less than I expected. I think the Procedures Trainer simulates thrust values which are too high. I think the ALFA Trainer does too.

4.3.7 Maneuvers.-

4.3.7.1 Comment on the following maneuvers: Sustainer Tracking, ASCS Zero Pitch, 180° Yaw, 180° Roll, Forward Inverted Flight, Drifting Flight, 720° Roll (for radar test): Sustainer Tracking: With the low relative motion between the sustainer and the spacecraft, fly-by-wire low torque thrusters worked very well. I did not track very long, but I stayed on the stick and kept the sustainer right in the open center plus mark. I convinced myself that it is quite an

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easy task to line up a point on the window with the sustainer and track it. I did not track very long because I also wanted to get some pictures of the sustainer at this time. Tracking and picture taking are not compatible. Tracking is only a function of the components of the control system. With one to four pounds of thrust you could get proportional control down to low levels. If you want tracking, I feel this would be ideal. ASCS Zero Pitch: I do not think that I ever held ASCS zero pitch. I doubt that this would be any different than ASCS in any other pitch attitude. You are without any reference to the horizon and this is alright unless you have cause to doubt your attitude indicators. You must cross-check your rates in the periscope. The zero pitch mark on the periscope horizon line is very valuable for gyro alinement. I used it a great deal. 180° yaw: This is no problem. I used varying rates in performing this maneuver without any difficulty. However, it is easy to confuse yourself when you have rates in more than one axis at a time. This produces a coupling effect and you don't get a lot of good out of the window, I did not, at least. 180° Roll: I think the only thing that I can say about this maneuver is that you do get pure roll without coupling. Rates in the other axes stay roughly at zero. I cannot remember doing a complete roll. I was supposed to do two over White Sands. I was talking to the Guaymas Cap Com then. I called and said something about "Give me a mark on the White Sands radar test," and it seems to me that he said, "Begin six-degree roll rate now." At that time I was not in the right attitude and my gyros were caged. Had I performed the radar test it would have yielded meaningless readings, since I wasn't rolling around the correct yaw axis. I told Guaymas Cap Com to wait until I got in attitude. I realized then I wouldn't make it in time. I do not feel I can give a good story on 180° roll, although I do remember nothing that pure roll stayed pure roll. It did not couple into pitch or yaw. Forward inverted flight: This is beautiful. That is the way to fly. It is nice to have the horizon ahead of you in view, or to be looking straight down. I think you can pick out your nadir point very easily without reference to the horizon. You can, whether you are looking straight down or off at an angle. I do not know how you do it, but I felt that I could tell whether I was looking straight down or ten or twenty degrees off to the side. Drifting flight: This is a thrill, a tremendous thrill, except it is not much fun when you don't have any rates, because you see the same things all the time. If you pick up a rate on any axis and watch the world go by, you

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have a moving picture up there. You see something new all the time. Everything, of course, is brand new. You can't beat it. It is wonderful. Drifting flight is really the most fun. 720° roll: I have commented on the 720° roll from radar. I didn't do it. It certainly would be no problem.

4.3.7.2 Comment on the gyro uncaging procedure: Alining the gyros is a time-consuming, or fuel-consuming, process if you have to do it in a hurry. Yaw reference is something that has to be studied. I think that we need a visual simulator to give us some practice on this problem. It is of vital importance to have all roll rates exactly zero before you can use terrain movement to determine yaw attitude. The gyro uncaging procedure is good. It is very handy to have a periscope to check on your pitch attitude after you lose the horizon. However, it is time-consuming and it takes steady attention for quite a period.

4.3.7.3 Comment on yaw attitude determination under both daylight and night conditions by using: Check points through the window; Check points through the periscope; Terrain drift through the window; Terrain drift through the periscope; Star bearing through the window; Star drift through the window: By pitching down fifty to seventy degrees in pitch you can obtain the best yaw reference through the window. You have to move a long way out of orbit attitude to get this reference. Another good yaw reference is available on the periscope in nearly any attitude. The high magnification setting on the periscope is the best for this, if you have a pattern on the ground or a cloud pattern. Yaw reference by star drift through the window is very time-consuming, even more so than terrain drift. We should not put a lot of stock in it, because it takes so much time. It would be better to recognize a star that should be on the horizon, get the horizon in your visual field, and then put the star where it should be.

4.3.7.4 Comment on yaw rate determination by using: Movement in the window; Movement in the periscope: Movement in the window is good but, again, roll can affect what you see so markedly that you must be very careful to have your roll rate zero before your indication of yaw rate means anything. If you are way out, say ninety degrees in yaw, the very best reference is low magnification on the periscope. For vernier corrections close to the proper yaw attitude, the high

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magnification is best and the relative motion along the reticle on high magnification is quite rapid. I should emphasize again that any roll rate at all is magnified tremendously in what you see as a yaw angle. Yaw attitude is difficult to determine at night. The very best reference is a known star. You can look at the earth and tell when you are looking straight down, but I could not look up and tell whether I was looking straight up or not. Without the horizon in the window you don't know whether you are pointing up. So, at night, the only really good yaw reference is by knowing the time and the star that should be on your track. You must find it and point the spacecraft at it. I agree with John Glenn that the very best yaw reference on the daylight side is the window. However, the window loses its effectiveness as your pitch attitude approaches zero. The periscope is useless at night. As a matter of fact, I remember saying into the tape the first nightside, "Something's wrong with my periscope, it must have come in." I was looking at the switch and trying to figure out what had happened to the periscope. Then I realized that it was looking at the nightside and dark earth below. I was still looking out the window at the sunset and it was just a black hole down there through the periscope. When the moon is not up, the periscope is useless, and the very best yaw reference is a familiar star pattern. You can also aline yourself in yaw if you can see the Big Dipper and find north. For this you must know what your attitude should be with respect to a compass rose. I did notice that the terminator is visible on the surface of the earth when the moon and the part that is not are both visible through the window. The lines on the window are very helpful. They were really bright at night.

4.3.7.5 What is your opinion of using drifting flight for extended periods of time? (i.e. several orbits): I think this is wonderful. I think that we could use some study on what rates to start out with. We should set up an attitude and then put in a rate that will, in the period of one orbit, allow you to sweep through at a very slow rate everything you want to see. The spacecraft was very stable. I think that it is possible to set up a very slow rate and have it stay in there for as long as you care to leave it. One degree per second is enough. John Glenn said in his debriefing that he wasn't able to hold zero rates for any length of time. His spacecraft gradually picked up a rate. I didn't

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notice this. I felt that, once zero rates were obtained, the spacecraft would stay oriented for a long period of time. During one period of drifting flight the moon crossed the window and the rates were low enough so I just zeroed them all out and the moon stayed in the center of the window for a long, long time. I was occupied with something else for some time and I was surprised to see that the moon had not moved after I was through.

4.3.8 Planning and Training.-

4.3.8.1 Were the inflight activities adequately planned: I think they were adequately planned and I was well aware of everything that we wanted to do and how to do it. It took too long to do it and report on it, too. I was unable to get any of the Weather Bureau photography. Changing film is just like John Glenn said. It bothers you to have to waste time on little things like changing film in a camera. Everything should be made very simple and very easy. Finger dexterity is something that is pretty hard in the suit but even this is improved at zero g's. There was a lot of activity planned during the flight. There was too much. The training involving inflight activities was hampered by a number of things. One of them was the lack of a visual simulator. Another was the lack of the inflight equipment. Finally, there was a lack of adequate flight configuration stowage. Training was also hampered to a great degree by the fact that a finished flight plan, one that had approval throughout, was not available much earlier in the preparation program. A flight plan was drawn up and practiced but down deep you knew it was just tentative. You had to wait until the last minute to get it approved. This is not good. Every little correction has a great effect on what you do. Adding and subtracting things, and prohibiting certain items, or including other items in the flight plan, hampers training and inflight performance.

4.3.8.2 How long before the flight do you think flight plans should be frozen: I think two months, or sooner. It should be finalized as soon as possible, because it affects the equipment you are going to use on the flight. There are a lot of other things to do besides sitting in the trainer working out the flight plan and working with the equipment. I think that the most vital part of the whole preparation phase is getting a flight plan that has everybody's sanction at the

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very earliest moment. Then you can work on this and have a guarantee that there will be no additions or deletions.

4.3.8.3 Did you practice stowing equipment in the Procedure Trainer: I did; however, we did not have the flight configuration equipment. We did not have a glove compartment. There were a lot of last minute changes. Stowage was not a problem in the flight. We worked that out very well. The ditty bag is almost unreachable in the trainer. You just can't work with it. At zero g, it's just as handy as it can be. The ditty bag was not a problem in flight. In the trainer you know what a problem it is with the suit on. You hate to sit in that suit in the trainer because you're so restricted in mobility. You have the mobility in that suit at zero g that you have in your shirt sleeves in the trainer at one g. It's just fabulous the mobility you have! I would recommend that the flight plan should not be quite so busy. I was unable to do everything that I wanted to do. I think one of the reasons was enough time was not allowed for looking at new things and evaluating and recording them. For example, five minutes was allowed for evaluating the haze layer. It takes you five minutes to look at it and another five minutes to report on it. The flight plan was too busy. I think that a good way to make up a flight plan would be to list the experiments and observations in order of their priority and then provide a certain part of the flight plan for their execution. The investigation of these items should be ad-lib, because so much is tied to launch time, which determines sunrise and sunset times. I think we could do some more work on the way the flight plan is arranged. In airplanes you go up and fly and do things in order, and it really doesn't depend much on the time of day. When you have things to do that depend on the time of day, I think we need a new approach.

4.3.8.4 Was there adequate time allowed for a smooth transition from one activity to another: This varies. There was one very good period on the third orbit after the Cape where there was time available to sit back and think about what I wanted to do. There was a little time that was not filled with demands and I could experiment a little bit. I could use my own ingenuity to evaluate the situation. The answer really is, no.

4.3.8.5 Was your training adequate for the activities involving control of the spacecraft? (maneuvering, switching control modes, gyro uncaging, etc.): I understand fully the functioning of all

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the systems, I believe. However, we don't have a good way to simulate the gyro uncaging procedure because we don't have any visual presentation through the window or the periscope. The first time this was ever really done was in flight. I am sure that had I had more training it would have been done more easily and quickly. Maneuvering in orbit is no problem. You can maneuver with respect to rates and attitudes that you see out the window when you have a good visual presentation just as easily as you can when you have rates and attitudes on the indicators. I am very familiar with what is required in switching control modes, but there were two or three times when I had double authority and did not want it. One of these times was during retrofire and, of course, I did not notice it at that time because the response of the spacedraft to the retrorockets is so high. However, in orbit-maneuvering it was apparent when I had double authority because the spacecraft rates are so high. I caught the error immediately but I expended fuel in the process. On two or three occasions the gyros did not cage. One time I caged and one of the needles did not go to zero. Another time pitch and roll attitude went to zero but yaw stayed at thirty degrees. I went to "free" and "caged" again and this time it did not cage. I caged once when I had a roll attitude that was creating some coupling in pitch and yaw. This occurred when I was low on fuel. I did not want to use a lot of fuel to bring the roll attitude to zero. I caged with roll attitude very close to the indicator stop. Pitch attitude was also very close to the negative indicator stop, but gyro caging worked fine that time. Prior to retrofire, I caged with yaw on the positive stop and this was when I had the ASCS problem. I did not really know what was wrong. The roll and pitch caged correctly but yaw did not. I set up a right yaw rate, I believe this was when the gyros were caged, and when I got past about forty degrees right yaw, the yaw needle flipped around and stopped at zero. This is bad practice. I realized that at the time but I felt there was no other choice. We do not have an adequate trainer for gyro procedures. Switching control modes training is also inadequate.

## 4.4 Retrosequence

4.4.1 Sensations.-

4.4.1.1 Describe what you saw, heard and felt during retrofire: I was very hurried during the preretrosequence period. This

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is, I believe, when I started knocking the particles off the side of the spacecraft. That fascinated me and I wanted to get some pictures at that time. So I pushed myself too close to the limit with the equipment stowage and the pre-retrosequence checklist. The Hawaii Cap Com was a big help in insisting that I get busy with the checklist. I kept watching the clock. I thought I would have time and I would have, had it not been for the ASCS problem. I was hurried during that period. Retrosequence came right on the California Cap Com's mark. The retrosequence light went green. I had the "switch warning lights to bright" item on the checklist and the lights were not as readily visible as they should have been. I do not really know why the warning lights were on dim. Earlier in the flight I had taped over the cabin water and fuel quantity lights. I may have gone to dim rather than tape a third light. It may have been an effort to reduce the lighting in the cabin at night. At any rate, they were on dim and that was not good. They are not really noticeable when dim. The California Cap Com's count was very helpful on retrosequence. I think it was sometime after retrosequence that I told the Cap Com that I didn't trust the ASCS retroattitude and was going to have to go fly-by-wire. The Cap Com said, "Okay," and stated that it would be necessary to bypass retroattitude. I would have forgotten that. I would probably have been five hundred miles long if it had not been for the Cap Com's reminder. I followed the Cap Com's countdown to retrofire. I looked at the clock and it was reading twenty-nine seconds. I did not get retrofire. I pushed the "fire retro" button and still did not get retrofire for about a second or a second and a half. It was a very short delay. Another item that concerned me was the fact that just prior to retrofire the balloon was right out in front of the window. This was a result of not being able to jettison it. During the drifting flight that had preceded retrosequence the balloon had become wrapped around the spacecraft. There were a couple of times when the line was coming down from the heat shield right across the window. However, I am convinced that the line was not wrapped around at the time I tried to jettison the balloon. I have never jettisoned the balloon before but I imagine you should hear some sort of report from the squib. I heard a report when deploying the balloon. When I tried to jettison it the switch was dead. I worked it from "deploy" to "jettison", back and forth. I shook it and wiggled it and did a lot of other things but nothing happened. So I watched this balloon, but it was not in sight at retrofire. I was afraid for a while that it was

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going to be. I would have liked to see what it did, but I did not. It was out of view. For fifteen minutes prior to retrofire I imagine that I was on fly-by-wire. However, the preretrosequence checklist called for ASCS with a manual backup which I selected. Then I suspected ASCS so I went to fly-by-wire and did not push the manual handle in, as I should have. This gave me double authority and that is where I lost the rest of the manual fuel. I got the count at retrofire. I looked at the clock and at twenty-nine the retrorockets had not fired. I punched the button and I had time to think "Oh, something has gone wrong." Then they fired. I think now that it was at that time that I saw the smoke, either then or after all three rockets fired. It did not smell like insulation burning. It smelled like hot metal to me, like oxide burning off when it gets hot. I saw nothing at retrofire. I heard the retrorockets fire, of course. It was a very mild deceleration. I had the idea at that time of a little push on the back. Not a great big one like the retropack appears to be. I was not paying much attention to my sensations at retrofire until it was all over. I called out one, two and three. After it was all over I felt, not that I had been pushed back to Hawaii as John Glenn did, but rather that I had just stopped. I was convinced that if I looked down at the earth I would see that all the relative motion had disappeared, and that I was going straight down. As soon as you look out the window this is all washed away, because the relative motion of the spacecraft has not changed much.

4.4.1.2 Did you detect and mark individual retrorocket firings: Very easily.

4.4.1.3 Compare the sight, sound, and feel sensations of retrofire with those experienced on the Centrifuge, ALFA Trainer, and Procedures Trainer: The sight is similar to what you see on all of these, but I think the alinement was very good this time because I don't remember any rates at all. I don't remember controlling a great deal. Of course, I had double authority, on which we have not practiced a great deal. I think the alinement was very good. The "feel" sensations of the retrofire and those produced by the Centrifuge simulations of retrofire are not similar at all.

4.4.1.4 Did you detect separation of the retropackage? How: I did. You hear a noise, and maybe you sense a little jerk.

4.4.1.5 Did separation of the retropackage affect the spacecraft

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in any way: No, not that I could see.

4.4.2 Control System.-

4.4.2.1 What control mode(s) was used for retrofire? Comment: I was on manual and fly-by-wire and I think that I had expended my remaining manual fuel during retrofire. After retrofire, I realized that I was on double authority. I went off of fly-by-wire and tried to control using the manual system because I wanted automatic control for reentry. I had no control of rates with manual at all. I went to rate command and still had no control. The reading on the manual needle fuel gage was five or six percent, but there was not any fuel left. So I went to fly-by-wire. At that time the auto fuel gage read fifteen percent. I was concerned, because I thought maybe this would indicate ten percent fuel actually remaining, because the manual tank was empty when indicating five percent. So I went to drifting flight again for ten minutes. I wanted to keep the attitude such that I could see the horizon. I had ten minutes to get a yaw reference at a pretty flat attitude, which is adequate. I did not want to use a lot of fuel getting into reentry attitude at that time because there would have been a long period where I could have drifted and not known it. So I stayed down where I could see the horizon and planned to stay that way until I got either .05g or reentry oscillations. I don't remember .05g. If it came on, I recorded it. I think I did note it and then I pitched up to an attitude that I felt was about right for reentry. I do not think it was just chance that I was in the right attitude at reentry. I think that prior to .05g or prior to the time that the oscillations built up, there was enough aerodynamic damping to orient the spacecraft properly. I believe that the spacecraft could reenter and get down to a hundred thousand without any fuel. I think it could do it on its own. The rates were very, very low. The oscillations, when they first started, were maybe a quarter of a degree on either side of zero and they remained like that. It was as stable as it could be until down around a hundred thousand feet and then I began to observe large oscillations. I noticed three or four degrees in pitch and yaw. I took the reentry roll rate out somewhere about that time. I noticed the rate needles were on the stops and I began to feel a knocking back and forth. You could hear a noise and feel a sharp stop on each side.

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4.4.3 Planning and Training.-

4.4.3.1 Was preparation and execution of retrosequence conducted as in flight simulations: No, it was hurried. The equipment was all stowed okay. I put the binoculars in the map case and this was not their planned position. Everything else was in the ditty bag, and the ditty bag was closed, except for the items that I launched with in the glove compartment. I did not go through the complete pre-retro checklist. I did get the important items. The retrosequence checklist is not in order of priority. It runs from left to right across the instrument panel. Perhaps we should have a short retro checklist to use in an emergency. The one I used was very complete. It was long, but it was easy to do. I did it in the trainer in two or three minutes on a number of occasions.

4.4.3.2 If you controlled retrofire, what was the difference in controlling actual retrofire as compared to retrofire simulations on the ALFA and Procedures Trainers: I think the attitude alinement was very good. In training I have never divided attention during a retrofire between window, periscope and the instruments. I know that this dividing your attention between the three reference systems is a bad way to control retrofire. However, I did this during retrofire and this was a difference between the trainer and the flight. Another difference was double control mode authority. Another difference was that the pitch needle was not indicating 34°. It was around 15°. The control task is a very simple one. Since I had double authority and did not realize it, the control task may have been more difficult than necessary. A final difference between the flight and the trainers was the linear accelerations to which I was not accustomed, which may have resulted in overcontrolling.

## 4.5 Reentry

4.5.1 Sensations.-

4.5.1.1 Describe your sensations during reentry, noting both high heating and high g periods: I did not notice a heat pulse in the cabin at all nor did I notice heat on the suit from direct sunshine. The only g pulse I really noticed was the reentry deceleration. I noticed this because I talked throughout the whole thing and I remember noting that I could not say as many words with one breath as I expected to be able to. I had to

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breathe in midsentence to get another bunch of words out. But the heat pulse was not noticeable. Incidentally, I noticed rate-of-descent of about six or seven feet per second on the rate-of-descent meter prior to retrofire. I had not noticed it before because the flight plan covered this indicator in orbit.

4.5.1.2 What was your first cue to g reoccurring upon reentry: I noticed a hissing sound. This was my first cue that reentry was starting. I also remember that the hissing sound began long before the Cape Cap Com said, "We're expecting the blackout to occur in forty seconds." I am not sure that I commented on the hissing. You are not really sure you hear it until after it is all gone. Then you realize it has been present. I put in a roll rate. I thought maybe, because of an improper reentry attitude, that I might get a coning movement. However, the spacecraft was rotating right around its axis. I looked down around the center of the window and it was turning in a perfect roll. I sighted through the lower part of the window right along the center line. I could see a given spot in the sky all the way around, so the roll rate was pure roll. This was after the oscillations had started, so I feel I was alined properly. The roll rate was reading ten degrees per second. The g period seemed long. This may just have been because you do not really notice the length of the g period when all you have to look at is the g needle in the trainer. It's such a subtle thing that I cannot be sure. I remember looking down and reading something under one g. That was my first cue.

4.5.1.3 Was there a noticeable difference between the linear acceleration experienced in the spacecraft and the Centrifuge? Describe: No, as far as the simulation of reentry is concerned.

4.5.1.4 If the window shutters were open, describe how the "fire ball" restricted vision from onset to termination. When did it start? What was the duration: The first thing I noticed was a higher light level outside the window. There was a haze outside but it was not a bright glow. It was a haze with a faint orange tinge, similar to the temporary haze that occurred at staging. It had a slight orange glow. This persisted for some time and disappeared. I was surprised that quite some time after that I was able to see the little orange glow with a black hole in the center which is, I assume, the track you've been through, leaving little glowing particles behind. Flaming particles continued to fall off. I think that the orange haze

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appeared prior to .05g but I am not sure. The orange glow was just sort of a faintly luminous haze. In addition there was a green flame coming from around the cylindrical section. It was very noticeable. I thought for a while that the trim angle might be wrong and that I was taking off part of the cylindrical section. I can remember seeing three separate streams. One right in the center that looked to me to be V-shaped and appeared to come out eighteen inches from the cylindrical section, and then two smaller streams on either side. These fluctuated and glowed and were a bright, light green. Later on, about the time we were probably transonic, I saw three or four puffs of white smoke that looked like the smoke you get from a grass fire that is just beginning to burn. They were white and thin. As I looked out the window they were behind the spacecraft. A white glob of smoke would shoot back and then another, and another. Three or four at a time. This was a little above a hundred thousand feet, just before the altimeter was off the peg. It was also around this time that the retrostrap came off. Around the same time, also, I think the balloon line floated back. The retrostrap was eighteen inches long and about an inch wide. Long after the g pulse I saw a little part of that nylon balloon line coming floating back past the window. There were times after landing when the window was completely submerged, so if it was coated it could have washed off.

4.5.2 Control System.-

4.5.2.1 What control mode(s) was used for reentry? Comment: I used fly-by-wire until .05g or until I picked up oscillations. Then I went to Auxiliary Damping. I put in a roll rate with fly-by-wire before I went to Aux Damp. I was not aware that Aux Damp provided roll rate on reentry, but it did. When I went to Aux Damp the roll rate increased.

4.5.3 Communications.-

4.5.3.1 Comment on the communications blackout during reentry. Duration: I heard the Cape Cap Com estimate blackout 40 seconds. I said to him, "I will standby for your transmission on emergency voice." I heard nothing. I called him a number of times during this period. I did not hear anyone. From then on down, I just talked about what was going on. The duration was from blackout until main parachute. Then I heard the Cape Cap Com transmitting blind something about "landing long, estimate an hour." I believe this was after the deployment of

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the main parachute, but I am not sure. It is possible that I missed some transmission because my ears did not clear until I got the visor open and squeezed my nose. When you clear your ears your hearing gets much more acute.

4.5.4 Cooling.-

4.5.4.1 Comment on ECS cooling during reentry: Immediately after SECO I remember reporting steam vent temperatures of 70° for both the suit and cabin. I was comfortable for quite some time, I knew that more cooling was available and so I increased the water flow from the launch marks of 4, up to 5. I may have been impatient. I knew that ten minutes was required. I did not realize that I might still feel the effect of a change in water valve setting after 30 minutes. I did not get any change and I increased it again. The maximum setting I used on either the cabin or the suit was about 8. I did not get a substantial change in cabin air temperature through the flight. I did get substantial changes in cabin steam exhaust temperature, and substantial changes in suit inlet temperature, but no real changes in suit temperature. The cabin steam exhaust dropped. The cabin excess water light came on and I looked at the gage and it was down at about ten degrees. Apparently it swept down through 40°, and as soon as it froze, it dropped right down to ten degrees. I think at that time both the cabin and suit controls were set together. I realized that I had frozen the cabin and it was about time that I backed both of them off to zero, and set them at a lower setting. Cabin temperature slowly came up. Suit temperature never changed, and the suit temperature was hot. Through various manipulations of the suit needle, I finally got a drop in suit temperature. I never saw a substantial change in suit steam exhaust. I was quite comfortable through reentry. I was never warm on the water. I was busy getting out and I may not have been sensitive to temperature. I remember being surprised that the cabin temperature was only 101°. I think that is what it was. In the trainer, cabin temperature is 130° and John reported 130°. I was much more comfortable during the reentry and the time on the water, even climbing out, than I was for that period on the second orbit. Cooling during reentry, once the suit valve got in the right position, was adequate. In orbit, the temperature settings are a very critical adjustment, and the lags are much longer than I had expected. I was impatient with the response that I got from new settings. I remember, when I was very hot, I

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opened the visor and it was like a fresh breeze on my face. The temperature of the cabin is higher by 30 degrees than that of the suit, but when you open the visor it is a wonderful feeling. I have an idea that it may be the humidity that makes the suit so oppressive. I think that we do not get rid of enough water out of the suit. I think we need a better way to keep the humidity down. That is the only explanation I can think of that would make a 101-degree temperature feel cool by comparison to 70 degrees.

4.5.5 Oscillations and Vibrations.-

4.5.5.1 Were there any oscillations of the spacecraft during reentry: Oscillations during the g-pulse down to maybe 2g's were minimal and I was really proud of Aux Damp. Another thing that I noticed was that we got through the whole g-pulse with an unnoticeable fuel consumption. I was surprised to see that I still read about 15 percent after we were through the g-pulse. I noticed then that the rate needles began to swing out and then I think I took the roll rate out. I noticed rates of 3 to 4 degrees per second. I looked back out and, during this time, things were falling away, I think. The rate needles were soon on the peg and the sun came across the window. The attitudes really diverged then and the thing I noticed was the change. It sort of knocked back and forth, and then the knock on each end became less, but the rotation in that direction continued. I got the sensation that we were building up amplitudes steadily. At about 70 or 80,000 feet the rates really started going up, and at about 45,000 the oscillations really started diverging. I turned the fuse switch on at 45,000 and went over for the drogue. I watched the altimeter, and remember saying that the rates were going too far, "I'm going to have to try the drogue now," and I punched it off, I think, at around 26 or 27 thousand feet. It snapped out and it was really straining and shaking and pulsing but this stabilized the spacecraft very well. Then at 15,000 feet, I got the fuse switch for the main parachute. At about 9500 I looked for the main light and it was not on so I pulled the main ring. The main parachute came out and I was surprised at how it strained! I've never seen fabric vibrate like metal. It was stretched so tight--not like a sail luffing or anything--and vibrating like a piece of metal! It was taking a tremendous strain. I watched it ruffle around while it was reefed and then it unreefed right on time and came out. It is a beautiful

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sight! It really is! I remember noting the reefing lines. You see these things hanging and you think something has failed and you think, "Here's something that's broken." But you realize immediately what it is. The parachute rotated so that I could see the whole thing and it was perfect. There was no damage whatsoever; rate of descent was pegged right on 30. I went to auto on the landing bag and it came out right away so apparently there had been twelve seconds of time elapsed.

4.5.5.2 Could you estimate their amplitudes: Greater than 180 degrees double amplitude. It seemed to me like they might have been approaching 270 degrees at the time I pulled the drogue. This is only my subjective feeling.

4.5.5.3 Were they bothersome to you in a physical sense: No, except I thought maybe I was going to start going round and round. You know, all the way. But it didn't bother me.

4.5.5.4 Did any spacecraft components vibrate excessively during reentry? Note exact time of occurrence: No, everything was very solid inside, except that there was an audible noise when we stopped. It seemed audible to me--maybe it was just jerky--not a nice gentle vibration.

## 4.6 Landing

4.6.1 Drogue.-

4.6.1.1 Describe spacecraft motions before and at drogue deployment: They are definitely divergent at this point. At drogue deployment I think we had maybe 270 degrees of oscillation. This is something that I felt from having seen the sun go through past the window, and noting the rate at which the amplitudes built up. The oscillations diverged very rapidly. They went from a double amplitude of say 30 or 40 degrees to these violent 270 degrees oscillations in about three or four cycles. The period of these violent oscillations was something like two to three seconds. The thing that I noticed prior to drogue was the oscillations building up. They stop abruptly on either side. There is some noise there, too. You hear it snap. Then the snap on either end gets easier, and you feel yourself going past the other side and very definitely increasing. I called out the drogue fuse switch at 45,000 and waited and watched the altimeter and got very good correlation between cabin

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pressure and altimeter reading. I think I punched the drogue off at around 26,000 feet. I had wanted to wait and let it come out but the oscillations were increasing so much. It stabilized the spacecraft immediately. I think we were in a pretty good attitude when it did go out because there wasn't a violent snap into the proper attitude at drogue deployment. I watched it out the window. It vibrated very fast back and forth. It had maybe three or four CPS everyway it went. It was pulsing and breathing and going back and forth at a very rapid rate.

4.6.1.2 Did you hear the drogue mortar: I did.

4.6.1.3 Describe drogue deployment. Automatic? Manual? Failure indications: I can't describe the drogue deployment very well. You hear it and it is there. It is that fast. As far as I am concerned, it was a perfect drogue. I couldn't see any damage at all.

4.6.1.4 What was the indicated attitude of drogue opening: I think 26,000 feet.

4.6.1.5 Describe spacecraft motions after drogue deployment: There were none. The spacecraft was very stable.

4.6.2 Snorkel.-

4.6.2.1 Did the snorkel door eject properly: As far as I know, yes.

4.6.2.2 Did the cabin inlet and outflow function properly: The $O_2$ handle came up automatically and I reached over and pushed it up at the tone. The light came on and I turned the tone off. There was no noticeable cooling effect at this point. I could not tell that anything had happened through noting suit temperature at this time. I could not tell that the fan had not shut down, nor could I tell that it had continued to run. I probably would have noticed had the fan shut down. Very little happens in the suit when the snorkels open.

4.6.2.3 At what altitude did each of the above occur: I think the snorkel came out at about the right altitude but I did not notice. I think it will be on the tape.

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4.6.3 Antenna Jettison.-

4.6.3.1 Describe spacecraft motions prior to jettison of the antenna section: The spacecraft was very stable.

4.6.3.2 Did you hear the antenna mortar: I did hear the antenna mortar.

4.6.3.3 What was the indicated altitude of antenna jettison: The indicated altitude was around 9,500 feet. A lot of things are visible through the window at main parachute opening. At main parachute deploy, you see a lot of things falling away.

4.6.4 Main Parachute.-

4.6.4.1 Did you hear the parachute open: I don't think anything is audible after antenna fairing release. The g peaks at reefing and unreefing are noticeable.

4.6.4.2 Describe the opening shock: There is not really a shock. It is just a gentle pressure.

4.6.4.3 Describe the view of the main parachute deployment through the periscope and window: I did not notice the parachute through the periscope. The view through the window was good.

4.6.4.4 Was any parachute or riser damage visible: I could see that it was a sound parachute while it was reefed and after it opened fully.

4.6.4.5 Was the spacecraft rotating relative to the parachute? Rate: There was a relative rotation between the spacecraft and the parachute. In a period of just two or three seconds I was able to see the entire parachute through its rotation. There was no damage whatsoever. Rate of descent was locked right on 30 feet per second.

4.6.4.6 Was the canopy stable: I was unable to sense oscillation on the main parachute. It seemed very stable and I felt that I was descending straight down without any oscillations. There was rotation but it disappeared after a short time. The canopy was very stable.

4.6.4.7 Describe the spacecraft motion after parachute deployment: It was straight down, as far as I could tell.

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4.6.5 Landing Bag.-

4.6.5.1 Did the landing bag deploy normally: Yes.

4.6.5.2 Did the sequence light work properly: When I went to automatic on the landing bag, the light turned green immediately. I do not remember any physical sensation of the bag or heat shield going down.

4.6.5.3 When did the landing bag deploy relative to main chute deployment: I do not remember exactly. It was after I had looked at the parachute and made sure it was okay.

4.6.5.4 Did the dropping of the heat shield have any shock effect: I did not notice any shock.

4.6.6 Impact.-

4.6.6.1 On what part of the parachute swing did landing impact occur: I could not tell. Through the periscope the horizon was very stable. It seems to me that I was going straight down.

4.6.6.2 How long did it take for the spacecraft to right it self: It never did right itself. The window was completely submerged for three or four seconds and then the spacecraft came up. I think the very first attitude it went to was the attitude it stayed at. The attitude was half pitch down and half left yaw and it stayed in that attitude after I got out. It may have been a little more nearly pure pitch after I got out. But the spacecraft did not right itself. It is possible that when I went to manual landing aids the small end could have been in the water. It was down close, and it never got very far up. I looked out and saw the main parachute still in water. I went to landing aids and I heard something then. I then went to reserve parachute override as a backup and this fired. I heard that. For a long time on the water, the reserve parachute floated in its package. I was tempted to go over and get it, but I would have had to disconnect from the spacecraft to do that so I did not. It was not very far away and it stayed close all the time.

4.6.6.3 What was the final trimmed angle of the spacecraft in the water: I think the spacecraft was at about 60 degrees

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from the vertical all the time, both before I got out and after I got out, too.

4.6.6.4 Did the main parachute disconnect normally? How could you tell: I think the main parachute disconnected normally. I heard the landing aids operate.

4.6.6.5 Did the reserve parachute eject normally? How could you tell: I heard it and felt it, too.

4.6.6.6 Did any equipment break loose at impact: Nothing broke loose at impact.

4.6.6.7 Could you estimate the landing time and prepare for the landing shock: The altimeter is really your best indication. I did not evaluate the appearance of the water through the periscope. I was busy with the landing checklist. I knew everything was okay, and I did keep track of my height by the altimeter. I did not look out the periscope to try and tell exactly when impact would occur. I looked at the altimeter and saw that it was close and did other things. Then I waited for impact. The impact was very gentle, but noticeable.

4.6.6.8 Could you estimate your horizontal speed at impact: I don't think there was any horizontal speed at impact.

## 4.7 Post Landing

4.7.1 Astronaut Status.-

4.7.1.1 Comment on the period of time while you were waiting for recovery vessels or aircraft: My status was good. I think after impact that I looked at the cabin temperature and it was 101 degrees. I do not remember being warm at all. I did take the helmet off. I don't remember that this cooled me down a great deal. I had heard Gus. I called a number of people and nobody could hear me, but I did hear Gus say, "Estimate an hour" and that I was long. That, coupled with the fact that we were listing and I saw some water inside, and expected a heat pulse, made me decide it would be best to at least prepare an egress route. When I had started I went ahead with it. My status was very good, but I was tired. I did not put the neck dam up until I got in the raft. The sea was quite calm except for periodic swells. The swells would increase periodically but it was not rocky. It was a very pleasant time on the water. I wrestled with the neck dam

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for three or four minutes after I was in the raft but I had forgotten to undo the little silver strap on it. I was trying to roll it up past that strap and couldn't do it. My hands got so tired I had to give up. I was making no headway at all. Then I noticed this little tab from the strap, pulled it off, stuck it down inside the suit (saving everything), and rolled the neck dam up with no problem. I was comfortable as far as temperature was concerned. It is a job to climb out. To get everything up there with you is a problem. I did turn the squib switch off and I shut down ASCS. I think I caged the gyros but I am not sure. I climbed out and slid the parachute canister out very easily. I had it two-thirds of the way out and was actually working my legs up around underneath the panel, before I had to disconnect the suit hose. I did this, but I forgot to lock the valve. I have locked that valve everytime I have removed that hose. There is available a self-locking, inlet fitting that I had worked with in egress training. It gives you maybe one half inch of water suit pressure drop (increase in the suit pressure) but I think that we should have it. We need something to seal the suit. I got out and then held on to the spacecraft and pulled the raft out and rested it in the recovery section. I stuck the camera down in the recovery section where it was anchored pretty well. The raft was attached to the suit at this point. I found the toggle and pulled it and the raft partially inflated, just a little bit, and then it broke two of the snaps open. I think I pulled two or three snaps out, pulled the toggle again, and this time it inflated. I had barely tapped the bottle the first time to start it out and then I undid a couple of the snaps and pulled it, and then it filled right up. It went down on the water, and I climbed aboard and took stock of the situation. Then I realized that the raft was up-side-down! I went back to the spacecraft, held on, climbed out of the raft, turned the raft over, and climbed back in. I felt very good during the period on the water after I had gotten all the equipment out. I drank a lot of water on the raft. The first thing I saw was some sea weed and the next thing I saw was a black fish that was just as friendly as he could be. Then I heard some planes. The first thing I saw was a P2V and then a little Apache. A Piper Apache came on and I was surprised to see him. I understand from talking to somebody here last night that he violated an airspace restriction that's set up by ADIZ for this flight. When he landed back in Puerto Rico or wherever it was, they confiscated his film. He took a lot of pictures. I got the mirror

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out and used it. It was quite hazy, though, and it was hard to find the little bright spot in the mirror. The survival kit was excellent. Everything was exactly where it was supposed to be and I didn't lose anything. Everything was retained properly. It was a real jewel. After the swimmers got there, I broke out the food and asked them if they wanted any, but they had finished lunch recently so they did not take any. I ate one of the chocolate bars. That was good. I attached the raft to the line to the pie-shape marker. It dips in the water and there must have been a stream of dye marker 10 miles long in the water. It really works good! The next thing that happened was that there were a lot of airplanes around and I watched them flying over. I was sitting there minding my own business and pretty soon a fellow called to me from behind and here was a fellow swimming up. I didn't even know he was in the water! He had dropped from 1,100 feet, he said. He landed behind me and swam up. He climbed in his raft, and we attached the rafts together. He was tired. His drop had not been good. Neither was the second drop--the man also had to swim a long way. But my status was real good. We had a pretty good time there. I kept watching the spacecraft though, because it seemed to me that the list was increasing slowly and that the water level was getting higher. I watched along the beacons. The beacons were just barely above the water and this is the way the spacecraft stayed.

4.7.2 Spacecraft Status.-

4.7.2.1 Comment on ECS cooling during the postimpact period: It was adequate throughout the time I was getting out. I wasn't warm. I don't remember being nearly as hot as I was on the second orbit.

4.7.2.2 Did the spacecraft leak? Where? Did you try to stop it: I do not know if the spacecraft leaked. There was water inside.

4.7.2.3 What was the status of the beacons, dye marker and light: The light was working. The beacons were operating. I heard the tone on the headset. The dye marker worked well.

4.7.2.4 How rapidly did battery voltages deplete after landing? How did current vary: I didn't watch battery voltages for long. In flight, the number two main battery was low. I made a comment on the tape about this. All the rest of them were up to twenty-four volts, but number two main was down to around

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twenty-two volts. I remember noticing it down only once. I also remember looking at it again and it was up. I don't know whether this is possible.

4.7.2.5 Did the HF antenna erect? How could you tell: The HF antenna did erect. I do not know how you can tell. I did not notice any sound thirty seconds after I went to Rescue Aids Manual.

4.7.2.6 Was steam noticeable at any time: No. I thought for awhile that I was hearing sizzling from somewhere. I thought I heard sizzling both while I was inside and when I was outside. The sound persisted for a long time and I finally realized that what I was hearing was the noise of the suit fan. I turned the cabin fan off. The suit fan is noisy intermittently and from outside this noise sounds like sizzling.

4.7.3 Egress.-

4.7.3.1 If used, did the explosive hatch function properly? Comment on its operation: I didn't use the explosive hatch.

4.7.3.2 Describe your egress from the spacecraft: I have described* all but the one period when I stowed the camera on top of the recovery section. I do not remember exactly how I got out, but I did not let go of the spacecraft. There was one period just as I was getting out that water ran up over the sill and went down inside, but there was just a little. I guarantee that sixty-five gallons did not get in at that time.

4.7.3.3 Do you recommend a change in the egress procedure you used: I do not recommend any changes in egress procedures, except that we adopt the long hose. It stayed in place throughout the flight and the loop was retained by velcro, which pulled loose very easily when I started out.

4.7.3.4 Did you encounter any hot spots on the spacecraft: There were no hot spots.

4.7.3.5 What survival equipment did you use? Was it adequate: I used the SARAH beacon. I used the mirror and I ate the food and drank the water. The water was handy to have. That was all I used.

* See Shipboard Debriefing

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4.7.3.6 Was your egress training sufficient, or was it deficient in any aspect: Egress training was good. I am glad I had all of it. It is interesting to note that I forgot to seal the suit. Everytime that I disconnected the hose in training I sealed that valve. This time I did not. Perhaps this is because I had never done it standing up in the tower.

## 4.8 Recovery

4.8.1 Visual Sighting.-

4.8.1.1 Did you see any airborne or surface recovery forces during descent? After landing prior to egress: I saw the P2V first and then there were a lot of airplanes. Two paramedics were dropped. The second was dropped too far away and he was exhausted by the time he got there. We all attached the rafts and talked about where we were and how long it was going to take to be recovered. The first thing that was dropped was something on a small red parachute that I think was a smoke bomb. The next thing that was dropped was a twenty man life raft. The parachute failed and it smacked the water with a tremendous impact and the case tore open. It was attached with a long line to something else which I think was the Stullken collar and it hit the water with a terrible bang, too. One of the bottles was broken on impact so that only the top loop of the Stullken collar could be inflated. This took just a little of the list out of the spacecraft. There were also some other things dropped but they were all too far away to do us any good. The Stullken collar at first appeared to be drifting toward us so we decided that we would let it get a little closer instead of swimming so far out to get it. I kept watching it and it wasn't getting any closer but was getting farther away. I told the divers that we had better go and get it. One of the divers started out to get it and one stayed with me. I told him that I was fine, that he should go help his buddy, so they both left. It took them a long time, swimming in the sea, dragging a raft. Even under water with a snorkel it was a long job for them, even with the flippers. Then they had to get the Stullken collar, put it on a raft, and tow it back. That took a long time. It's a good thing they went to get it when they did. They finally got back and wrapped it around the spacecraft and inflated it. Because of the angle, or list, or because of improper installation of the collar, the spacecraft appeared

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to be coming out of the collar and the list was increasing. I told them to stop and to make sure that it was installed properly. They both went down and they did do something underneath. The spacecraft moved somewhat back into the collar, and then they inflated one tube and the spacecraft righted itself somewhat. They had a strap which they put around the hatch just in case it blew. We also had two extra rafts that we stuck inside the collar. One was by the hatch and the other over by the periscope. The periscope door was open and the spacecraft was oscillating and I was afraid that the door might wear a hole in the collar, so we put one raft down over the door. Then we waited there for a long time. People would come over and drop smoke flares, but we needed a radio. I thought a little while of getting back in the spacecraft and using the radio to talk to the P2V and tell him what the status was and that we needed a radio to transmit with. The jumper had no radio. However, I was afraid that if I climbed back in, even with the collar, there was danger of getting water in the small end again. So, I did not do that. I really did not feel that there was a need to have a radio to talk to them because they certainly knew where we were and they knew that our status was good. We were all waving to them. The divers wanted another twenty man raft but they never got that. The SA16 came over and made a low pass and pushed out a big yellow can, about a 10 gallon can, on a parachute. It was not very close. The diver had to swim a long way to get it. We thought this was our radio. He swam back and sat up on the collar and opened the can and there was nothing inside but a battery! We were back where we started from. The next thing that happened, I guess, was that the HSS appeared. I wondered for awhile whether he was going to sit down on the water but he did not. He had the sling way down and he was way up in the air. I went back to the spacecraft and stood on the collar and got the camera. He made a beautiful approach and the sling dragged up very slowly to the raft. The diver helped me. I put it on, but I was on the wrong side of the spacecraft, so I took it off again. I didn't have the camera either and I wanted to take the camera with me. I got out of the sling, walked around to the other side, grabbed the camera and put the sling on and motioned to him to go up and he began to take the tension up. When he was almost above me so that I felt that if I let go of the spacecraft I would be held substantially above the water, I did this. Either the helicopter settled or the winch operator pushed the wrong switch because I went down!

[redacted]

There was one period there when I'm sure that nobody saw anything of me but a camera and a hand! I looked at the camera when I got back up and it had just a few drops of water on it so I'm sure that it was not submerged. It may have been just the movement in the water. It got splashed, but I don't believe it had been submerged. It was a long lift. He was about fifty or sixty feet up in the air. I got in with no problem and stowed the camera and took my gloves off. I took my left boot off and poked a hole in the toe and stuck my leg out the window and drained the water out. Then I lay down to get the water out of the right leg into the left leg. I had to lie down close by the relief tube so I just stuck the toe up over the relief tube and put the rest of the water from the suit out through the relief tube! That is all. I saw nothing during descent and heard nothing during descent.

4.8.2 Communications.-

4.8.2.1 What recovery aircraft or vessel was first contacted: The first one I saw was the P2V. There were, I think, three separate P2V's, two C54's, and an SA16, and a Piper Apache, blue and white.

4.8.2.2 Comment on the quality of communications with recovery: The Cape Cap Com was weak but readable while I was on the parachute. I was aware that I was long, that the Cape Cap Com was transmitting blind, and that I should expect an hour recovery time. That is about what I got from the Cape. I also remember being told there would be jumpers in the water.

4.8.2.3 Did you receive the information you desired at all times from reentry until completion of the recovery operation: I did not hear emergency voice during reentry, though I listened for it.

4.8.3 Pick Up.-

4.8.3.1 Did you experience any difficulties during the recovery operation? Describe: The only really difficult thing is getting out of the spacecraft. That is difficult because it takes a long time and your movements are restricted in a space suit.

[redacted]

[redacted]

## 4.9 Sequencing Review

With reference to the sequence panel, note which functions were operated manually and which were automatic. Cover the entire flight and comment on each function:

4.9.1 Tower Jettison: The tower jettison was right on time, automatically.

4.9.2 Cap Sep: The spacecraft separated right on time, automatically.

4.9.3 Retroseq: The retrosequence began right on time, automatically.

4.9.4 Retroatt: I don't know. I do not remember the light being red, but the warning lights were still on dim, and were not readily visible.

4.9.5 Retrofire: Retrosequence was right on time with the clock and the count. At the California Cap Com's count for "fire retro" I did not get "fire retro," but this count was one second early. I waited for the clock to get to twenty-nine. They still did not fire. I went immediately to the "fire retro" button and the retrorockets still did not fire. One or two seconds passed before I felt the first retrorocket.

4.9.6 Retro Jettison: The retrorockets jettisoned automatically right on time.

4.9.7 Retract Scope: The periscope retracted automatically right on time.

4.9.8 .05g: I do not recall the .05g light.

4.9.9 Drogue: The drogue was not deployed automatically. It was deployed manually.

4.9.10 Snorkel: The snorkel was opened automatically.

4.9.11 Main: The main parachute was deployed manually.

4.9.12 Reserve: The reserve parachute was not used. It was jettisoned automatically after landing.

4.9.13 Landing Bag: The landing bag was manually positioned to the automatic position, and the light went green immediately.

[redacted]

## 5.0 GENERAL FLIGHT ACTIVITIES AND INFORMATION DEBRIEFING

### 5.1 Aeromedical

5.1.1 Did you test different kinds of vision? When? Describe: - No, vision is not affected at all. John satisfied himself that this was true, and I believe it is true.

5.1.2 Did you experience visual difficulty at any time? When? Describe: - Only once. That was when sweat ran down in my right eye and gave me a momentary problem.

5.1.3 Was there any blurring of vision during acceleration, maximum noise, or weightlessness? Describe: - There was no blurring of vision during acceleration or during maximum noise or during weightlessness.

5.1.4 Was your peripheral vision affected by your face plate or by high g levels: - Your vision is restricted by the face plate. But I do not think you get a noticeable reduction of peripheral vision at 6g's. Peripheral vision was not affected by the high g levels.

5.1.5 Did you notice any tearing? When: - There was no tearing.

5.1.6 Was there any time during the flight when you had difficulty hearing? Describe: - There was no time in the flight that I had any difficulty hearing.

5.1.7 Did you experience any ear pain: - As far as I can remember, I did not notice any ear pain. I was aware of the pressure on my ears as I always am when I have an increase in pressure and can not get to my nose to clear my ears. I heard in the air during the flight everything that I heard later on the ground tape, so I think that even though my hearing was reduced a little bit when my ears were tight I heard everything. My ears cleared immediately when I got to my nose and did squeeze it and blow.

5.1.8 Did you have to make "say again" requests? Why: - I do not remember making any "say again" requests.

5.1.9 Did you note tinnitus at any time? When: - There was no tinnitus at any time.

5.1.10 Did you note vertigo at any time? When: - There was no vertigo at any time.

[redacted]

5.1.11 Did you note the presence of a nasal discharge at any time? Describe: - I do not remember nasal discharge at any time.

5.1.12 Did you experience dryness of the nose and throat? When: - I don't remember dryness of the nose or throat. The doctor said my throat was red, though, when I got on the ship. He said this comes sometimes from breathing 100 percent oxygen for a length of time.

5.1.13 Did you have any sinus pain? Describe: - I had no sinus pain.

5.1.14 Did you have any problem with oropharyngeal secretions: - I had no problem with oropharyngeal secretion.

5.1.15 Were you thirsty at any time? When: - I was thirsty. I was thirsty before launch, in the van, and I was thirsty in flight. I was thirsty on the raft.

5.1.16 Was your mouth dry? When: - My mouth was not dry. I was just thirsty.

5.1.17 Were you conscious of any specific odors? What? When: - I was conscious of no specific odors in flight except the smoke at retrofire.

5.1.18 Were you conscious of sweating? When? Where: - I was conscious of sweating pretty much throughout the flight.

5.1.19 Did any unusual skin sensations occur? Describe: - I had no unusual skin sensations.

5.1.20 Did you feel warm or hot? Where? When: - I felt warm and hot from about half way through the first orbit on through half way through the third orbit.

There is one thing that I heard on the tape that I did not mention before. There was one time the suit seemed very cool. I was cool all over, but it was close in the helmet. It seems as though it was very warm on my face. I moved around a little bit, or I opened the visor, or something, and it went away. It seemed like there was a sort of stagnant place where no flow was getting up around my face. The flow was such that it did not sweep air across my face.

[redacted]

5.1.21 Were you short of breath at any time? When: - I wasn't short of breath at any time but I did notice I could not say as many words with one breath during reentry acceleration as I expected to be able to.

5.1.22 Was there any orthopnea? Tachypnea: - There was no orthopnea nor tachypnea.

5.1.23 Did you have any chest discomfort? When? Where: - I had no chest discomfort.

5.1.24 Were chest motions limited during acceleration? Any other time: - I do not remember chest motions as being limited except that I was aware of reduction of vital capacity at reentry acceleration only.

5.1.25 Did you cough postacceleration? Were you aware of palpitation? When: - I did not cough postacceleration. I was not aware of any palpitation.

5.1.26 Were you aware of your pulse? How: - I was aware of my pulse only during the blood pressure measurements when I could feel the pulse in my arm. I felt it when systolic started coming through and it dropped out when diastolic was measured.

5.1.27 Describe eating, drinking, and swallowing: - Eating, drinking and swallowing is completely normal in all respects. The only thing that's different is getting the food to your mouth. Once it is in your mouth, it is no problem.

5.1.28 Did you experience abdominal discomfort? When? Where: - I did not experience any abdominal discomfort.

5.1.29 Did you have an urge to yawn? When: - I did not have an urge to yawn.

5.1.30 Did you feel particularly sleepy at any time? When: - I did not feel sleepy at any time.

5.1.31 Did you feel like stretching at any time? When: - I did feel like stretching, but I was surprised to note that I did not stretch at any time in the spacecraft. Before launch I took my left leg out of the trough and laid it across my right leg which was comfortable. I did not move out of the couch again until the third orbit,

[redacted]

just past Africa, I think. Then I took my feet out and stretched them up straight, so that the knees were straight. This felt very good.

5.1.32 Did you experience indigestion, belching, or excessive passage of stomach gases at any time? When: - I did not experience indigestion. I did not belch. There was no passage of stomach gas at any time that I can remember.

5.1.33 Did you experience an urge to defecate? When: - There was no urge to defecate.

5.1.34 Did you experience an urge to urinate? When: - I think that I urinated in flight but I didn't mention it on the tape and I can not remember when it was now.

5.1.35 Did you attempt to urinate? Describe: - I just can't remember for sure.

5.1.36 Was the urinal satisfactory: - The urinal is quite satisfactory. However, it may not be quite long enough.

5.1.37 Did you experience any difficulty with pressure points on: Hands and feet? Wrists and Ankles? Elbows? Shoulders? Others: - I had no pressure points in flight, or even before launch. I was very comfortable. There just were not any pressure points anywhere.

5.1.38 Was there any tingling of any body members? Describe: - There was no tingling of any body members.

5.1.39 Were there any unexpected flight events which caused fear or other physiological response? Describe: - There were some unexpected flight events. They did not cause fear. They did cause some concern. When things do not go as planned it takes more time to analyze the situation and adjust your program to take care of it, but there was no physiological response due to unexpected flight events. My greatest disappointment was caused by the excessive fuel consumption.

5.1.40 Was comfort maintained in the suit and cabin? If not, explain: - Reasonable comfort was maintained in the suit, but I was hot. I finally got the feel for the suit water valve and then I became quite comfortable in the suit.

[redacted]

5.1.41 In your opinion, does zero g feel anything like being submerged in water: - Zero g is, I think, very similar to being submerged in water. Except for the resistance that the water offers to your movements, it is very similar.

John Glenn mentions that it is different in one respect because you do not know where up is at zero g, and you do in the water. If you close your eyes you can get disoriented in the water, too. I can. There is an up in the water, but there is no up in flight at zero g.

5.1.42 Did the semiautomatic blood pressure device operate satisfactorily: - The semi-automatic blood pressure devise operated satisfactorily as far as I am concerned. The doctor on the ship said that the blood pressure cuff had slipped when I took off my suit, but this is not correct. I feel that it was exactly in the place where we put it, and that the microphone was in place. The sensors were all exactly in the same place. The sensors were dry and the tape was good. There was no discomfort from the sensors.

5.2 Assessment of Preflight Training Program

5.2.1 Were you sufficiently trained for the mission: - No, I could have used more training. I would say that there are some holes in the training which should be taken up when there is time for a long discussion.

5.2.2 Has your flight experience pointed up any areas where you felt you had no training and needed it: - Yes, the lack of a visual simulation is one problem area. We also need a better way to simulate the gyro handling in flight. The effect the trainer has on how you handle the flight overpowers everything else. It is the most vital factor in your training. Where the trainer is accurate, you are prepared. Where, even in minor items, it does not properly simulate the spacecraft you are not trained. You need a simulation of the view out the window and periscope to show you what you can expect when you look in the window or the periscope during the flight. I had some training in attitude reference through the window, with a line representing horizon, on the ALFA Trainer. Perhaps the ALFA Trainer was not used enough. The ALFA Trainer might have been very, very good if I had more practice with the window horizon only,

[redacted]

without the periscope earth-simulation lighted. I wonder if we can put the same type of window presentation on the Procedures Trainer? That would even be better because, on the ALFA Trainer, gravity cues are always present. You always know about where you are because you are sloshing around in a couch. If we had a display in the Procedures Trainer that simulated the horizon movement with no g input, this would be very valuable.

5.2.3 How do you rate the relative worth of the ALFA Trainer, the Mercury Procedures Trainer, and the Centrifuge with regard to preparation for doing the actual manual control tasks in the capsule: - The very best trainer is the Procedures Trainer. Both the Centrifuge and ALFA Trainers are valuable, but I think a man could make this flight without Centrifuge experience. He could not make it without Procedures Trainer experience. I think the order of priority would be Procedures Trainer, Centrifuge, and ALFA Trainer.

5.2.4 Which trainers could have been omitted without loss in your state of readiness in this flight: - None.

5.2.5 Do you have any suggestions relative to retiming of the training program? For example, were you rusty in any particular control task: - I do not feel that I was.

5.2.6 When were you the most anxious? Would extra training have helped: - I was the most anxious prior to reentry, after retrofire, because of my low fuel state. Yes, a visual simulator would have helped at this point.

5.2.7 How did the noise and vibration experienced in the centrifuge training program compare with those you actually experienced during the flight: - The noise and vibration experienced in the spacecraft were similar to the centrifuge. There was more vibration. There was not much noise, and maximum q was not nearly as bad as I had expected. It was not much worse than the very first vibrations at lift-off. I was surprised at how gentle it was.

5.2.8 Were any physiological effects experienced during the mission accelerations that were not experienced on the centrifuge accelerations or vice-versa? (Angular acceleration, etc ?): - Yes, the yaw oscillation prior to BECO and SECO was new. I do not think it is necessary to experience this oscillation during training.

[redacted]

5.2.9 What sound effects do you wish we had on the Procedures Trainer: - I do not think it is necessary to have any sound effects, but it would not hurt. The more you can include in the trainer, the better the training.

5.2.10 In retrospect, was there proper balance between failure training and normal procecures training: - I needed more training in the flight plan. I could have used more training in both areas.

5.2.11 Did you notice any difference in the operation of the rate-and-attitude indicator in the spacecraft as compared to that in the Procedures Trainer: - I noticed only one difference in the operation of the rate-and-attitude indicators compared to the trainer and that was the lower rates I got out of fly-by-wire low thruster operation. Low fly-by-wire produced less of an acceleration than I expected. The rates built up more slowly.

5.2.12 Compare the response of the $H_2O_2$ jets with the response of the controls of the ALFA Trainer: - The response of the thrusters was very similar to the response of the controls on the ALFA Trainer.

5.2.13 Should we have had an ALFA Trainer powered by the actual $H_2O_2$ control systems: - No. I had no trouble with thruster tail off. The control system was beautiful throughout.

5.2.14 How did the overall angular response of the spacecraft compare with that of the ALFA Trainer: - Pretty good, with the exception of the response of the low thrusters in the fly-by-wire control mode.

5.2.15 How realistic was the horizon display on the ALFA Trainer: - It is pretty good. The only problem is the presence of gravity which gives you an extra cue to attitude. A better simulation for training in the use of external reference would be a movable horizon on a static simulator.

5.2.16 Should we have had an ALFA Trainer at Cape Canaveral in order to keep you peaked-up just prior to the flight: - No, I do not think that is necessary. It would have been desirable to have had a horizon simulation on the window of the Procedures Trainer. We also need a good periscope display on the Procedures Trainer.

[redacted]

5.2.17 Did your previous zero g training in Project Mercury have any value in preparing you for this flight: - Yes, the zero g training was valuable.

5.2.18 How improtant was your training in the MASTIF Trainer relative to this flight: - The MASTIF was interesting but irrelevant.

5.2.19 Should more or less emphasis have been placed on environmental training: - I think more. I should have had three orbits in the pressure chamber. I would have been more familiar with the cabin and suit water valves. I think the only reason it is necessary is to get familiar with the temperature rates to the flow control valve settings.

5.2.20 Was the training you received on the transparent indicator mockup capsule of any value: - It was of great value. it is a good thing to have.

5.2.21 Were any Mercury trainers detrimental to your state of readiness: - Yes, Mercury trainers were detrimental to my state of readiness in some respects. Everyone that is not accurate in any point is detrimental.

5.2.22 If in retrospect you could pick just one Mercury trainer to help you train, which one would you pick? If two, which two? If three, which three: - If I could pick the Mercury trainer in order of importance, my list would be the Procedures Trainer, then the Centrifuge, then the ALFA, and then the transparent indicator mockup capsule.

5.2.23 Should we have included cloud cover on the ALFA Trainer: - Yes, that would have been good.

5.2.24 Was the star display on the ALFA Trainer realistic: - The star display on the ALFA Trainer is fairly realistic.

## 5.3 Observations

5.3.1 Celestial Observations - In response to the following questions note the time, spacecraft orientation, size, brightness, location and other descriptive details applicable.

5.3.1.1 Describe any unusual phenomena which was observed: I described the fireflies. They appeared to be like snowflakes.

[redacted]

I do not think that the fireflies were visible, unless the sun was shining on them. I do not believe that I saw any that were truly luminous. I think that all the ones I saw reflected light. One time on the tape, I said, "There is one that is truly luminous." Later I saw some others that were just as bright. It made me change my mind about the other being luminous, because they looked the same. The one I described as luminous was the first one I saw. At that time I had been on red light and it looked green only by contrast, I believe.

5.3.1.2 Can you compare the velocity at which the confetti departed at the time of the balloon release with the velocity of the particles when you were hitting them off the side of the vehicle: I can. The particles traveled at different speeds, but I do not think I saw any particles that moved as fast as the confetti did.

5.3.1.3 When you were facing forward, did you see them coming towards you from a distance: No, I do not remember seeing them coming directly toward the window.

5.3.1.4 When you were facing backwards and you were hitting them off the side of the spacecraft, did they converge as they went back: No, they spread out. They diverged. Some were traveling out one way, some another, in an arc to the rear of 110°. I think you could probably follow one particle for as long as a minute, maybe longer. I did not do this, but there were some whose relative motion was such that you could watch them for a long, long time. Their motion, position and speed were random. Some in close changed course, but the ones that I knocked off the side of the hatch all went past the window, from right to left.

5.3.1.5 Can you make an estimate of the diameter of the particles: I saw one that was a half an inch long and it looked like a lathe filing. It was shaped like a curlycue.

5.3.1.6 When you were knocking particles off the side of the spacecraft, were they all identical, as far as you could tell, in color and size: No, some were gray and some were white. The large ones were four or five times the size of the little ones. They also varied in brightness. This was a function of their size.

5.3.1.7 Can you estimate the number of particles in the cloud which came off the spacecraft when you hit the side: I would say there may have been as many as 200.

[redacted]

[redacted]

5.3.1.8 Was there any difference in the number of particles, depending on where on the spacecraft of how frequently you knocked: I did not notice that There seemed to be no reduction in the number with repeated knocking.

5.3.1.9 Describe the appearance of sunrises: I think I described the appearance of the sunrise on the voice tape. I can not remember the colors now but there are very definite changes in color, like in a rainbow.

5.3.1.10 Did all sunrises appear the same? Differences: I think that all sunrises and sunsets are the same.

5.3.1.11 Describe the general appearance of the sky during the day and night: There are more stars visible at night. On the daylight side, when the sun is on the window, you can not see stars.

5.3.1.12 Compare the view of the sky you had with the same view from the earth on a clear night: You can not see as many stars at night through the spacecraft window, partially night-adapted, as you can with no night adaption on the earth.

5 3.1.13 Did you identify stars and constellations? Which ones and how many: I did identify stars and constellations at night. Whether I did this during daylight, I do not remember. I have seen stars and a horizon in the west, when the sun was up in the east, but the horizon you see out to the west was still dark. The terminator has not yet reached the western horizon.

5.3.1.14 Did you count the stars in a known constellation? Which one and how many: I did try to count stars, but I did not get a final number in any given group. I am convienced from having seen Corvus during the flight and later in the S2F, that you see a lot more stars on the ground. I think a star count through this window is meaningless because you can see more on the ground than I could through the window.

5.3.1.15 Comment on the Star Navigation Device: The Star Navigation Devise is a very useful item, but the shiny plastic covering is not satisfactory. It wrinkled so that no matter how I would illuminate it with the finger tip lights, red or white, a glare was always present that prevented me from reading the time or the names of the constellations. I think larger letters are needed on the star chart. Larger elapsed time numbers are also required. The star charts would be more useful if they were larger.

[redacted]

[redacted]

5.3.1.16 Could you identify stars readily enough to use them for a yaw reference by position? (not by star drift): Yes, this is the way to orient in yaw. Star drift takes a long time.

5.3.1.17 Comment on the following, if an attempt to observe them was made: (1) Sun's outer corona, (2) Zodiacal light, (3) Gegenshein, (4) Libration clouds, (5) Comets, (6) Narcreous clouds, (7) Noctilucent clouds, (8) Meteros, (9) Night air glow, and (10) Aurorea: I did not look at the sun through the filter, so I can not comment on the outer corona. I could not see Zodiacal light. Judging from the stars that I was able to see through the spacecraft window, I would not expect to see it. I did look for Gegenschein, but I did not see it. I do not think you can see these faint light phenomena at all. I did not see libration clouds. I thought I saw a comet but it was the balloon. I did not see nacreous clouds, or noctilucent clouds or meteors. At one time I could see the horizon. It is a bright band. Above this there was a dark space up to the haze layer, which is another bright band. They look identical in brightness. I took the airglow filter out and looked at the two bright bands through it. I could see only the upper band. I would estimate that the width and brightness of the upper band was identical to the lower band. The upper layer is half the width of the big color band at sunset. The layers appear to extend over the whole horizon. I did not see an aurora. I only rode it!

5.3.1.18 Were you briefed, trained and equipped adequately for observing and recording the celestial phenomena you encountered: Yes, I think so.

[redacted]

[redacted]

5.3.2 Terrestrial observations.-

5.3.2.1 Is there much difference in the apparent color of the land areas, water areas,or clouds as compared with their (1) appearance from a high-flying conventional aircraft? (2) appearance from previous Mercury flights: There is no difference in the apparent color of the land, water areas, or clouds compared to the view from a high-flying airplane. The view looks to me exactly like the pictures from the other Mercury flights.

5.3.2.2 Is there much difference in the color attenuations from an oblique view as compared to a vertical view of the earth: There is no difference in color attenuation from an oblique view and a vertical view. The colors may appear a little hazier off in the distance but, if so it is exactly the same as the view you get from an airplane down lower.

5.3.2.3 Did you distinguish the Gulf Stream and other ocean currents by their color: I did not distinguish the Gulf Stream or any other ocean currents by their color. The color of all the water I saw was a dark blue, except for the shallow water around islands.

5.3.2.4 Could you discriminate snow and clouds: I didn't see any snow that I know of. I think snow could be easily distinguished from clouds.

5.3.2.5 Could you tell the relative heights of different clouds: There was one time that I felt I could see four separate cloud layers below me.

5.3.2.6 Are the different types of clouds distinct enough so that you could determine cloud height from the cloud type: Yes, you can recognize cirrus, cumulus, and stratus cloud formations.

5.3.2.7 Could you detect winds on the earth's surface, and were swell patterns detectable at sea: I do not think swell patterns were detectable. I think you could detect winds on the earth's surface by the way smoke was blowing. I did see some dust. Over Africa there was one very hazy dust layer.

5.3.2.8 What terrain observations surprised you: I was surprised that I could see individual fields, some were green and some, lying fallow, were brown. After retrofire, I saw a dirt road. It was so clearn that I feel that I could have seen a truck on it.

[redacted]

At launch, I saw Bermuda. The South Atlantic was nine-tenths covered with clouds. All of Western Africa was clear. I had a beautiful view of Lake Chad. Parts of Africa were green and I knew that was jungle. There were clouds over the Indian Ocean. The Pacific was roughly three- or four-tenths covered with clouds. Farther west in the Pacific it was not quite as heavily clouded. The western half of Baja California was covered along its length by clouds. The eastern half was not. Over the United States, during the radar test, I noticed that there were a lot of clouds below. After retro-fire, I could see the El Centro area. I did not see Florida or the Cape.

5.3.2.9 Did you discern a haze layer(s) which might be associated with the tropopause or other stable layers of the stmosphere? If so, describe: I did see the airglow layer at night. I think that the coloring at sunset may be associated with the tropopause. There is a very definite demarcation between the colors.

5.3.2.10 Could you see ships or comparable objects on land or sea: I didn't see any ships. I did not see anything moving on the ground.

5.3.2.11 On the horizon, was the transition from light to dark smooth: On the daylight side, with the sun well up, it is. You can see the horizon and there is quite a big haze layer above that, which tapers off very gradually to the black of space. The transition from light to dark is smooth.

5.3.2.12 Did the view distract you from flight procedures: Yes, it's a very arresting sight. You have to stop and think about it, not only the first time but every time you see it. You can't tear your eyes away from it.

5.3.2.13 Describe your sensations of relative motion: I think a very good analogy to viewing through the periscope is viewing through the big bug eye lens in the F98B. In this aircraft it is possible to look out through the forward camera in order to check the field of view. The relative motion you perceive through that bug eye lens is very similar to the periscope on high magnification view. Out the window it seems normal. There is nothing to indicate that you are going 17,000 miles per hour. It looks normal, as if you are maybe at about Mach.9. If you can not see the earth, you have no senation of movement.

[redacted]

5.3.3 Balloon experiment.-

5.3.3.1 Describe the deployment of the balloon, the two balsa blocks, and the Mylar confetti: At the time of balloon deployment, I saw one balsa block and mistook it for the balloon. I though the balloon had gone out in a little square package. I had never seen a balloon deploy. I did not know what it was going to look like and I did not see the line. I thought the line had failed and that the whole package had been lost. I saw the confetti whenit was jettisoned and disappeared rapidly. It was visible for a very short time. Finally the balloon came into view. It looked to me like it was a wrinkled sphere about 8 or 10 inches thick in the center. It had a little sausage coming out of each side. It stayed roughly that shape most of the flight.

5.3.3.2 Describe the balloon's motion following deployment, throughout the orbit, and during release. Initially, I judged by the balloon's relative motion that it would oscillate at about one cycle per minute, but it did not. The balloon's motion became unpredictable. The line would be tight at times. Then when the balloon came back in, the line would be so slack that it would have big loops in it. I do not think it ever hit the spacecraft. It also wrapped around the heat shield of the spacecraft on the third orbit.

5.3.3.3 Describe the balloon's motion at the time drag measurements were marked: The balloon's motion at the time of draf measurements was, as always, random but the line was tight, or at least roughly straight out.

5.3.3.4 Describe any attempts to damp oscillations, if they occurred: I did not attempt to damp any of the oscillations. It did not have any oscillations, it just wandered.

5.3.3.5 Describe the balloon's appearance during daylight, darkness, and following release: The balloon's appearance during daylight was apparently the same as on the surface of the earth. At night, it was once silhouetted against the bright earth. I think this was after moonrise.

5.3.3.6 Comment on the value of the various colors under various lighting and contrast conditions: The day glow orange was good. The silver color was also good. I did not have a good way to evaluate colors because I could not see them all. When I looked

[redacted]

[redacted]

out at the balloon, I saw the orange and one shiny silver color. This may be because they were the only colors I did see.

5.3.3.7 Comment on the value of the phosphorescent surface during darkness and daylight when turned away from the sun: I could not see it glow. This may have been because it was not inflated.

5.3.3.8 What is your opinion of the balloon experiment: It did not work. It did not inflate and it did not jettison. I really think that was potentially a bad situation if you cannot get rid of the balloon. At retrofire there is a chance that it could damage the spacecraft. It might not. There is not much chance of it hitting the spacecraft considering the way it drifts, but there was one period while I was talking to the California Cap Com, that it was right in front of the window and the thought occurred to me that it might hit the window.

5.3.4 Ground Flare Observation.-

Describe the appearance of the ground flares: I did not see the ground flares. I was able to see one dim light over Australia, but that was before flare ignition. It might have been a city that was lighting up the cloud layer above it. John Glenn says that the lights of Perth covered about one-quarter to one-third of the window area, so this could not have been Perth. I had just a small light spot through the clouds.

5.4 Flight Experiences

5.4.1 Were you ever disoriented:
(See answer to question 4.3.1.3 on page 4-7-Eds)

5.4.2 Were you confused at any time? When: I was not confused by this at all. The only orientation that has any meaning to you at all is the location of the controls and other things in in the spacecraft. You know where they are.

5.4.3 Were you ever uncertain of the spacecraft attitude relative to the earth:- Yes.

5.4.4 Did you at any time think the capsule was tumbling when in fact it was not: - No.

[redacted]

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5.4.5 Were you aware of any illusory phenomena? When? Describe:- I was aware of just one illusory phenomena. When I looked out the window and saw where the horizon was, and then looked at the right hand shelf where the ditty bag is located, I was surprised to see that it was vertical. Lying on your back in the trainer and the spacecraft on the ground, you are aware that this ditty bag is horizontal. But in the spacecraft, it appeared to have rotated 90 degrees down, and to have become vertical. I did not translate my change of attitude of 90 degrees to this shelf. There was no g input to tell me that I had rotated 90 degrees. So I expected to be looking straight up, which I was not.

5.4.6 Did you have the same sensation toward the main instrument panel: No. John Glenn felt the same way to a mild degree, in relation to the left fuse panel. I did not feel the same way about the fuse panel. But it is exactly the same thing. You just don't feel that the spacecraft is oriented right.

5.4.7 This, seemingly, has some definite connection between the one-g field in the trainer and the actual orbital conditions in the spacecraft. Do you think it would have been better, from a training standpoint, to have rotated the procedures trainer 90°; No. It is more comfortable to be on your back on the ground, and this illusory phenomenon couldn't matter less. I explained this to Dr. Graybiel and he understands it perfectly, as I do. I had no g to indicate to me that I was not in the normal position, so I expected the panel to be in the normal horizontal position instead of the vertical. It is interesting to note that in the spacecraft the horizontal is actually 15 degrees nose down.

5.4.8 On tape you reported that you missed the button on the time zero clock slightly. Did you do this with your eyes closed: Yes. I did this a number of times. I missed by about 2 or 3 inches. I did this same thing later, while talking to Dr. Graybiel. I tried to touch the corner of a desk near me. When I reached over to touch it with my eyes closed, and after not having looked at it recently, I missed the corner by about 3 inches. The error was random. On an average, I neither overshot or undershot. When I opened my eyes and looked at the exact spot I was trying to touch, and then closed my eyes again and reached out, I found no difficulty in touching the exact spot. This was what I experienced both on the ground and in flight.

[redacted]

[redacted]

5.4.9 What were the most reassuring or even comforting events or conditions of the flight: The most comforting event is zero g. The most reassuring event is parachute deploy. Although, by then you know the flight is over, and that, in itself, is reassuring.

5.4.10 Was your own ability to control the spacecraft after so much training reassuring: I do not look at that as being particularly reassuring. I expected to be able to control the spacecraft. I think it is reassuring to know that all the thrusters are working right.

5.4.11 When did time seem to pass rapidly: The time passed most rapidly from lift-off to impact.

5.4.12 When did it seem to drag? Did the time from landing to recovery seem long: It did not. I enjoyed the time on the water.

5.4.13 When were you pressed for time: I was pressed for time from lift-off to impact.

5.4.14 Did you notice any reaction response of the spacecraft to your movements: Yes. I have described the reaction response of the spacecraft earlier.

5.4.15 What sounds occurred which you were not able to immediately recognize or did not expect: There was a change in the noise level of the spacecraft three or four times. A couple of times it was an increase when something started happening that had not been going on before. The other times it was a decrease when something stopped. This was usually an abrupt change in noise level. Some were audible in the earphone and some through the helmet and ear cup from the spacecraft equipment.

5.4.16 What experiences from training came to mind during the flight: The turnaround was something that I recognized. Attitude control using star reference is similar to the ALFA Trainer, but the periscope view is not at all similar to the ALFA Trainer. The whole launch was very familiar. The retrofire and reentry are familiar, but the orbital flight itself is full of new sensations.

[redacted]

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5.5 Evaluation of Spacecraft Systems

5.5.1 Comment on your suit. Do you suggest any changes: - The suit is too restricting on the ground. In the flight, it bothered me very little. However, the helmet bothered me. It is hard to see out of the window and to get any of the equipment up to your eyes.

5.5.2 Do you think a larger visor would help: - Yes. It would.

5.5.3 Does the helmet restrict your head movement or your vision: - It primarily restricts vision, but when you try to get up close to the window, the helmet also restricts your movement.

5.5.4 Comment on your couch. Changes: - The couch was very comfortable. I did not move far enough forward to change the periscope view. At most, I moved only 2 or 3 inches.

5.5.5 Comment on your restraint harness. Changes: - I don't think we need the leg supports. The retraint harness is not a good one. The shoulder harness reels are not right. They do not have the proper tension and the whole thing is not compatible with the suit. The restraint system should be built into the suit.

5.5.6 With regard to the ECS, was there any noticeable overpressure in the suit at any time? If so, was this bothersome: - There was no noticeable overpressure on the ECS at any time.

5.5.7 Was there any noticeable negative pressure in your suit at any time? How severe? Did you take any measures to correct this: - There was also no noticeable negative pressure.

5.5.8 Could you hear the demand regulator? When? Could you hear oxygen flow through the helmet exhaust hose? Was this annoying? Did it interfere with communication or your ability to concentrate: - Yes, I could hear the demand regulator. I was not conscious of the flow through the exhaust hose, so it did not interfere.

5.5.9 Did you use emergency oxygen? When? What difference did this seem to make: - The only time I used emergency oxygen was when the snorkel came out. Once when it was so hot, I considered selecting emergency rate. I thought it might help. But I did not use it.

5.5.10 Did the ECS signal lights operate properly: - The ECS signal lights operated properly.

[redacted]

5.5.11 Did the ECS supply quantity indicators operate satisfactorily: - The supply quantity indicators operated satisfactorily.

5.5.12 Do you have any comments on the overall operation of the rocket and pyrotechnic systems: - With the exception of late retrofire and the smoke, the rockets and pyrotechnics systems operated correctly. In addition, the balloon jettison failed.

5.5.13 Did the roll, pitch, and yaw rate and position indicators function properly: - There was one time when I read 34° on the pitch attitude indicator, but was not in retroattitude according to the window reference. At the same time a pitch down rate was indicated but the pitch attitude needle did not move. The other two attitudes at this time were at zero. This occurred on just one occasion, the first time I mentioned an ASCS problem. The pitch indicators showed the pitch to be about 20 degrees or more off retroattitude, but it was not. It was not moving. It was just as though the gyros were caged.

5.5.14 Describe the capsule response to all control modes used during the mission: - The spacecraft response in all control modes was excellent.

5.5.15 Was there any indication of thrusters leaking on automatic control system? Did tailoff seem excessive: - The tailoff was imperceptible. The response was just beautiful.

5.5.16 Was there evidence of thrusters failing to start? Any delayed starts: - There was no evidence of thrusters failing to start.

5.5.17 In general, do you have any comments pertaining to the reaction control system: - The only thing that bothered me on the reaction control system was the low rates that I got from fly-by-wire low thrusters. From the training I received on fly-by-wire operation in the Procedures Trainer, I was used to seeing a specific rate needle response to a given stick deflection. The rates I could develop with the fly-by-wire low thrusters in flight were not as great as they were on the trainer. Since they were lower, this sometimes caused me to use the high thrusters instead. There were times when I suspected the low thrusters were not working correctly because the rate buildup was so slow.

5.5.18 If used, was the manual periscope extension-retraction lever operation adequate: - The manual periscope extension-retraction lever wasn't used in flight. Its operation has always been adequate on the ground.

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5.5.19 Was the periscope filter usable: - I did not use the periscope filter. I did not even think about it, although I had used it on the ground.

5.5.20 Comment on radio reception as to continuity, clarity (indicate excellent, good, fair, unintelligible) for those radios used (UHF, HF, command voice receiver): - Radio reception was excellent. I received transmissions that could not be answered, because I could receive at a greater distance than I could transmit. The clarity was excellent. I used UHF low and UHF high over Kano. There was no difference in the reception. No ground station ever read me on HF, so far as I know. I made a number of HF transmissions, but no one ever answered me.

5.5.21 What was the relative noise level in audio: - It was not noticeable.

5.5.22 Is a 400-cycle or an 800-cycle tone prevalent: - I do not remember hearing the 800-cycle tone that has been a problem in the past. In orbit it is very still in the spacecraft.

5.5.23 Were there any differences in instrument readability from the static situations during powered flight, orbital flight, and during reentry: - A great number of instruments are not readable under the red lights.

5.5.24 Could you read the indicators easily at all times? Any glare: - There was no problem with glare on the instruments. There was a glare problem on the star chart.

5.5.25 Did you encounter any unexpected problem relative to reaching any of the controls: - I did not encounter any problem relative to reaching any of the controls. Everything is easier to reach under zero g.

5.5.26 Did you encounter any instrument malfunctions? If so, describe: - With the possible exception of the rate of descent indicator, there were no instrument malfunctions.

5.5.27 Did any of the ejected items collide with the capsule: - Not that I could tell.

5.5.28 Did noise and vibration interfere or aid in the execution of your control tasks or communication tasks? Explain: - Noise and vibration did not interfere or aid in execution of control tasks and

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[redacted]

communications tasks. Reentry acceleration did make me breathe more often than I would ordinarily.

5.5.29 Did sound cues offer any confirmation of sequence operations? If so, describe: - Sound cues offered confirmation of most of the sequence functions. .05g did not, of course, provide a sound cue. Only sequence items that produce sound cues can be confirmed orally.

5.5.30 Were there any peculiarities in hand-controller characteristics? If so, describe: - I think that the RSCS 'boot' that can be sensed in ground tests in the pitchdown, roll and yaw right directions, disappeared in orbit. These were quite noticeable on the pad.

5.5.31 Estimate the percentage of time that the gyros were normal, free and caged. Did the gyros ever tumble? When? Action taken: - I would say that the gyros were free 10 percent of the time, normal, 30 percent, and caged, 60 percent. They never tumbled.

5.5.32 Estimate the percentage of the time that you flew in the various control modes: - There was just a brief period, perhaps a minute, in rate command. The Aux Damp mode was also for short periods, two or three in orbital flight and then during reentry. I used it for perhaps a minute and a half altogether in flight up to reentry. The fly-by-wire and manual modes were used for about equal periods of time. The automatic mode was used about ten percent of the time.

5.5.33 Was the cabin display adequate throughout the flight: - The cabin display was adequate but there were a lot of improvements which would be beneficial.

5.5.34 Were any fuse switches changed to the alternate switch position during the flight? If so, which ones and at what time during the flight? Did you note the ammeter reading at this time: - No, none of the fuse switches were changed to the alternate position.

## 5.6 Flight Operational Procedures

5.6.1 Were voice procedures adequate: - Voice procedures were okay. I think they could be improved, however.

5.6.2 Was there too much talk from the ground: - I think there was too much talk. I had to answer too many questions which only provided confirmations of readings the ground stations already had. There is some requirement for this but it was frequently a handicap to be required to talk. On some occasions there was too much talk from the ground.

[redacted]

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5.6.3 Did you have enough information from the ground on trajectory and impact prediction? On capsule telemetry measurements? On advice on astronaut procedures from the Capsule Communicator(s)? On recovery information and problems? On the weather: - I did have enough information from the ground on trajectory and impact predictions. I could have used more recovery information but the lack of information was due to the overshoot. I got information on T/M measurements rapidly, and advice on astronaut procedures from the Capsule Communicators. I did get conflicting information on handling the flow control valves, but that was a minor part of the problem.

5.6.4 Did the abort light ever come on: - The abort light never did come on.

5.6.5 Would you have liked to be informed about how the launch vehicle and the ASIS was performing in real time: - There was no need to know about launch vehicle performance. It is nice to know about your pitch attitude. Nothing was said about the launch vehicle performance, which implied that it was satisfactory and that is all I needed to know.

5.6.6 Were you able to assess properly the operations of all the spacecraft systems by reference to the onboard instrumentation: - A lot of things are measured on the ground that are not measured in flight, but I think that the pilot has most of the information he needs.

5.6.7 Would you comment on the absence of the inverter lights: - The inverter lights are a much better system than the inverter ammeter and selector knob. They are a passive indicating system. The pilot has a direct indication of inverter failure. In this spacecraft, it requires some activity on the part of the pilot to determine inverter failure. The inverter failure warning light is located right under the fans position. In the trainer, my immediate impulse when I had an inverter failure light on was to go immediately to the fans bus, because it's right by the light. This is not correct. I should have evaluated the system more clearly. However, it is a human engineering problem.

5.6.8 Were you adequately briefed on all phases of the mission: - I was verbally adequately briefed on all phases of the mission. However, as previously noted, improvements are required on some procedures.

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## 5.7 Pilot's Equipment

5.7.1 Comment on the adequacy of the following: Hand held camera for color, earth horizon, and cloud photography: - It's a good camera. We need one with both an automatic and a manual shutter.

5.7.2 Comment on the adequacy of the following: Binoculars: - The binoculars are good but it is hard to look out the window because you have to point them up and then they run into your helmet. You cannot get your helmet back far enough out of the way because you are restrained. I think it would be handy to have a prism system so that you could hold the binoculars out in front of you and point them up normal to the window.

5.7.3 Comment on the adequacy of the following: Variable density filter: - I didn't use the variable density filter. I wish I had. I think it's a good one.

5.7.4 Have you any other comments on the equipment: - The equipment should have been developed right along with the capsule, so that it was window compatible and heat compatible. It should have been worked out months in advance instead of waiting for the night before launch at the Cape. We ought to start thinking about future missions and plan them farther ahead of time. This also effects the flight preparations because you cannot train adequately until you have the inflight equipment.

## 5.8 Summary Questions

5.8.1 From a pilot's point of view, what did you get out of this flight: - March and May flight time.

5.8.2 What spacecraft systems need improvement the most? In what way is improvement needed: - It is desireable to have better control of the suit and cabin temperature. We need to look at the control system again, too. We ought to have an orientation mode that uses low thrusters only. We ought to be able to cut the high thrusters out altogether or fly-by-wire for orbit maneuvering. I think we need a new stick. The one we have is good for manual but it is not good for fly-by-wire, in my estimation. It is a handy combination of the two control levers that is needed: One for fly-by-wire and one for manual. I thought about this during the flight. It would be good to have a little pencil stick that you could move to a stop, and know you have fly-by-wire low in that direction.

The temperature control system needs improvement. The inverter lights are better than the meter alone. The pilot's personal equipment needs improvement. Provision for equipment stowage is not adequate on the ground but in flight it has been adequate. The spacecraft lighting needs improvement.

There are a few suit items that need improvement. The visor seal hose needs to be retained better. The helmet restricts visibility.

5.8.3 What flight control procedures should be improved and in what way: - The launch went very well, I think. I don't see any need to change flight control procedures, except perhaps to require less talk to the range stations. R and Z cal should not be mentioned during the flight.

The matter of Com Tech calling and then saying stand by for Cap Com is time-consuming and unnecessary. I know it has to be done this way as far as the ground in concerned. I think the smoothest way to do this is to have Com Tech do the calling and, as soon as the spacecraft is heard on the ground, make an automatic switch-over to Cap Com. When Com Tech says, "Roger, reading you loud and clear," he should say, "Give me your report." You give it and Cap Com takes over from there. This procedure would take less time.

5.8.4 In retrospect, would you have liked to train any more than you did on any particular trainer or in any particular systems study area? If so, which ones: - I cannot think of any systems area where I would have liked more training, except on the gyros reference system. It would be good to have a trainer that gives realistic gyro training. I do wish I could have spent more time in the trainer with the flight equipment, practicing on the flight plan.

5.8.5 How do you feel about your ability to perform during longer periods of weightlessness: - I think I could have performed well endlessly in a weightless condition. I seriously wonder if a person couldn't live at zero g with a substantially reduced need for sleep. Maybe we can find out about this some day.

# 2.0 COMMUNICATIONS

## 2.1 Introduction

The table that follows is a verbatim transcript of the MA-7 flight communications taken from the spacecraft onboard tape recording. This is, therefore, a complete transcription of the communications received and transmitted by the pilot, Scott Carpenter.

In the table, column one is the ground elapsed time (GET) from lift-off in hours, minutes, and seconds when the communique was initiated. Column two identifies the communicator, as follows:

CC - Capsule (spacecraft) Communicator at the range station

CT - Communications Technician at the range station

F - Flight Director at Bermuda range station

S - Surgeon or Medical Monitor at the range station

Stony - Blockhouse Communicator

All temperatures are given as $^{o}F$; all pressures are in pounds per square inch, absolute (psia); fuel, oxygen, and coolant quantities are expressed in remaining percent of total nominal capacities; retrosequence times are expressed in GET (hours, minutes, and seconds).

Within the text, a series of three dashes are used to designate times when communiques could not be desciphered. One dash indicates a time pause during a comminique. The station in prime contact with the astronaut is designated at the initiation of communications. Also, in the top right hand corner of each page, the station or stations in contact and the orbital pass number are designated.

[redacted]

2.2 Contents of Communication Transcript

| | PAGE NUMBERS | | |
|---|---|---|---|
| LOCATION | ORBIT #1 | ORBIT #2 | ORBIT #3 |
| Cape Canaveral | 2 - 3 | 2 - 29 | 2 - 58 |
| Bermuda | - - - | 2 - 31 | - - - |
| Canary | 2 - 8 | 2 - 33 | 2 - 61 |
| Kano | 2 - 10 | 2 - 35 | 2 - 63 |
| Zanzibar | - - - | 2 - 37 | - - - |
| Indian Ocean Ship | 2 - 12 | 2 - 38 | 2 - 64 |
| Muchea | 2 - 14 | 2 - 41 | 2 - 68 |
| Woomera | 2 - 18 | 2 - 46 | 2 - 71 |
| Canton | 2 - 22 | 2 - 48 | - - - |
| Hawaii | 2 - 24 | 2 - 51 | 2 - 73 |
| California | - - - | 2 - 53 | 2 - 76 |
| Guaymas | 2 - 26 | 2 - 56 | - - - |
| Cape Canaveral | - - - | - - - | 2 - 79 |

[redacted]

## 2.3 Transcript

### CAPE CANAVERAL

| | | |
|---|---|---|
| | Stony | 5,4,3,2,1,0. |
| 00 00 01 | P | I feel the lift-off, the clock has started. |
| 00 00 04 | CC | (Cape Canaveral) Roger. |
| 00 00 06 | P | Loud and clear, Gus. |
| 00 00 07.5 | CC | Roger, Aurora 7, stand by for - the time hack. |
| 00 00 11 | P | Roger. |
| 00 00 12.5 | P | Little bit of shaking, pretty smooth. |
| 00 00 16.5 | CC | 3,2,1, Mark. |
| 00 00 21 | P | Roger, the backup clock has started. |
| 00 00 24.5 | CC | Roger, Aurora 7. |
| 00 00 29 | P | Clear blue sky. 32 seconds, 9,000, fuel and oxygen steady, cabin pressure 15 1 and dropping. A little rough through max q, and one minute. |
| 00 00 46 | CC | Roger, you're looking good from here. |
| 00 00 47 | P | Okay, 25 amps and the power is good. |
| 00 00 50.5 | CC | Roger, you're looking good. |
| 00 00 59.5 | P | Mark, one minute. Cabin pressure is on schedule, fuel and oxygen are steady, 24 amps, all the power is good. |
| 00 01 10.5 | CC | Roger, pitch is 56, you look - |
| 00 01 13 | P | Roger, my pitch looks good, it's smoothing down a little bit now. I feel the pitch program starting over. |
| 00 01 22.5 | CC | Roger. |
| 00 01 26.5 | P | The sky is getting quite black at 1 30 - elapsed. Fuel and oxygen is steady, cabin pressure is leveling off at 6 2, 22 amps and the power is still good, one cps sway in yaw. |

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| | | |
|---|---|---|
| 00 01 44 | CC | Roger, understand. Pitch is 37, you look real good. |
| 00 01 59 | CC | Standby. |
| 00 02 08.5 | P | Roger. There is BECO on time, and - |
| 00 02 14.5 | CC | Ah, Roger, understand BECO. |
| 00 02 16 | P | Roger, I felt staging. Do you confirm? |
| 00 02 19 | CC | Staging? |
| 00 02 20 | P | Do you confirm staging? |
| 00 02 22 | CC | Aurora 7, we confirm staging. |
| 00 02 24 | P | Roger, g peaked at 6.3. |
| 00 02 32 | P | The tower is way out. It's gone, the light is green. Going over the BECO check now. |
| 00 02 41.5 | CC | Roger, Aurora 7. |
| 00 02 49 | P | BECO check is complete. |
| 00 02 54.5 | CC | Roger, understand complete. Is that correct? |
| 00 02 57.5 | P | That is Roger. |
| 00 03 01.5 | P | At three minutes. Fuel and oxygen are still steady, cabin is holding 5 8, power still looks good, my status is good. |
| 00 03 14 | CC | Roger, pitch minus, minus 2-1/2, and you're right on, you're good. |
| 00 03 19 | P | Roger, reading you loud and clear, Gus. |
| 00 03 29 | CC | Aurora 7, --- , you are good. |
| 00 03 33.5 | P | Roger, still reading you, broken a little bit. At 30, my status is good, fuel and oxygen are steady. Cabin is holding 5 8, cabin is holding 5 8, power is good, 25 amps. |
| 00 03 47.5 | CC | Roger. |

| | | |
|---|---|---|
| 00 04 01 | P | Four minutes, Aurora 7 is go. Fuel and oxygen steady, cabin holding, 25 amps, power is good. |
| 00 04 12 | CC | Roger, Aurora 7. Pitch minus 3-1/2, you're good. |
| 00 04 15.5 | P | Roger, reading you on Bermuda antennas now, much louder. |
| 00 04 19 | CC | Roger. |
| 00 04 30 | P | 4 plus 30 my clock, fuel and oxygen steady, 3-1/2 g's. Cabin holding 5 8, 25 amps power is good. |
| 00 04 42 | CC | Roger, Aurora 7, you're through .8, V/VR of .8. |
| 00 04 46 | P | Roger. .8. |
| 00 05 09 | P | Okay, there is BECO, the posigrades fired. I am weightless and starting the fly-by-wire turn-around. Aux Damp is good. |
| 00 05 25.5 | CC | Roger. You look good down here. |
| 00 05 27 | P | Periscope is out, - and |
| 00 05 32 | CC | We have a go, with a 7-orbit capability. |
| 00 05 36 | P | Roger. Sweet words. |
| 00 05 38.5 | CC | Roger. |
| 00 05 52 | P | Okay, turnaround has stopped. I'm pitching down. I have the moon in the center of the window, and the booster off to the right slightly. |
| 00 06 07.5 | CC | Roger, understand. |
| 00 06 09.5 | P | Fly-by-wire is good in all axes, my pitch attitude is high, coming down now. |
| 00 06 17 | CC | Roger, understand. |
| 00 06 38 | P | Roger. The control system on fly-by-wire is very good. I have the booster in the center of the window now, tumbling very slowly. |

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| 00 06 50.5 | CC | Roger, Aurora 7, understand. You sound real good. |
| 00 06 59.5 | P | It's very quiet. |
| 00 07 04.5 | P | A steady stream of gas, white gas, out of the sustainer engine. Going to ASCS, now. |
| 00 07 15 | CC | Roger. Understand. |
| 00 07 17 | P | ASCS seems to be holding very well. I have a small island just below me. |
| 00 07 26.5 | CC | Aurora 7, standby for retrosequence times. |
| 00 07 29.5 | P | Standing by. |
| 00 07 31.5 | CC | Area 1 B is 17 17. |
| 00 07 38.5 | P | 17 17 Roger. |
| 00 07 41.5 | CC | Roger, standby for later times. That's all I have right now. |
| 00 07 50 | CC | Roger, sequence time for end of orbit. |
| 00 07 53.5 | P | Send your message. |
| 00 07 55 | CC | Aurora 7, retrosequence time for end of orbit --- 28 26. |
| 00 08 00 | P | 01 28 26, Roger. |
| 00 08 04 | CC | End of mission, 04 32 39. |
| 00 08 09 | P | 04 32 29, Roger. |
| 00 08 12 | CC | Negative 04 3, 04 32 39. |
| 00 08 17.5 | P | Roger, understand, 04 32 39. |
| 00 08 21 | CC | Roger. |
| 00 08 22.5 | P | Roger, I have copied. |
| 00 08 27 | P | ASCS looks good, all fly-by-wire thrusters appear to be good in all axes. Going to - beginning to unstow the equipment. |

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| 00 08 41 | CC | Aurora 7. |
| 00 08 43 | P | Roger, and the SECO checklist is complete. She peaked at 6.3. |
| 00 08 51.5 | CC | Cap Com. Over. |
| 00 08 53.5 | P | Go ahead, Gus. Loud and clear. How me? |
| 00 09 01.5 | CC | Aurora 7, Cap Com. |
| 00 09 03 | P | Roger, loud and clear. How me? |
| 00 09 07 | CC | Aurora 7, Cape Cap Com. Over. |
| 00 09 16 | CC | Aurora 7, Cape Cap Com. Over. |
| 00 09 18.5 | P | Loud and clear, Gus. How me? |
| 00 09 25 | CC | Aurora 7, Cape Cap Com, if you read, retro delay to normal? |
| 00 09 29 | P | Retro delay normal, Roger. |
| 00 09 32 | CC | --igee 8 6. |
| 00 09 34.5 | P | Roger, copied perigee 8 6, did not get apogee. |
| 00 09 54.5 | P | Mark, one picture of the booster. Going to transmit and record now. 2, 3, 4, 5, 6, - 10, 11, 12 pictures of the booster, traveling right down the center of the booster, right down the center of the window. |
| 00 10 34 | P | Going over the insertion checklist now. D-c volts is main. Retromanual fuse switch is off, retromanual is off, all instruments, are, all bateries okay. The a-c power is good. The, let's see, where's the booster. There's some beautiful cloud patterns down there. The booster is in front of a large cloud pattern. I seem to be, I seem to be much closer to the earth than I expected to be. The booster is approximately two miles away now. |
| 00 11 40 | P | I have some pictures of the booster, maybe 17 or 18, all together, then going to the horizon, north sweeping south, there is the moon, just setting. Winding the camera at this time. |

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| 00 12 22 | P | There is some rather large pieces floating around. The flight plan is now out. Gyros are going to free at 12 33, and I'm going to fly-by-wire to track the booster. I will - this is not a good tracking problem. Our speeds are too close to being the same. I will put it in the center of the right window, plus. I have it right in the center - I feel that - overshot there. Getting ahead of me in pitch. |
| 00 13 29.5 | P | The high thrusters work well, close tracking should be done on - on fly-by-wire low only. To follow the booster is a tough job with the highs. Gyros are staying within limits pretty well. Elapsed time is 13 56. I have lost sight of the booster at this time. I'll pick up a retroattitude at this time for Canary radar. Large piece of ---. |
| 00 14 21.5 | ? | This is Casterfield. Good luck. Over. |
| 00 14 27 | P | Aurora 7, copied. Roger, thank you. |
| 00 14 37.5 | P | Going back to gyros free, or to gyros normal. |

CANARY

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| 00 14 47 | CC | Aurora 7. This is Canary Cap Com. How do you read? Over. |
| 00 14 51 | P | Hello , Canary Cap Com. Aurora 7, reading you loud and clear. How me? |
| 00 14 56.5 | CC | Read you loud and clear also. We have radar track. Please remain in orbit attitude. |
| 00 15 02 | P | Roger. Understand. I, my control mode is fly-by-wire, gyros normal, maneuver off. I am picking up retroattitude and automatic control very shortly. Over. |
| 00 15 18.5 | CC | Roger. Will you verify that your retrodelay switch is in the normal position. |
| 00 15 24 | P | Retrodelay is normal. I say again, retrodelay is normal. |

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| 00 15 29.5 | CC | Roger. Will you please proceed with the short report. Fuel and oxygen readings. |
| 00 15 38 | P | Roger. Fuel 103-100. Oxygen 89-100. All the power is good. Aurora 7 status is go in all respects. Over. |
| 00 15 53.5 | CC | Roger. Say again fuel, please. Over. |
| 00 15 56.5 | P | Fuel 103-100. Over. |
| 00 16-01.5 | CC | Roger. Have copied. |
| 00 16 04.5 | CC | Please send blood pressure. Over. |
| 00 16 07 | P | Roger. Blood pressure start now. |
| 00 16 19 | P | I have, west of your station, many whirls and vortices of cloud patterns. Pictures at this time - 2, 3, 4, 5. Control mode is now automatic. I have the booster directly below me. I think my attitude is not in agreement with the instruments. It's probably because of that gyro free period. Outside of a minor difference in attitude indications, everything is proceeding normally. |
| 00 17 14 | CC | Can you confirm orientation, ASCS and fly-by-wire --- operating normal? |
| 00 17 21.5 | P | Roger. Wait one. |
| 00 17 53 | P | Roger. Canary, TS plus 5 is verified. Manual is satisfactory in all axes. Fly-by-wire and auto is satisfactory, all axes. Aux Damp is okay also. Over. |
| 00 18 08.5 | CC | Roger, I have copied. I have new end of orbit, end of mission and 1 Bravo times for you. Are you prepared to copy? |
| 00 18 15 | P | Standby one. |
| 00 18 39.5 | P | Send your message, Canary. |
| 00 18 41.5 | CC | Roger. End of orbit time, 01 28 17. End of mission, 04 32 27. 1 Bravo 16 plus 56. Did you copy? Over. |

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| 00 19 05 | P | Roger. End of orbit 01 28 17, Hotel 04 32 39, 1 Bravo 16 56. Over. |
| 00 19 22 | CC | Correction. Aurora 7, correction 1 Bravo. Make that 16 plus 52. Over. |
| 00 19 30 | P | Roger. Understand. 16 52. |
| 00 19 33 | CC | Roger. Apogee altitude is 143. Perigee 86. Did you copy? Over. |
| 00 19 43.5 | P | Roger. 143 and 86. |
| 00 19 48 | CC | Roger. Here are sunrise and sunset times. Sunrise orbit one: 1 plus 21 plus 00. Sunrise, orbit two: 2 plus 50 plus 00. Sunrise, orbit three: 4 plus 19 plus 00. |
| 00 20 16.5 | P | Roger, Canary. I'm going to have loss of signal before I get these. I want to get some pictures. Have Muchea or, correction have Kano send these to me, in this order: Sunset, sunrise, sunset, sunrise, break, break. Did you copy? |
| 00 20 36 | CC | --- plus 41 plus 20. Did you copy? Over. |
| 00 20 40.5 | P | That is negative. I'll have to wait awhile for those. |
| 00 20 50 | P | I'll get them from Kano. Thank you. |
| 00 20 52.5 | CC | Have a blood pressure reading. Your first attempt was unreadable on the ground. Over. |
| 00 20 58 | P | Okay. It's on the air. |

KANO

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|---|---|---|
| 00 23 49 | CC | Aurora 7. This is Kano on UHF/HF. Do you read? Over. |
| 00 23 56 | P | Roger, Kano Cap Com. Aurora 7, reads you loud and clear. How me? |
| 00 24 02.5 | CC | Roger, Aurora 7. Kano Cap Com reads you loud and clear. Welcome back, Scott. |

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| 00 24 08 | P | Roger. |
| 00 24 09 | CC | Blood pressure check, please. Hold your button for 4 seconds and then go through the short report. |
| 00 24 16 | P | Roger. Blood pressure start, now. My status is good. The capsule status is good. Fuel is 99-98, oxygen 89-100. Cabin is holding good. All d-c power is good. All a-c power is good. 22 amps. Everything is green and you should be reading blood pressure. Over. |
| 00 24 41.5 | CC | Roger. We are reading blood pressure. Do you want to check your UHF low? Over. |
| 00 24 47 | P | Roger. Going to UHF low now, standby 15. |
| 00 25 10.5 | P | Hello, Kano. Hello, Kano Cap Com. Aurora 7 UHF low. How do you read? |
| 00 25 17 | CC | Aurora 7. Kano Cap Com reads you loud and clear. Over. |
| 00 25 20.5 | P | Roger. Reading you the same. Going back to UHF high. |
| 00 26 22 | CC | Aurora 7, Kano Cap Com. How do you read? Over. |
| 00 26 28 | P | Loud and clear, Kano. Send your message. |
| 00 26 32 | CC | Roger, Aurora 7. Are you going to be doing your caging, uncaging procedure now? Over. |
| 00 26 37.5 | P | Roger. I - am a little behind in the flight plan at this moment. I have been unable at this time to install the MIT film. I finally have it. I'll go through the gyro uncaging procedure very shortly. |
| 00 27 01 | CC | Roger. |
| 00 27 34 | P | Okay, the MIT film is now in. |
| 00 28 00 | P | ASCS is operating okay. |
| 00 28 12.5 | CC | What mode are you on now? |
| 00 28 14.5 | P | Roger. My mode is auto, gyro normal, maneuver off. |

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| 00 28 21.5 | CC | Aurora 7, Kano Cap Com. Be sure you're on fly-by-wire before going through the procedures for uncaging. |
| 00 28 27 | P | Roger, Roger. Understand. |
| 00 28 54.5 | P | I'm going to be unable to complete the MIT pictures on this pass, I believe. Negative, negative, I can fix the problem. Too much film was out of the cannister, that was the problem. Film is now in tight. The small back going on now. |
| 00 29 43.5 | P | At 29 43, the first time I was able to get horizon pictures with MIT film. Set at F 8 and 125th. A picture to the south into the sun, directly down my flight path is number two. Number three 15 degrees north at capsule elapse 30 17. |
| 00 30 29.5 | P | Stowing the camera at this time. Going to the gyro uncaging procedure at this time. Fly-by-wire, now. Gyros going to cage. Maneuver at this point is on. |
| 00 31 02.5 | P | Pitching down, yawing left. |

INDIAN OCEAN SHIP

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| 00 31 36 | CT | Aurora 7, Aurora 7, Aurora 7. This is I.O.S. Com Tech on HF and UHF. How do you read? Over. |
| 00 31 49 | P | Roger, Indian Com Tech. Aurora 7 reading you weak but readable. Go ahead. |
| 00 32 10 | CT | Aurora 7, Aurora 7. This is I O.S. Com Tech on HF and UHF. How do you read? Over. |
| 00 32 19 | P | Hello, Indian Ship Cap Com. Aurora 7. Loud and clear. How me? |
| 00 33 59 | P | Hello, Indian Cap Com, Indian Cap Com, Aurora 7. How do you read? |
| 00 34 17 | P | Hello, Indian Cap Com, Indian Cap Com, Aurora 7. How do you read? |

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| 00 34 26.5 | P | At 34 28, I'm increasing the cabin water valve and the suit valve to 6. Steam vent temperature now reads 65 and 75. |
| 00 34 47 | P | Mark, African coastal passage, about 20 seconds ago. |
| 00 35 02.5 | P | I'm using the airglow filter at this time. Visor is coming open for a better look at that. Hello, Indian Cap Com, Aurora 7. Do you read? |
| 00 35 39 | P | Maneuver is going off at this time, and I'm going to aline manually, to retroattitude. |
| 00 38 04 | P | Station calling Aurora 7. Say again. |
| 00 39 28 | P | Okay. That took me some time to aline my attitudes properly. Three more pictures with MIT film, 2, 3, directly into the sun, at an elapsed time of 39 42. |
| 00 40 12.5 | P | Okay, going through - |
| 00 42 30.5 | P | The big back is going on the camera, at this time. There was a period there when nothing was recorded because I was in VOX power off, instead of record. The big - |
| 00 43 02.5 | P | At 43 02, I think my gyros are properly alined. |
| 00 43 15.5 | P | What in the world happened to the periscope? |
| 00 43 25 | P | Oh, it's dark, that's what happened. It's facing a dark earth. Sunset F16 to F, okay, we'll start with F16. Up north, coming south. Try some at 250. |
| 00 44 12.5 | P | It's getting darker. Let me see. Muchea contact, sometime. Oh, look at that sun. |
| 00 44 31 | P | F-11. |
| 00 44 45.5 | P | F-5 6. That was those last four, were F 3 8. It's quite dark. I didn't begin to get time to dark-adapt. |

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| 00 45 15 | P | Photo lights are off. Cabin lights are going to red at this time. Oh, man, a wide, a beautiful, beautiful red like in John's pictures. Going to fly-by-wire. |
| 00 46 01 | P | It is a reflection. It is a reflection in the window. That's too bad. |
| 00 46 10 | P | I see at this point, I'm not sure I am recording on VOX record. I will go to transmit. I have Venus, now approaching the horizon. |
| 00 46 37 | P | It's about 30 degrees up. It's just coming into view. Bright and unblinking. I cannot - I can see some other stars down below Venus. Going back to ASCS then at this time. |
| 00 47 05 | P | Bright, bright blue horizon band as the sun gets lower and lower - the horizon band still glows. It looks like five times the width of the - the diameter of the sun. I'm at - now at 47 34 elapsed. |
| 00 47 46.5 | P | It's now nearly dark, and I can't believe I'm where I am. |
| 00 48 08 | P | Oh, dear, I've used too much fuel. |
| 00 48 22 | P | Well, I'm going to have to increase, let's see, going to ASCS at this time. |
| 00 48 38 | P | My fuel reads 75-100 at this time. The window - is Venus occlude. No, that - that is not correct. Venus did not occlude. I'm getting out the equipment to measure Venus occlusion. |
| 00 49 15 | P | There is too much red light in the cockpit from the time correlation. Venus at above the - horizon. |

MUCHEA

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| 00 49 28.5 | CC | Aurora 7. This is Muchea Cap Com. How do you read? |
| 00 49 34 | P | Hello, Muchea Cap Com, Aurora 7. Loud and clear. How me, Deke? |
| 00 49 39 | CC | Rog. Coming in very good, dad. Sound very good, how's things going? |

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| 00 49 45.5 | P | Roger. Things are going very well, my status is very good. The capsule status is very good. The control mode is normal. Automatic gyros normal and maneuver off. Fuel is 72-100. Oxygen 88-100. Everything is normal with the exception of - the fact that I am a tad behind in the flight plan. Over. |
| 00 50 11.5 | CC | Roger. Understand. |
| 00 50 13 | P | Blood pressure is starting now. |
| 00 50 17 | CC | Okay. Blood pressure starting. We suggest that you do not exercise during the blood pressure since your temp is up. |
| 00 50 23.5 | P | Roger. This is the story on the suit temp. I have increased 2 ten-degree marks since lift-off. And now about - well, 15 degrees above launch mark. My steam vent temperatures read 69 and 80. I'll take one more stab at increasing, or decreasing, temperature by increasing flow rate. If this doesn't work, I'll turn them off and start lower. Over. |
| 00 50 59 | CC | Rog. Understand. I'll give you some retrotimes while you're sending blood pressure. End of orbit is 01 28 18. End of mission is 04 32 28. |
| 00 51 15.5 | P | Roger. Understand. End of orbit 01 28 18 and 04 32 28 for end of orbit. Over. End of mission. |
| 00 51 26 | CC | That's affirmative. We indicate your clock is one second slow and this is compensated for. |
| 00 51 31 | P | Roger. Thank you. |
| 00 51 34 | CC | GMT time hack at this time - we're coming up on 13 36 57, MARK. |
| 00 51 41 | P | Roger. My GMT - my backup GMT are right in sync. with GMT. Over. |
| 00 51 49 | CC | That's very good. |
| 00 51 51.5 | CC | Okay, if you're ready I'll give you the emergency voice check. We will turn off UHF and HF transmitters for this so that you will not have to change volume. |

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| 00 51 59 | P | Roger, standing by. |
| 00 52 24.5 | CC | Aurora 7. Muchea Cap Com. 1, 2, 3, 4, 5, 5, 4, 3, 2, 1 command voice. How do you read? |
| 00 [illegible] | P | Roger, Deke. Read you loud and clear, loud and clear emergency voice. |
| 00 52 [illegible] | CC | Very good, very good. Switching back to UHF. |
| 00 52 20 | P | Roger. |
| 00 52 24.5 | CC | Aurora 7, Muchea Cap Com on UHF. How do you read? |
| 00 52 28 | P | Roger. Muchea Cap Com. Loud and clear. Tell Jerry and Gus and Lewis and - everybody else there, that I worked with "hello." John Whittler, if you see him, tell him to saddle Butch up. Break, break. Is your cloud cover such that I can expect see light - or flares at Woomera? Over. |
| 00 52 52.5 | CC | Roger. The cloud coverage here is 3,000 overcast stratus and we think you'll probably see them through the clouds. Woomera is clear. |
| 00 53 03.5 | P | Roger. |
| 00 53 18.5 | CC | Seven from Muchea. Would you send us one more blood pressure? |
| 00 53 21.5 | P | Roger. Starting now. |
| 00 53 28.5 | CC | We're going to send you a Z cal at this time. |
| 00 53 31 | P | Roger. And - go ahead and send it. I'll - you'll be interested to know that I have no moon, now. The horizon is clearly visible from my present position; that's at 54 44 elapsed. I believe the horizon on the dark side with no moon is very good for pitch and roll. The stars are adequate for yaw in, maybe two minutes of tracking. Over. |
| 00 54 01.5 | CC | Roger, understand. Sounds very good. Z cal off, R cal coming on. MARK. |
| 00 54 12 | CC | Suggest that you back the fuel control back to your first black mark. |

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| 00 54 18 | P | Roger. I'll try that. Going all the way off and - back up a little bit lower than where I was. |
| 00 54 28.5 | CC | Roger, your suit temperature is down a bit at this point. |
| 00 54 31.5 | P | Say again, Deke. |
| 00 54 33 | CC | Your suit temperature is down, which is good. |
| 00 54 36.5 | P | Well, that's a result of an increase in flow lately. I would think that - I'll try increasing rather than decreasing. |
| 00 54 55.5 | P | Hello, Woomera Cap Com, Aurora 7. Do you read? |
| 00 55 00 | CC | Roger. This is Woomera, this is Woomera Cap Com. Reading you loud and clear. How me? |
| | CC | This is Muchea Cap Com. They will not be contacting you for another three minutes. |
| 00 55 08 | P | Roger. Go ahead, Deke. Just trying to get the word on the flare. |
| 00 55 12 | CC | Roger, understand. I'll give you the settings, correction, the attitudes for the first flare at this time. It would be plus 80 yaw, minus 80 in pitch. |
| 00 55 28.5 | P | Roger, understand, Deke. Plus 80 yaw, minus 80 pitch. |
| 00 55 37 | CC | Roger, okay. The Cape now advises to keep the suit setting where it was since it's coming down. |
| 00 55 44.5 | P | Roger. I - for your information, I have increased it just slightly. My readings now are 7 and 7 on suit and cabin. What are my inverter temperatures and thruster line temperatures, Deke? Are they okay? |
| 00 56 04.5 | CC | Rog. We are losing you. We are losing you on air ground. Would you care to contact Woomera at this time? |
| 00 56 11.5 | P | Roger. |

WOOMERA

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| 00 56 14.5 | CC | Aurora 7, Aurora 7, this is Woomera. Read you loud and clear. How me? |
| 00 56 18.5 | P | Roger, Woomera. Reading you loud and clear, also. I'd like read-out on my inverter temperatures - and mark on your flare. Over. |
| 00 56 29 | CC | Roger. We're going to have the flare in approximately two minutes. We'll give you a read-out on your temperatures. |
| 00 56 37 | P | Roger. And for your information, Rate Command is also working in all axes. Over. |
| 00 56 47.5 | CC | Roger, Rate - Rate Command in all axes. |
| 00 56 52 | P | That - that signifies that all control systems are operating satisfactorily. Over. |
| 00 57 00 | CC | Roger, understand. All systems okay. We have your temperatures. Your 150 inverter, 152. Your 250 inverter, 167. Do you copy? Over. |
| 00 57 13 | P | Roger. Copied, thank you. Standing by. |
| 00 57 16.5 | CC | We're going to have the flares, all four of them, go at approximately 58 plus 30. We do have an eight by eight coverage. |
| 00 57 24 | P | Roger. I am at - plus 80 yaw, minus 80 pitch, now. |
| 00 57 35 | CC | Roger. We'll give you a time hack when we come up to flare test. |
| 00 57 41 | P | Roger. |
| 00 57 47 | CC | This is Woomera Cap Com, 7. Sir John reports all systems look good down here. And Systems reports everything okay on his panel. |
| 00 57 57 | P | Roger. Thank you. It looks good to me, also. |
| 00 58 00 | CC | Roger. You are loud and clear. Coming up on the flare test - in approximately 25 seconds. |

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| 00 58 05.5 | P | Roger. |
| 00 58 09.5 | CC | Good air to ground. |
| 00 58 12 | P | Roger. Going to fly-by-wire. It doesn't cost so much. |
| 00 58 17.5 | CC | Roger. Fly-by-wire, Manual on. Is that affirmative? |
| 00 58 21.5 | P | Manual is - no, I'm, my control mode is pure fly-by-wire now. |
| 00 58 26 | CC | Roger. Flare test coming up. Stand by. Mark, 58 plus 30, all four flares away. |
| 00 58 52 | CC | Aurora 7, Aurora 7, this is Woomera. How do you read? Over. |
| 00 58 55 | P | Roger. Reading you loud and clear. Searching for your flares. Stand by. |
| 00 59 02 | CC | Roger. We still have approximately 60 seconds left. |
| 00 59 11 | CC | You're up to minus 50 on roll. |
| 00 59 15 | P | Roger. Backing off, thank you, thank you. Backing off. |
| 00 59 27.5 | P | I do not have your flares. I'm sorry, Woomera. |
| 00 59 31 | CC | Say again, Seven. |
| 00 59 33.5 | P | No joy on your flares. I do not have your flares visible. |
| 00 59 37.5 | CC | Have copied. Evidently the cloud coverage is too tight. |
| 00 59 43 | P | At this time I have extensive cloud coverage - wait. |
| 00 59 49.5 | CC | Did you try Aux Damp when you're in fly-by-wire to see if you are holding attitudes? |
| 00 59 54 | P | Negative. I have verified that Aux Damp is operating satisfactorily. Over. |

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| 01 00 00 | CC | Roger. Understand. |
| 01 00 02 | P | I have some lights on the ground underneath me. Standby, I'll try to identify them. |
| 01 00 12 | CC | Roger. Wilco. |
| 01 00 42 | CC | Aurora 7, Aurora 7, this is Woomera Cap Com. Do you read? Over. |
| 01 00 46 | P | Loud and clear, Woomera. Go ahead. |
| 01 00 49 | CC | Roger. Could you give us a short report at this time? |
| 01 00 52.5 | P | Roger. My control mode is fly-by-wire, gyros are free, and the maneuver switch is off. Fuel reads 75-85, oxygen 88 and 100. Wait till I pick a washer out of the air. And everything is very good. Over. |
| 01 01 23 | CC | Roger. You're intermittent. What is your suit temperature? Over. |
| 01 01 29 | P | Roger. Suit temperature is now 70. Suit temperature is 70, steam exhaust is 70, the cabin exhaust is 80. |
| 01 01 43 | CC | Roger. Do you confirm - do you have your - back down to the black scribe mark? |
| 01 01 51 | P | That is negative. I have them both set on seven at this time and - an increase in setting resulted in a decrease - in suit temperature. I think I'd like to try - try them at this setting a little while longer. Over. |
| 01 02 11 | CC | Roger, understand. I believe at this time you're supposed to have your midnight snack. |
| 01 02 18 | P | Roger. I'll get to that shortly. |
| 01 02 21.5 | CC | Roger. You're starting to drift or fade slightly. |
| 01 02 26.5 | P | Roger. |

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| 01 02 31.5 | CC | Are you prepared to go into drifting flight before too long? |
| 01 02 34.5 | P | Roger. I can do that at this time. At night yawed - |
| 01 02 40 | CC | --- is that affirmative? |
| 01 02 41.5 | P | I am going to drifting flight at this time. Over. |
| 01 02 46.5 | CC | Roger. |
| 01 02 53.5 | P | Gyros are caged. I have about a two-degree per second yaw rate. All gyros are zero. I have Corvus directly above me. I'm yawing over the top. I feel that my attitude is - the line of sight is nearly - nearly vertical. |
| 01 03 55 | P | I am in VOX record only now. The time is 104 elapsed. I'm searching the star charts. |
| 01 04 19 | P | The finish on the star chart is so shiny that - it's impossible to read because of reflection. |
| 01 04 44.5 | P | I've got to turn white lights on, that's all. |
| 01 05 03 | P | At 105. |
| 01 05 14.5 | P | Attitudes are of no concern to me whatsoever. I know I'm drifting freely. The moon crossed the window not too long ago. |
| 01 05 51.5 | P | Let's see, now what can - I am at this moment rocking my arms back and forth and I can make this show up in the roll, yaw and pitch needle. By moving my torso, I can make the pitch rate needle move up to one degree per second. Roll is, needle, rate needle is very sensitive to this. Yaw is also. Let's see, am going to open the visor at this time. Have a few crumbs of food floating around in the capsule. |
| 01 06 58.5 | P | At 106 - at 1 minute, 1 hour and 7 minutes elapsed, I'm going above the scale to approximately 6 on cabin and suit. |

CANTON

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|---|---|---|
| 01 07 16 | P | Hello, hello, Canton Com Tech, Canton Com Tech, Aurora 7. Weak but readable. Go ahead. |
| 01 07 40.5 | CT | Aurora 7, Aurora 7, this is Canton Com Tech, Canton Com Tech. Do you read? Over. |
| 01 07 46.5 | P | Hello, Canton Com Tech, Aurora 7. Loud and clear. How me? |
| 01 08 23.5 | P | The food - hello, Canton Com Tech, Aurora 7. How do you read? |
| 01 08 33 | P | Hello, Canton Com Tech, Aurora 7. How do you read? |
| 01 08 41 | P | This food has crumbled badly. |
| 01 08 50.5 | P | First meal at 1 08 52. |
| 01 09 21 | P | Hello, Canton Com Tech, Canton Com Tech, Aurora 7 on HF. How do you read? |
| 01 09 39.5 | CT | Seven, this is Canton Com Tech. Do you read? |
| 01 09 45 | P | Canton Com Tech, Aurora 7. Loud and clear. How do you read Aurora 7 on HF? Over. |
| 01 10 07 | CT | Aurora 7, Aurora 7, this is Canton Com Tech. Do you read? Over. |
| 01 10 13 | P | Roger, Canton Com Tech, loud and clear. How me? |
| 01 10 33.5 | CT | Aurora 7, Aurora 7, this is Canton Com Tech. Do you read? |
| 01 10 57 | P | Hello, Canton Com Tech, Canton Com Tech, Aurora 7. Loud and clear. How me? |
| 01 11 04 | CC | This is Canton. Loud and clear, Aurora 7. Can you begin with the short report? |
| 01 11 10 | P | Roger. I've been reading you for some time. I've tried to contact you on HF with no success. My status is good; the capsule status is good; control mode is fly-by-wire; gyros caged; maneuver is off. |

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| | | The fuel reads 74-85, oxygen is 87-100, the cabin temperature is a bit high at 104, the suit - steam vent temperature is 70 and cabin is 80, but I believe they're coming down. Over. |
| 01 11 49 | CC | Roger. Did you wish to check your attitude readings with our telemetry? Over. |
| 01 11 56.5 | P | Roger. My - my gyros are caged at this time. Stand by one. |
| 01 12 05 | CC | Standing by. |
| 01 12 17 | P | I am beginning to pick up what I believe is a - yeah, it's very definitely a cloud pattern equally low. |
| 01 12 31.5 | CC | Roger. |
| 01 12 42 | P | I am - let's see, Canton, do you have the exact sunrise time for the first orbit? Over. |
| 01 12 55 | CC | Say again, Aurora 7. |
| 01 12 57 | P | Sunrise time for first orbit. Over. |
| 01 13 03 | CC | I have a sunrise time of 1 plus 21 plus 00. |
| 01 13 10 | P | 1 plus 21 00. Roger. Thank you. |
| 01 13 13.5 | CC | Did you - could you comment on whether you are comfortable or not - would you --- a hundred two on body temperature. |
| 01 13 21 | P | No, I don't believe that's correct. My visor was open, it is now closed. I can't imagine I'm that hot. I'm quite comfortable, but sweating some. |
| 01 13 38 | CC | Roger. Can you confirm then that the face plate is closed, and will be closed for the pass over Guaymas. |
| 01 13 44 | P | That is correct, George. I'll leave the face plate closed. I have had one piece of the inflight food. It's crumbling badly and I hate to get it all over, and I have had about four swallows of water at that time. |
| 01 14 04.5 | CC | Roger, four swallows of water. |

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| 01 14 11 | CC | You wish to start your comment now on the haze layer - there was the --- pitch, and at the same time confirm that the flight plan is on schedule. |
| 01 14 16.5 | P | Roger. I cannot confirm that the flight plan is completely on schedule. At sunse I was unable to see a separate haze layer - the same - height above the horizon that J hn reported. I'll watch closely at sunrise and see if I can pick it up. Over. |
| 01 14 48 | CC | Roger. |
| 01 14 53.5 | CC | All readings appear to be normal down here. The capsule looks good from down here. |
| 01 15 01.5 | P | Roger, the - |
| 01 15 02.5 | CC | --- queries, you can continue on with your observations. Over. |
| 01 15 05.5 | P | Roger. Thanks, George, see you next time around. |
| 01 15 10 | CC | Okay, Scott. Good luck. |

HAWAII

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| 01 15 30.5 | CT | Aurora 7, Hawaii Com Tech. How do you read me? Over. |
| 01 15 40 | P | I am in VOX record now. I heard Hawaii calling, ha ha, Hawaii calling. I will go to transmit directly, and see if we can pick up Hawaii. |
| 01 15 54 | P | Hello, Hawaii Com Tech, Aurora 7 on HF. Loud and clear. How me? |
| 01 16 17.5 | P | Hello, Hawaii Com Tech, Hawaii Com Tech, Aurora 7. Loud and clear. How do you read HF? Over. |
| 01 16 32.5 | P | Going now to record only while I switch back to UHF. |
| 01 17 30.5 | P | Hello, Hawaii, hello, Hawaii Com Tech, Aurora 7. Weak but readable. Go ahead. |
| 01 18 00 | CT | Aurora 7, Aurora 7, --- on HF, UHF. How do you read? Over. |

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| 01 18 05 | P | Roger, Hawaii Com Tech. Aurora 7 reading you loud and clear. How me? |
| 01 18 30 | CT | Aurora 7, Hawaii Com Tech. How do you read? |
| 01 18 51.5 | P | All right. My - I am at 1 19 02. Have been several times completely disoriented. There, I have Cassiopeia directly in the window and am yawing around for the sunrise - photographs. The sky is quite light in the east. |
| 01 19 51 | P | Excess cabin water light came on at that time. I'll have to go back all the way down and off. Suit is - still high. The cabin water gage is reading - plus 9, which is hard to believe. |
| 01 20 15 | P | My temperature, my body temperature doesn't feel - feel bad at all. My suit - yes, my suit temperature is down now, also. |
| 01 20 32.5 | P | But the steam vent temperature is - still about - 70. |
| 01 22 03 | P | I have the fireflies. Hello, Guaymas. |
| 01 22 18 | P | I have the particles. I was facing away from the sun at sunrise - and I did not see the particles - just - just yawing about - 180 degrees, I was able to pick up - at this - Stand by, I think I see more. |
| 01 23 00 | P | Yes, there was one, random motions - some even appeared to be going ahead. There's one outside. Almost like a light snowflake particle, caught in an eddy. They are not glowing with their own light at this time. |
| 01 23 32 | P | It could be frost from a thruster. |
| 01 24 01.5 | P | Going to transmit to - record only, at this time. |
| 01 24 11 | P | The weightless condition is a blessing, nothing more, nothing less. |
| 01 25 43 | P | I am now photographing large cloud banks over the Pacific on a southerly direction. |
| 01 26 08.5 | P | I'm drifting slowly to retroattitude at this time. |

GUAYMAS

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| 01 27 22 | P | Hello, Guaymas Com Tech, Aurora 7. Loud and clear. How me? |
| 01 27 29.5 | CC | Roger, Aurora 7, this is Guaymas Cap Com. How me? Over. |
| 01 27 33.5 | P | Roger, Guaymas, loud and clear. My control mode is now fly-by-wire, gyros are caged, I'm in - maneuver is off. I'll go to automatic mode directly. My status good; the capsule status is good. The fuel is 69-69, oxygen is 88-100. The cabin steam vent has gone to plus 10, I believe that's a bad gage reading, and suit temperature steam vent is coming down slowly, now reading 68. Over. |
| 01 28 16 | CC | Roger. Understand 68. How is your temperature comfort? Over. |
| 01 28 19 | P | Roger. My body comfort is good. I am tracking now a very small particle, one isolated particle, about - There is another, very small, could be a light snowflake. |
| 01 28 40 | CC | Roger. We're reading - we're having a - a bad body temperature reading on you, 102.4, probably erroneous. |
| 01 28 48.5 | P | I can't believe it. My suit temperature shows 60 and I feel quite comfortable. I'm sure I would be sweating more than this if my temperature were 102. |
| 01 28 59.5 | CC | Your suit inlet temperature near 61, so it looks pretty good. |
| 01 29 04 | P | Roger. |
| 01 29 06.5 | CC | Roger. It looks like we have a go for the second orbit as everything appears all right for you. |
| 01 29 13 | P | Roger. I was hoping you'd say that, Gordo. |
| 01 29 16 | CC | You start to conserve your fuel a bit and maybe, perhaps, use a little more of your manual fuel. |

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| 01 29 22 | P | Roger. Can do. |
| 01 29 24.5 | CC | Roger, are you ready for Z and R cal? |
| 01 29 27 | P | Roger, send them. |
| 01 29 28.5 | CC | Z cal coming on now. |
| 01 29 31 | P | And, MARK, coastal passage. |
| 01 29 35 | CC | Say again. |
| 01 29 36 | P | Mark, coastal passage coming over the - Baja. |
| 01 29 41 | CC | Good. |
| 01 29 43 | CC | How does it look? |
| 01 29 46 | P | Half covered with clouds, and - and the other half is dry. Will you pass on - this message for me, Gordo, to all the troops at Guaymas? |
| 01 30 05 | P | Hola, amigos, felicitaciones a Mexico y especialmente a mi amigos de Guaymas. Desde el espacio exterior, su pais esta cubierto con nubes - and - es - also - se me muy bello. Aqui el tiempo esta muy bueno. Buena suerte desde Aurora Siete.<br><br>(Translation: Hello, friends, greetings to Mexico and especially to my friends of Guaymas. From outer space, your country is covered with clouds and is very beautiful. Here the weather is very good. Good luck from Aurora 7.) |
| 01 30 33.5 | CC | Roger, muchas gracias, amigo. |
| 01 30 35.5 | P | Ha ha, okay. |
| 01 30 37.5 | CC | Give us a blood pressure. |
| 01 30 39 | P | Here you go. |
| 01 30 50 | CC | Roger, do you - I'd like to pass your 2 Alpha time on to you, Scotty. |
| 01 30 54.5 | P | Roger. |

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| 01 30 56 | CC | Roger, 2 Alpha time is 01 36 13, with a GMT of 15 21 30, that takes into account your clock error. |
| 01 31 08.5 | P | That's 02 36 13? |
| 01 31 12.5 | CC | Roger, 01 36 13. |
| 01 31 15.5 | P | Roger, 01 36 13 for 2 Alpha. |
| 01 31 19.5 | CC | For Golf 03 00 31. |
| 01 31 25 | P | Roger, 03 00 31 for Golf. |
| 01 31 28.5 | CC | There's a GMT on that of 15 45 43. |
| 01 31 33.5 | P | Roger. Standing by for the - my mark on the radar test over White Sands. |
| | CC | --- |
| 01 31 46 | P | Roger. |
| 01 31 52.5 | CC | Roger, command roll now. |
| 01 31 55 | P | Roll now. |
| 01 32 02 | P | No, I'll have to get in a better attitude for you first, Gus. It'll mean nothing this way, I mean - Coop. |
| 01 32 10 | CC | Roger. |
| 01 32 58.5 | CC | You still reading us, Scotty? |
| 01 32 59.5 | P | Roger, loud and clear. |
| 01 33 02 | CC | Hearing you also. Have you done your roll for the radar yet? |
| 01 33 10.5 | P | That's negative. I'm afraid I'm not going to make it, Gordo, unless I get the attitudes - down close. |
| 01 33 21.5 | CC | Roger, we're reading your attitudes all right at zero now. |
| 01 33 26.5 | P | Roger, the gyros are caged. |

CAPE CANAVERAL

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| 01 33 41 | CC | Aurora 7, this is Cape Cap Com on emergency voice. |
| 01 33 44 | P | Roger, Cape. Loud and clear. How me? |
| 01 33 48 | CC | Loud and clear. I'm going back to HF/UHF. |
| 01 33 52.5 | P | Roger. |
| 01 33 55 | CC | Are you ready for your two Bravo time? |
| 01 33 58 | P | Roger, send two Bravo. |
| 01 34 00.5 | CC | 01 49 30. |
| 01 34 07 | P | Roger. 01 49 30. |
| 01 34 12.5 | CC | Roger, and two Charlie time is nominal. |
| 01 34 15.5 | P | Okay, standby one. |
| 01 34 37.5 | P | Okay, Gus, my status is good; my control mode is fly-by-wire; the gyros are still caged; maneuver is off. Fuel is 62 and 68, a little ahead on fuel consumption, fuel quantity light is on, the excess cabin water light is on. I'll try and get auto mode here directly. |
| 01 35 04.5 | CC | Roger. Can you give us a blood pressure? |
| 01 35 07 | P | Roger. Blood pressure coming now. |
| 01 35 13.5 | CC | And after the IOS voice has dropped, will use Zanzibar in that area. |
| 01 35 20 | P | Roger, I heard IOS calling but I couldn't raise him. |
| 01 35 24 | CC | Roger. |
| 01 35 30 | CC | Aurora 7, use a normal balloon release. |
| 01 35 34 | P | Roger. |
| 01 35 41 | P | And are you going to give me a mark for that? |
| 01 35 47.5 | CC | Roger, one at an elapsed time of 1 37. |

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| 01 35 51 | P | 1 37, Roger. |
| 01 36 00 | CC | Roger. In two minutes, Echo will be almost directly overhead. |
| 01 36 05 | P | Roger. |
| 01 36 08 | CC | Could you give us a cabin steam and suit temperature, please? |
| 01 36 11 | P | Roger. Suit steam is 69 and cabin is - plus 11. That dropped down very suddenly when the excess cabin water light came on. I think I'm going to - increase - I'll try to increase suit water flow one more time, if that doesn't work I'll drop - down - to closed and start over again. |
| 01 36 46 | CC | Aurora 7, cut back your cabin water. |
| 01 36 49 | P | Okay. Cabin water going back. I'll start now at two. This is - 20 degrees below launch value. |
| 01 36 58 | CC | Roger. I'm going to give you a Z cal. |
| 01 37 00.5 | P | Roger. |
| 01 37 07 | CC | Okay. I'm going to give you an R cal. |
| 01 37 10 | P | Be my guest. |
| 01 37 35 | CC | Aurora 7, Cap Com. Do you read? |
| 01 37 37 | P | Roger, loud and clear. |
| 01 37 38.5 | CC | Roger. Everything looks good down here, except for your fuel usage, you better watch that a little bit. |
| 01 37 44 | P | Roger. |
| 01 37 50 | CC | Aurora 7, have you deployed the balloon? |
| 01 37 52 | P | That is negative. Standby. |
| 01 38 03 | P | Balloon deploy, NOW. The balloon is out, and off. I, I see it way out but it - I think now it is way out, and drifting steadily away. I don't see the line, I don't see that any attempt was made to inflate the thing. It's just drifting off. |

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| 01 38 38 | P | I have only the rectangular shape tumbling at this point about 200 yards back, barely visible, and now wait, here is a line. That was the cover, the balloon is out. |
| 01 39 01 | CC | Understand. The balloon is out. |
| 01 39 02.5 | P | That is Roger. |
| 01 39 09 | P | There is very little acceleration here. |
| 01 39 17 | CC | Aurora 7, did the balloon inflate? |
| 01 39 19 | P | The balloon is partially inflated. It's not tight. I've lost it at this moment. Wait one, I'll give you a better reading shortly. |
| 01 39 50 | P | There is an oscillation beginning. |
| 01 39 54.5 | CC | This is an oscillation in the balloon? |
| 01 39 56.5 | P | Yes. |
| 01 40 11 | P | The line is still not taut. I have some pictures of the line just waving out in back. I would say we have about a one cycle per minute oscillation. It's both in pitch and yaw. |
| 01 40 38.5 | CC | How many cycles per minute? |
| 01 40 40 | P | One cycle per minute, or maybe one cycle in a minute and a half. |
| 01 41 01 | P | The moon is just above the horizon at this time. |
| 01 41 17 | P | I have a picture of the balloon. |
| 01 41 25 | CC | Aurora 7, Cap Com. Reapeat your last message. |
| 01 41 28.5 | P | Roger, I've got a washer to put away. |
| 01 41 33 | CC | Roger. |

BERMUDA

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| 01 41 40.5 | F | Aurora 7, Aurora 7, this is Bermuda Flight. How do you read? Over. |

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| 01 41 45 | P | Roger. Bermuda Flight, reading you loud and clear. |
| 01 41 49 | F | Switch wobulator switch off. |
| 01 41 51.5 | P | Roger, phase shifter. |
| 01 41 54 | I | MARK! |
| 01 41 56 | P | Phase shifter is off. |
| 01 42 18 | P | Phase shifter is on, now. |
| 01 42 23.5 | CC (Cape) | Aurora 7, Cap Com. What control mode? |
| 01 42 26.5 | P | Fly-by-wire. |
| 01 42 28 | CC (Cape) | Thank you. |
| 01 43 01 | F | Bermuda Flight. How do you read? |
| 01 43 02.5 | P | Hello, Bermuda Flight. Reading you loud and clear. How me? |
| 01 43 07 | F | Will you run a blood pressure, please? Read you loud and clear. |
| 01 43 10 | P | Roger. Blood pressure starting now. |
| 01 43 30 | P | I have lost sight of the balloon at this minute. |
| 01 43 34 | F | Roger. |
| 01 43 59 | P | Also, Bermuda, the balloon not only oscillates in cones in pitch and yaw, it also seems to oscillate in and out toward the capsule, and sometimes the line will be taut, other times it's quite loose. |
| 01 44 20.5 | P | It's now about 50 degrees off of the flight path. |
| 01 44 32 | P | Pictures of whirls taken, just east of Bermuda, now the balloon line is tight. |
| 01 45 27.5 | P | At 01 45 30, I have turned the cabin, or the suit water valve all the way off and back up to one. |
| 01 47 18 | P | I'm taping now the fuel quantity warning lights in preparation for the dark side. I think also excess cabin water I'll tape. It's not a satisfactory lighting arrangement to - |

CANARY

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| 01 47 48 | P | Hello, Canary Cap Com, Aurora 7. Loud and clear. How me? |
| 01 48 10.5 | CC | Aurora 7, Aurora 7, this is Canary Cap Com. How do you read? Over. |
| 01 48 16 | P | Hello, Canary Cap Com, Aurora 7. Loud and clear. How me? |
| 01 48 21 | CC | Roger. You're coming into UHF range. Proceed with the short report. Over. |
| 01 48 27 | P | Roger, Canary. My status is good, the capsule status is good, my control mode is automatic, gyros normal, maneuver off. Fuel 51-68, oxygen 85-100, my cabin steam vent temperature now is picking up and reading about 19, suit steam vent temperature still reading 70. I have backed it off to zero and reset it at one. Over. |
| 01 49 09 | CC | --- cabin exhaust temperature. Over. |
| 01 49 11.5 | P | Cabin exhaust temperature is climbing back up to 19. Over. |
| 01 49 18 | CC | Roger, have you been doing any drifting flight? Over. |
| 01 49 23 | P | That is Roger. I did quite a bit of drifting flight on the dark side over Woomera and Canton. Over. |
| 01 49 34 | CC | Roger, did you observe any haze layers? Over. |
| 01 49 40.5 | P | Roger, I did observe haze layers but not the ones that were separated from the horizon that we expected, and that John reported. I'll keep a sharp lookout next time and try to see them after sunset. On the light side there is nothing more than the bright, iridescent blue layer, which separates the actual horizon from the deep black of space. Over. |
| 01 50 15.5 | CC | Aurora 7, you are fading rapidly, you are fading. MCC is worried about your auto fuel and manual fuel consumption. They recommend that you try to conserve your fuel. |

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| 01 50 28.5 | P | Roger, tell them I am concerned also. I will try and conserve fuel. |
| 01 50 41.5 | CC | Aurora 7, Aurora 7, I cannot read you. Do you read Canary Cap Com? Over. |
| 01 50 48.5 | P | Roger. Canary, copied your message. Over. |
| 01 50 52 | CC | Roger. Understand copied message regarding fuel and consumption. |
| 01 50 56.5 | P | That is Roger. |
| 01 51 01.5 | CC | Surgeon here has requested a blood pressure transmission. |
| 01 51 05.5 | P | Blood pressure is coming your way now. |
| 01 51 20 | CC | We are receiving same at Canaries and it looks good. |
| 01 51 24 | P | Roger. |
| 01 51 41.5 | CC | Canary Systems indicates all telemetry readings look good. |
| 01 51 46.5 | P | Roger, that's good to hear. |
| 01 51 56.5 | CC | Aurora 7, do you have anything to report on your balloon test? Over. |
| 01 52 02.5 | P | Roger. The balloon is oscillating through an arc of about 100 degrees. It gets out of view frequently. At this moment, it's nearly vertical. MARK a coastal passage at this time - it seems to - what I'm trying to tell you is that it oscillates 180 degrees, above and below. Over. |
| 01 52 40 | P | It also oscillates in and out. Sometimes the line is tight and other times it is not. |
| 01 53 52 | P | When I look over to the right side, I have the sensation that - |
| 01 54 05.5 | P | Hello. |

KANO

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| 01 54 15 | CC | This is Kano, how do you read? Over. |
| 01 54 17 | P | Hello, Kano. Aurora 7. Loud and clear. How me? |
| 01 54 32.5 | CC | Aurora 7, Aurora 7, this is Kano. How do you read? Over. |
| 01 54 37 | P | Hello Kano, loud and clear. How me? |
| 01 54 52 | CC | Aurora 7, Aurora 7, this is Kano. How do you read? Over. |
| 01 54 59 | P | Kano, this is Aurora 7. Reading you loud and clear. How me? |
| 01 55 04 | CC | Aurora 7, Kano Cap Com. What is your status? Over. |
| 01 55 08.5 | P | Roger. My status is good, fuel reads 51 and - and 69, oxygen is 84 and 100, cabin pressure is holding good. All d-c and a-c power is good. The only thing of - to report regarding the flight plan is that fuel levels are lower than expected. My control mode now is ASCS. I expended my extra fuel in trying to orient after the night side. I think this is due to conflicting requirements of the flight plan. I should have taken time to orient and then work with other items. I think that by remaining in automatic, I can keep - stop this excessive fuel consumption. And the balloon is sometimes visible and sometimes not visible, I haven't any idea where it is now, and there doesn't seem to - and it seems to wander with abandon back and forth, and that's all, Kano. |
| 01 56 44 | CC | Roger, Aurora 7. Will you give us a blood pressure check again---. Over. |
| 01 56 49 | P | Roger, blood pressure is on the air. |
| 01 57 01 | CC | Aurora 7, how are you feeling? Your body temperature is up somewhat. How do you feel? Over. |
| 01 57 07.5 | P | Roger. I feel fine. Last time around I - someone told me it was 102. I don't feel, you know, like I'm that hot. Cabin temperature is 101, I'm reading 101, and the suit temperature indicates 74. |

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| 01 57 38.5 | CC | Are you perspiring any? |
| 01 57 41.5 | P | Slightly, on my forehead. |
| 01 57 50 | P | Since turning down the suit water valve, the suit steam vent temperature has climbed slightly - am increasing from one to two at this time. This should bring it down. The cabin steam vent temperature has built back up to 40. |
| 01 58 27.5 | CC | Roger, Aurora 7, everything looks okay now. We seem to have lost the body temperature readings from previous stations. We are reading 102 right now, but as long as you feel okay right now. |
| 01 58 42 | P | Roger, I feel fine. |
| 01 58 46 | CC | Can you see anything of the Gulf of Guinea? |
| 01 58 49.5 | P | Roger, I just - just passed the coast line and I am over a solid cloud cover at this time. |
| 01 59 05 | CC | Roger, Aurora 7. Would you care to send a greeting to the people of Nigeria? |
| 01 59 09 | P | Roger, please send my greetings and best wishes of me and my countrymen to all Africans. Over. |
| 01 59 21 | CC | Roger, thank you very much. I'm sure it will be appreciated. Over. |
| 01 59 24.5 | P | Roger. |
| 01 59 54.5 | CC | Aurora 7, Kano. Are we still in contact? Over. |
| 01 59 57.5 | P | Say again, Kano. |
| 01 59 59 | CC | Roger. Would you repeat in a few words why you thought the fuel usage was great? Over. |
| 02 00 06 | P | I expended it on - by manual and fly-by-wire thruster operation on the dark side, and just approaching sunrise. I think that I can cut down the fuel consumption considerably on the second and third orbits. Over. |
| 02 00 32 | CC | Roger, understand. Over. |

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| 02 00 43.5 | CC | Have you started your night adaptation? Over. |
| 02 00 46 | P | Roger. |
| 02 01 08 | CC | Aurora 7, Kano. Just for your own information, the 250 inverter is on 180 degrees right now. Over. |
| 02 01 18 | P | Say again, please. |
| 02 01 21 | CC | ---. Over. |
| 02 02 43.5 | P | At this time, oh-h, this doggone - food bag is a problem. |
| 02 03 00 | P | Actually, the food bag is not a problem, the food inside it is. It's crumbled, I dare not open the bag for fear the crumbs will get all through the capsule. |
| 02 03 43 | P | Things are very quiet. |

ZANZIBAR

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| 02 04 03.5 | P | Roger, Zanzibar, loud and clear. How do you read Aurora 7? |
| 02 04 17 | CT | Aurora 7, Aurora 7, this is Zanzibar Com Tech, transmitting on HF/UHF. Do you copy? Over. |
| 02 04 26 | P | Roger, loud and clear. How me, Zanzibar? |
| 02 04 31 | CT | Aurora 7, Aurora 7, this is Zanzibar Cap Com. Read you weak, but readable. Do you have a short report for us? |
| 02 04 38.5 | P | Roger, my status is good, the capsule status is good, my control mode is automatic, gyros are normal, maneuver is off. Control fuel is 51 and 69, oxygen is 82 and 100. That's about all except I have, so far, been unable to get my suit steam vent temperature down much below 70. Steam vent, or the water control valve setting at this time is 4 at the prelaunch mark. It may be too high, turning it off at this time and going to three, which is where the cabin is set. Over. |
| 02 05 40 | CC | Aurora 7, Zanzibar Cap Com, Roger, Roger. Do you have the latest - contingency area times? |

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| 02 05 49 | P | Roger, I have them. |
| 02 05 51 | CC | Very good. Are you going to start your balloon test? |
| 02 05 55 | P | The balloon is out. I don't see any reason for not leaving it on through the dark side, and I just saw a particle going by at about two or three feet per second. |
| 02 06 13 | CC | Roger, understand. According to flight plan, you're supposed to go to FBW about now and he says you're on auto mode and I wondered if you plan to go through with this. Over. |
| 02 06 25.5 | P | That is negative. I think that the fact that I'm low on fuel dictates that I stay on auto as long as the fuel consumption on automatic is not excessive. Over. |
| 02 06 39.5 | CC | Roger, Aurora 7. Congratulations on your trip so far and I'm glad everything has gone ---. |
| 02 06 44.5 | P | Thank you very much. |
| 02 06 50.5 | P | I now have the wide, blue horizon band. It looks to be, at this time Capsule elapsed 207, to be about the diameter underneath the sun. It seems to be the same thickness underneath the sun as the sun's diameter. North and south it becomes less distinct and lighter. It extends up farther from the horizon. |
| 02 07 29.5 | CC | Roger, Aurora 7, that's a hard one to pronounce, anything that we can do for you ---. |
| 02 07 38 | P | Negative. I think everything is going quite well. |
| 02 07 41.5 | CC | Roger, we'll be waiting. Out. |
| 02 07 43.5 | P | Roger. See you next time. |

INDIAN OCEAN SHIP

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| 02 07 48 | CC | Aurora 7, this is Indian Ocean Ship. Over. |
| 02 07 50.5 | P | Roger, Indian Cap Com. Loud and clear. How me? |
| 02 07 54.5 | CC | Roger, loud and clear. We have had transmitter trouble on your previous run. We just got a message from the Cape ---, to conserve fuel. I monitored part of your transmission to Zanzibar and understand --- the situation. |

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| 02 08 12.5 | P | That is Roger. |
| 02 08 14.5 | CC | Do you have retrosequence times for 2 Delta, 2 Echo and Golf? |
| 02 08 19 | P | That is negative. I have the nominals. |
| 02 08 23.5 | CC | Roger. 2 Delta and 2 Echo are still nominal. Area Golf is 03 00 29, 03 00 29. |
| 02 08 35 | P | Roger. 03 00 29. |
| 02 08 39 | CC | Roger, Aurora 7, I read you loud and clear. Do you have any comments for the --- Ocean? |
| 02 08 46.5 | P | That is Roger. I believe we may have some automatic mode difficulty. Let me check fly-by-wire a minute. |
| 02 09 07 | P | All thrusters are okay. |
| 02 09 11 | CC | Roger. |
| 02 09 17.5 | P | However, the gyros do not seem to be indicating properly. |
| 02 09 25.5 | CC | Roger. |
| 02 09 27 | P | And that is not correct either. The gyros are - are okay, but on ASCS standby, it may be an orientation problem. I'll orient visually and - see if that will help out the ASCS problem. |
| 02 10 11.5 | CC | Aurora 7 from Indian Cap Com. Your blood pressure on your --- fairly high and you are supposed to, if possible, give a blood pressure over Indian Ocean Ship. |
| 02 10 23.5 | P | Roger. I've put blood pressure up on the air already. Over. |
| 02 10 29.5 | CC | Say again, Aurora. |
| 02 10 31 | P | Blood pressure is on the air now. |
| 02 10 35 | CC | Roger. |
| 02 10 40 | S | Blood pressure is coming through fine. |
| 02 10 42.5 | CC | Your blood pressure is coming through fine. |

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| 02 10 44.5 | P | Roger. |
| 02 10 58 | CC | Aurora 7, this is Indian Cap Com. We have lost telemetry contact. How do you read me? Over. |
| 02 11 04.5 | P | Roger. Still reading you okay. |
| 02 11 07.5 | CC | --- Report to Cape you have checked fly-by-wire and all thrusters are okay. Is there anything else? |
| 02 11 13 | P | That is negative. Except this problem with steam vent temperature. I'm going - I'll open the visor a minute, that'll cool - it seems cooler with the visor open. |
| 02 11 26 | CC | Roger. Did you take xylose? |
| 02 11 28.5 | P | That is negative. I will do so now. |
| 02 11 35 | CC | Roger. |
| 02 11 45 | CC | Aurora 7, confirm you've checked fly-by-wire, and all thrusters okay. |
| 02 11 51.5 | P | Roger. Fly-by-wire is checked, all thrusters are okay. |
| 02 11 56 | CC | Roger. |
| 02 12 28 | CC | Aurora 7, Indian Ocean Cap Com. I do not read your transmission. |
| 02 12 32 | P | Roger. Indian Cap Com, Aurora 7. |
| 02 12 35.5 | CC | Out. |
| 02 15 11.5 | P | Well, I have - I am in record only, and I am getting warm now. |
| 02 15 34 | P | Don't know what to do with the cabin. |
| 02 15 45 | P | I'll turn it up and see what happens. |
| 02 16 04.5 | P | I have gotten badly behind in the flight plan now. |
| 02 17 06 | P | Okay, evaluating capsule stability at this time. The capsule is most stable. |

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| 02 17 24 | P | I seem able to put it at zero rates. Alright, I will do that now. At capsule elapsed 02 17 32 I will zero out all rates. |
| 02 17 45 | P | That's as close to zero as I can make it. At 02 17 49 my rates are zero and attitudes are zero plus, or at zero, minus 3, minus 48. Let those rest awhile, and I'll see what we can do about suit temperature. |
| 02 18 14 | P | Cabin is rising, suit temperature seems to be rising, too. I'm going to let it go out until 2 25 to see if this is going to bring it down some. |
| 02 18 49 | P | I don't need to exercise, I really don't feel I need the exercise. I would get too warm. |
| 02 19 02 | P | We'll be getting to Muchea shortly. |
| 02 19 08.5 | P | Have a slight pitch up rate at this time, at 02 19 13, I'll zero that out, now. Fly-by-wire - have a slight yaw left rate - I'll zero out now. Attitudes at this time are minus 30. |
| 02 19 57.5 | P | Both busses are okay. All - let's see - number two battery is down to 22. One is 24, three is 24, stand-by one and two are 24, isolated is 27, main is 23, main IBU is 27. Two - two is now up. Main battery number two is up. |
| 02 20 34.5 | P | I am over the dark side now. The moonrise has not occurred and although I still see the lighted area from the setting sun behind us. |
| 02 22 16.5 | P | Now, I do have the haze layer at this time. It seems to be brighter than - It's good to open the cabin, open the visor. |
| 02 23 07 | P | The reticle now extincts at about 5.6. |

MUCHEA

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|---|---|---|
| 02 23 21 | P | Hello, Muchea Cap Com. Aurora 7 loud and clear. How me? |
| 02 23 26 | CC | Read you loud and clear also, what's your status? |

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| 02 23 28 | P | Roger. My status is good, control mode is fly-by-wire, gyros normal, maneuver off. Fuel is 45-6-70, that's 45-70, and oxygen is 84-100. I have only one minor problem, and that is my inability to get the suit steam vent temperature down, Deke. |
| 02 23 56.5 | CC | Roger, what's it running now? |
| 02 23 58.5 | P | Well, I'm reading 70. I'm really a little at a loss as to how to get it down, my suit - water valve is set now past the marks. This doesn't seem to bring it down, and neither does putting it - negative, that's wrong. The cabin was past the marks. The suit temperature is at prelaunch value of about four. I'm going to go to a setting of plus 6 at this time and see if that will bring it down below 70. Over. |
| 02 24 40.5 | CC | Okay, fine. We're indicating 84 suit which is a bit high. |
| 02 24 44.5 | P | Roger. My gage shows 7, 76 on the suit. |
| 02 24 50 | CC | Rog. |
| 02 24 52 | CC | Okay, let me give you a couple of retrotimes here. You have a 2 Dog nominal, Gold is 03 --- 29, Hotel 04 32 26. |
| 02 25 10 | P | Roger, understand 26. |
| 02 25 13.5 | CC | We're including your clock is still one second slow. |
| 02 25 18.5 | P | Roger. |
| 02 25 20 | CC | GMT hack of 15 10 42 - MARK. *(02 25 25 CET) |
| 02 25 26 | P | Roger, I'm right on and so is the backup. |
| 02 25 29.5 | CC | Roger, would you send us a blood pressure, please? |
| 02 25 33.5 | P | Starting, Roger, starting now. |
| 02 25 53.5 | CC | What mode of communications are you using at this time? |

* Editor's note

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| 02 25 58.5 | P | I am on UHF high, Deke. |
| 02 26 01 | CC | Fine, Roger. Would you try using your mike button once instead of your VOX. See how this comes in. |
| 02 26 05.5 | P | Roger. Soon as I get through the blood pressure. I can do it now. |
| 02 26 11.5 | P | This is using the push to talk. 1,2,3,4,5,4,3,2,1. How now? |
| 02 26 18 | CC | I see no difference. They're identical. |
| 02 26 20 | P | Roger, is the modulation pretty good? |
| 02 26 23 | CC | Very good. |
| 02 26 24 | P | Roger. |
| 02 26 26 | P | Capsule stability, Deke, is very, very, good. I've noticed that I can put in a one degree per second rate on the needle just by moving heads and arms, - my head and arms. Over. |
| 02 26 42 | CC | Very good, excellent. For your information, there will be no flares at Woomera on this pass since the cloud cover won't allow you to see them anyway. |
| 02 26 50 | P | Roger. I was unsuccessful last pass. |
| 02 26 55.5 | CC | Okay, I'm going to send you a Z cal at this time. |
| 02 26 59 | P | Roger. |
| 02 27 02.5 | CC | MARK! |
| 02 27 15.5 | CC | Z cal is coming off. |
| 02 27 17.5 | P | Roger. |
| 02 27 18.5 | CC | On with R cal. |
| 02 27 20 | P | Roger. |
| 02 27 33 | P | Blood pressure stop. |

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| 02 27 34.5 | CC | Blood pressure stop. Okay, we're going to oscillate R cal & couple of times here in attempt to reset our temperature problem. |
| 02 27 41.5 | P | Roger. |
| 02 27 47 | CC | Okay, R cal off. We suggest you go to manual at this point and preserve your auto fuel. Low at this point. |
| 02 27 53.5 | P | Roger. Goint to manual now. |
| 02 27 57 | CC | Roger. |
| 02 28 00.5 | P | At this time I'm reading 45-70 on fuel. |
| 02 28 04.5 | CC | Rog. Understand 45-70. |
| 02 28 07 | P | Cabin temperature is 107. |
| 02 20 10.5 | CC | Cabin 107. |
| 02 23 17.5 | CC | I don't believe you've ever received any sunrise, sunset times. |
| 02 28 23 | P | Roger, give me the whole lot of them, Deke, or the ones that are coming. Give me rise, set, and rise. |
| 02 28 32 | CC | Roger. Will do. Your next sunrise will be 02 50 00. |
| 02 28 40 | P | Roger. Copy. |
| 02 28 41.5 | CC | Sunset 03 41 20. |
| 02 28 47 | P | Roger. |
| 02 28 48.5 | CC | Sunrise 04 19 00. |
| 02 28 54.5 | P | Roger. Copy. |
| 02 28 59 | CC | Well, it sounds like you're doing real well up there, Dad. |
| 02 29 01.5 | P | Roger, it's a little warm. |
| 02 29 04 | CC | I suspect so. |
| 02 29 09 | CC | Been riding your horse the last couple of days. |

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| 02 29 12 | P | Good. |
| 02 29 23.5 | CC | For your information, Cape informs that if we don't stay on manual for quite a spell here we'll probably have to end this orbit. |
| 02 29 31 | P | I'll be sure and stay on manual. |
| 02 29 33.5 | CC | Roger. |
| 02 29 35.5 | CC | You've got a lot of drift left here yet too. |
| 02 29 38.5 | P | Say again. |
| 02 29 40 | CC | You've got drift capability left yet, too. |
| 02 29 41.5 | P | Roger. |
| 02 29 47.5 | CC | Did you see any lights over the Australian ---? |
| 02 29 50.5 | P | I did - that is Roger, I did see some lights. I couldn't identify them, however. |
| 02 29 57.5 | CC | Roger, understand. |
| 02 30 05.5 | CC | Would you give us another readout on your suit steam temp? Has this changed any? |
| 02 30 09.5 | P | It may have gone down just a tad. It's about zero now, I mean about 70 now. It was a little bit higher. The visor is closed and I'm beginning to feel a little cooler. |
| 02 30 24 | CC | Very good. |
| 02 30 27 | CC | We indicated 2 degree drop at suit inlet, so it sounds like you're making out a bit. |
| 02 30 30 | P | Roger. My control mode now, Deke, is manual, gyros free, and the maneuver is off. |
| 02 30 41.5 | CC | Roger. I understand. Manual, gyro free, and maneuver off. |
| 02 30 44.5 | P | Roger. |

02 31 23.5 CC Aurora 7, this is Muchea Cap Com. Are you reading?

02 31 26 P Still reading, Muchea.

02 31 28 CC Very good.

02 31 30 CC We are just kind of leaving you alone. How is your balloon doing, incidentally?

02 31 33.5 P I haven't found it since it got dark. It's - it's - it rambles quite a bit, Deke. It's not inflated fully and it doesn't stretch out on the line tight like I expected. It bounces in and out and oscillates up and down and sideways. Have no good tensiometer readings yet.

WOOMERA

02 32 08 CC Aurora 7, Aurora 7, this is Woomera Cap Com. How do you read? Over.

02 32 12 P Hello, Woomera, Aurora 7. Loud and clear. How me?

02 32 17 CC Roger. You are loud and clear, also.

02 32 20.5 CC We copied your transmission over Muchea. Understand you still have the balloon on. Is that an affirmative?

02 32 26 P That is affirmative. I have the balloon on. However, I haven't seen it for some time. It wanders quite a bit and I do not have it in sight at this moment. I believe that - it might be visible against the earth background at this time.

02 32 49 CC Roger. Do you see the moon at all?

02 32 52 P I am faced the wrong way and limited in maneuverability I have left because of my fuel state. I can see the terminator between moonlit side, and unmoonlit side. Over.

02 33 08.5 CC Roger, understand.

02 33 15 CC You are manual control. Is that right?

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| 02 33 16.5 | P | That is correct. My control mode is manual, gyros free, maneuver off. Over. |
| 02 33 22.5 | CC | Roger. Could you give us - could you give us cabin temperature? |
| 02 33 31.5 | P | Roger. Cabin temperature is 102 at this time. |
| 02 33 37 | CC | Roger. What is the suit temperature? |
| 02 33 41 | P | Okay, standby. |
| 02 33 49.5 | P | Suit temperature is 74, suit steam exhaust is 71. |
| 02 33 58.5 | CC | Roger, understand. Are you feeling a little more comfortable at this time? |
| 02 34 02.5 | P | I don't know. I'm still warm and still perspiring, but not really uncomfortable. I would like to - I would like to nail this suit temperature problem down. It - for all practical purposes, it's uncontrollable as far as I can see. |
| 02 34 26.5 | CC | Roger, understand. You might have to wait a few more minutes before this takes effect. You are on No. 6 Is that right? |
| 02 34 34 | P | That is right. Suit temperature is No. 6. |
| 02 34 39 | CC | Roger. Systems reports that your suit temperature has dropped two degrees over station, if that's any encouragement to you. |
| 02 34 44.5 | P | Roger, thank you, it is. |
| 02 34 46.5 | CC | Roger. |
| 02 34 50 | CC | Have you taken any food thus far? |
| 02 34 53 | P | Yes, I have. However, the food has crumbled badly, and I hate to open the package anymore for fear of getting crumbs all over the capsule. I can verify that eating bite-size food as we packaged for this flight is no problem at all. Even the crumbly foods are eaten with no, with no problem. |

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| 02 35 20 | CC | Roger. How about water? |
| 02 35 22.5 | P | I had taken four swallows at approximately this time last orbit. As soon as I get the suit temperature - pegged a little bit, I'll open the visor and have some more water. Over. |
| 02 35 37 | CC | Roger. You are still coming in very loud and clear. |
| 02 35 43 | P | Roger. |
| 02 35 45 | CC | --- out at this time. |
| 02 37 11 | P | For the record now - |
| 02 37 32.5 | P | One of the labels for a fuse switch has slipped out, and sideways, and has tied the adjoining fuse switch together with it. This happened to emergency main and reserve deploy fuse switches. |
| 02 38 06.5 | P | I caged the gyros. They are too critical. I will try and navigate on the dark side without the gyros. |
| 02 38 30 | P | The fuse switch label should be glued in better so that turning off one fuse does not turn off the adjoining one. |
| 02 39 35 | P | I guess I'd better try to get that xylose pill out. I hate to do this. |
| 02 40 57.5 | P | Oh yes. There is the xylose pill. It didn't melt. All the rest of the stuff in here did melt. |
| 02 41 31 | P | Okay, xylose pill being consumed at 02 41 35. The rest of the food is pretty much of a mess. Can't stand this cabin temperature. |

CANTON

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| 02 43 39.5 | P | Hello, Canton Com Tech. Aurora 7 reads you loud and clear. How me? |
| 02 43 44.5 | CC | This is Canton Cap Com. Read you loud and clear. Could you begin your short report, please? |
| 02 43 51 | P | Roger, George. My control mode is manual. The gyros are caged, maneuver is off. Fuel is 45 and 64, a little ahead of schedule. Oxygen reads 82-100. |

Steam vent temperature in the suit is dropping slightly. It's a little below 70. Cabin is 46. Suit temperature has dropped to about 71 now. All the power is good, and here is a blood pressure. Over.

02 44 30 CC Okay, standing by for blood pressure.

02 44 44 CC We are receiving the blood pressure check. Over.

02 44 47 P Roger.

02 44 50 CC Do you plan on eating as called for by ---. Over.

02 44 57 P I did have the visor open a short time ago for the xylose pill. All of the rest of the food that I have aboard has either crumbled or melted. It's unusable in its present state so I think the xylose pill will constitude my last zero g meal. However, the first one, before the food crumbled, was quite easy. It's no problem to eat this bite-size food - in a weightless state. I also drank some water at that time, which was no problem.

02 45 32.5 CC Roger. I take it, from what you said then, that you have confirmed that your faceplate is closed for the decision on the third orbit.

02 45 42.5 P That is correct, my faceplate is closed. Also, what is the trend of my cabin pressure on the ground? Over.

02 45 51 CC Stand by, please.

02 46 08 CC We are checking on your request there, Scott. Could you hit that button again? We lost your EKG.

02 46 15 P Oh, you want blood pressure or EKG?

02 46 17.5 CC No, we lost the EKG. Possibly you could press on those sensors. Okay, Surgeon informs me that the EKG is now returning. Your other question, cabin pressure is staying at 5 1 approximately.

02 46 36.5 P Roger. No change in reading since launch. Is that correct?

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| 02 46 40 | CC | Negative on that. It's gone from 5.8 at launch to approximately 5.1 in very, very gradual descending trend. |
| 02 46 52 | P | Roger. My cabin pressure indicator is reading 4.8 at this time. |
| 02 47 02 | CC | Roger, I have no comment on this, just that the trend appears to be good here on the ground. |
| 02 47 09.5 | P | Roger. |
| 02 47 16.5 | CC | Do you have any specific comments on your balloon experiments; for example, the best color contrast with the ---. |
| 02 47 36.5 | P | Yes, I would say the day-glow orange is the best. |
| 02 47 41 | CC | Roger. For your information, the second sunrise should be expected in approximately three to four minutes. |
| 02 47 47.5 | P | Roger, thank you. |
| 02 47 50.5 | CC | Everything continues to look very good here on the ground. I've got a reading here on the ground for cabin pressure. This is for your information, is 4.8. Now this does take the trend that has been set up considerably. The suit pressure comes in at 4.9. |
| 02 48 10 | P | Roger. |
| 02 48 14 | CC | We find now that the - the $O_2$ partial pressure is fluctuating slightly, and the --- hanging around 4.2. |
| 02 48 26.5 | CC | Did you ---? |
| 02 48 29.5 | CC | $O_2$ partial pressure is fluctuating --- 4.2. Over. |
| 02 48 35 | P | Roger, copied, George, thank you. |
| 02 48 39 | CC | As I said before, everything looks very good here. Surgeon is after me here for you to try another blood pressure. Is this convenient? |

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| 02 48 47.5 | P | Negative. I won't be able to hold still for it now. I've got the sunrise to worry about. |
| 02 48 52.5 | CC | Okay, Roger. We have no further queries. If you have any comments we'll be listening down here. |
| 02 49 00 | P | Negative. I have a beautiful sunrise through the window. I'll record it so you can see it. |

HAWAII

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|---|---|---|
| 02 49 07.5 | CC | Aurora 7, Aurora 7, Hawaii Com Tech. How do you read me? Over. |
| 02 49 12.5 | P | Roger, Hawaii, Aurora 7. Loud and clear. How me? |
| 02 49 17.5 | CC | Aurora 7, this is Cap Com. Can you give me a short report, please. |
| 02 49 22 | P | Roger. My control mode is manual, gyros caged, maneuver off. Stand by one. My status is good and the capsule status is good. I want to get some pictures of the sunrise. Over. |
| 02 49 37.5 | CC | Roger. Give me the short report first. |
| 02 49 40 | P | Roger. Fuel is 45-62. Over. |
| 02 49 48 | CC | Roger. 45 and 62. |
| 02 49 50.5 | P | Roger. |
| 02 50 31 | CC | Aurora 7. Did you drink over Canton, did you drink any water over Canton? |
| 02 50 36 | P | That is negative. I will do, shortly. |
| 02 50 40.5 | CC | Roger, Sir John feels that this is advisable. |
| 02 50 44.5 | P | Roger. |
| 02 50 45.5 | CC | Do you have an auto fuel warning light? |
| 02 50 48 | P | That is right. I have reported it and I believe I reported it a long time ago. It is covered with tape at the moment. |

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| 02 50 59 | CC | Roger. |
| 02 51 24.5 | CC | Aurora 7, Aurora 7, Cap Com. Cape Flight advises me that we - that they expected the cabin to do such. |
| 02 51 31.5 | P | Roger, thank you. |
| 02 51 34 | CC | --- temperature exhaust -- steam exhaust? |
| 02 51 39 | P | Roger. Suit exhaust is 7C. Cabin exhaust is 49. |
| 02 51 46 | CC | Roger. |
| 02 52 20.5 | CC | Aurora 7. This is Cap Com. Would like for you to return to gyros normal and see what kind of indication we have, whether or not your window view agrees with your gyros. |
| 02 52 34 | P | Roger. Wait one. |
| 02 52 47 | P | I have some more of the white particles in view below the capsule. They appear to be traveling exactly my speed. There is one drifting off. It's going faster than I am as a matter of fact. |
| 02 53 11.5 | CC | Roger, understand. |
| 02 53 15 | P | I haven't seen the great numbers of these particles, but I've seen a few of them. Their motion is random; they look exactly like snowflakes to me. |
| 02 53 29 | CC | Roger. Have you tried returning -- . |
| 02 53 33 | P | Negative. Le me get within scanner limits first. |
| 02 53 39 | CC | Say again. |
| 02 53 40 | P | I must adjust my attitude, to within scanner limits first. |
| 02 53 46.5 | CC | Roger. |
| 02 54 18.5 | P | There were some more of those - little particles. They definitely look like snowflakes this time. |

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| 02 54 26 | CC | Roger, understand, your particles look like definite snowflakes. |
| 02 54 32 | P | However - |
| 02 54 33.5 | CC | Can we get a blood pressure from you, Scott? |
| 02 54 34.5 | P | Roger. Blood pressure - start - now. I have the balloon - now - pretty steadily below me, not oscillating. And go to gyros normal. Gyros normal now. |
| 02 55 07.5 | CC | Roger. TM indicates your - zero pitch. |
| 02 55 15 | CC | LOS, Scott, we've had LOS. Can you read me? Over. |

CALIFORNIA

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|---|---|---|
| 02 58 16 | CT | Aurora 7, Aurora 7, this is California Com Tech, California Com Tech. Do you hear me? Over. |
| 02 58 22.5 | P | Hello, Cal Com Tech, Aurora 7. Loud and clear. How me? |
| 02 58 45 | CT | Aurora 7, Aurora 7, this is California Com Tech, California Com Tech. Do you hear? Over. |
| 02 58 51.5 | P | Hello, California Com Tech, Aurora 7. Loud and clear. How me? |
| 02 58 56 | CT | We're reading you loud and clear, also. Stand by for Cap Com. |
| 02 58 59.5 | P | Roger. |
| 02 59 06.5 | CC | Aurora 7, California. How do you read? |
| 02 59 09.5 | P | Hello, Al, loud and clear. How me? |
| 02 59 12.5 | CC | You're loud and clear, Scotty. Short report. |
| 02 59 16.5 | P | Roger. Control mode is manual, gyros normal, maneuver off. Fuel is 45-50. Balloon is out. Oxygen 81-100. And my status is good. The capsule status is good, except I'm unable to get a reasonable suit steam exhaust temperature. Still reading 70. Over. |

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| 02 59 42 | CC | Roger, seems to me as long as suit inlet is going down that you could continue to increase flow until you feel comfortable. |
| 02 59 52.5 | P | Roger. |
| 02 59 55 | CC | Understand you're GO for orbit three. |
| 02 59 58 | P | I am - Roger, I am GO for orbit three. |
| 03 00 00 | CC | Seven, this is California. |
| 03 00 12 | P | Go, California. |
| 03 00 15 | CC | General Kraft is still somewhat concerned about auto fuel. Use as little auto, use no auto fuel unless you have to prior to retrosequence time. And I think maybe you might increase flow to your inverter heat exchanger, to try to bring the temperature down. They are not critical yet, however. |
| 03 00 38 | P | Roger, I have gone from 4 to 5 on the inverter at this time. And I think I'll increase just a tad on the suit. |
| 03 00 49.5 | CC | Roger. You're sounding good here. Give you a period of quiet while I send Z and R cal. |
| 03 00 55.5 | P | Roger. |
| 03 01 06 | CC | Seven, this is California sending Z cal on my mark. |
| 03 01 09.5 | P | Roger. |
| 03 01 11 | CC | One, MARK. |
| 03 01 25 | CC | Z cal off. |
| 03 01 26.5 | P | Roger. |
| 03 01 29 | CC | Stand by for R cal 3,2,1. |
| 03 01 35 | P | All right now, I'm beginning to get all of those various particles, they - they're way out. I can see some that are a hundred feet out. |
| 03 01 52.5 | CC | Roger. R cal off. |

| | | |
|---|---|---|
| 03 01 55.5 | P | They all look like snowflakes to me. No don't - they do not glow of their own accord. |
| 03 02 12 | CC | Roger, Seven. Do you - have you --- perspire or have you stopped perspiring at the moment? |
| 03 02 20 | P | No, I'm still perspiring, Al. I think I'll open up the visor and take a drink of water. |
| 03 02 27 | CC | Roger. Sounds like a good idea. |
| 03 02 42 | CC | Seven, would you give us a blood pressure, please, in between swallows. |
| 03 03 27 | P | Okay, there's your blood pressure. I took about 20 swallows of water. Tasted pretty good. |
| 03 03 38 | CC | Roger, Seven. We're sure of that, we're getting Alpha times and - Hotel. You have Hotel, I know. How about 3 Alpha? |
| 03 03 48 | P | Roger, and MARK now a tensiometer reading. It's as tight as I've seen the string. Mark another tensiometer reading. |
| 03 03 59 | CC | Roger, we have those. |
| 03 04 01 | P | Now say again your last question. |
| 03 04 06 | CC | Do you have 3 Alpha of 03 11 00? |
| 03 04 12 | P | 03 11 00. |
| 03 04 16 | CC | That is correct. |
| 03 04 22 | P | Roger, copied. |
| 03 04 45 | CC | Seven, this is California. Do you still read? |
| 03 04 47 | P | Roger, loud and clear. |
| 03 04 50 | CC | Roger, we have no further inquiries. See you next time. |
| 03 04 53 | P | Roger. |

FOR OFFICIAL USE ONLY

GUAYMAS

| | | |
|---|---|---|
| 03 05 11 | CC | Aurora 7, Guaymas Cap Com. |
| 03 05 13 | P | Hello, Guaymas. Go ahead. |
| 03 05 15 | CC | Roger, we're reading you loud and clear. We'd like to conduct a wobulator test here. We use White Sands whenever you give us the word. |
| 03 05 23 | P | Roger, I have one, it's the yaw gyro on the stop at this time. |
| 03 05 31 | CC | Is your wobulator on now? |
| 03 05 33 | P | Yes, the wobulator is on. |
| 03 05 35.5 | CC | Roger. |
| 03 05 43 | CC | What was that on your yaw? |
| 03 05 45.5 | P | I have the yaw needle on the 250 stop. |
| 03 05 50.5 | CC | Roger. |
| 03 05 52.5 | P | I will not cage until after I get rid of the balloon and then I can start a slow yaw to the left to pick it off the stop. |
| 03 06 04 | CC | Roger. |
| 03 06 12 | CC | Roger, can you turn your wobulator on now and leave it on? |
| 03 06 15.5 | P | Roger, it has been on and I haven't touched it. |
| 03 06 19 | CC | Roger, understand. |
| 03 06 20.5 | P | Do you want it off? |
| 03 06 24 | CC | Roger. On and off in approximately 20 second intervals. |
| 03 06 29 | P | Okay, wobulator going off - NOW. |
| 03 06 38 | CC | Roger, we're relaying this. |

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| 03 06 46.5 | P | Am I in a position to do a three sixty roll for them at this time? |
| 03 06 51 | CC | Your 00 yaw, you do have a yaw input in. |
| 03 06 57 | P | Could we do this three sixty roll on this pass at White Sands? |
| 03 07 03 | P | Gordo. |

CAPE CANAVERAL

| | | |
|---|---|---|
| 03 07 12.5 | CC | Aurora 7, Cape Cap Com. |
| 03 07 15 | P | Roger, Cape. Loud and clear and break, break. Guaymas, the wobulator is back on now. |
| 03 07 24.5 | P | Roger, Cape. go ahead. |
| 03 07 26.5 | CC | Roger, Aurora 7, Cape Cap Com back on HF. Give me your report. |
| 03 07 32 | P | Roger. Control mode manual, gyros normal, the maneuver switch is off. Fuel is 45-45, oxygen is 70, or, correction, oxygen is 80 and 100. Suit temperature is 68 now and coming down pretty well. Suit steam vent temperature is 69 and beginning to be a little more confortable. Over. |
| 03 08 12 | CC | Roger, and how do you feel, now? |
| 03 08 15 | P | I feel pretty good. Still warm. |
| 03 08 18 | CC | Okay, sounds like you'll be alright. |
| 03 08 23 | CC | Did you - your normal balloon release time will be 3 plus 34, Scott? |
| 03 08 28.5 | P | 3 plus 34, Roger. |
| 03 08 31 | CC | Roger, can you describe the balloon and its actions a little to us. |
| 03 08 35 | P | Yes, it has a random drift. There is no oscillation that I can predict whatsoever. The - the line leading to the balloon sometimes is tight, sometimes is loose - loose enough, so that there are loops in it. Its - its behaviour is strictly random as far as I can tell. The balloon is not inflated well either. It's an oblong shape out there, rather than a round figure, and I believe when the sun is on it, the day glow orange is the most brilliant, and the silver. That's about all I can tell you, Gus. |
| 03 09 28.5 | CC | Roger. Surgeon suggests that you drink as much water as you can. Drink it as often as you can. |

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| 03 09 38.5 | P | Roger. |
| 03 09 40 | CC | Retrosequence times for area 3 B and 3 C are nominal. |
| 03 09 43.5 | P | 3 B and 3 C nominal. Roger. |
| 03 09 50.5 | CC | And we recommend you go to normal on your gyros with the maneuver switch off. |
| 03 09 55 | P | Roger, the gyros are normal and the maneuver switch is off. |
| 03 09 59.5 | CC | Roger. |
| 03 10 11.5 | CC | Would you give us your - your temperature control valve settings, please? |
| 03 10 20 | P | Roger, suit is 7.5, cabin is about 10. That's 10 on the cabin and 5 on the inverters. Over. |
| 03 10 35 | CC | Roger. |
| 03 10 37.5 | CC | Standby for Z cal. |
| 03 10 39.5 | P | Roger, standing by. |
| 03 10 46 | CC | R cal. |
| 03 10 53.5 | P | Mark a tensiometer reading. It's as tight as I've - as it gets. |
| 03 11 29.5 | CC | Aurora 7, Cap Com. |
| 03 11 32 | P | Go ahead, Cap Com. |
| 03 11 33.5 | CC | - drifting flight yet? |
| 03 11 35 | P | Say again. |
| 03 11 36.5 | CC | Have you done any drifting flight? |
| 03 11 38.5 | P | That is Roger, and if I am to save fuel for retrosequence I think I better start again. Over. |
| 03 11 49 | CC | Roger, I agree with you. |

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| 03 11 52 | P | My control mode is now manual, gyros are caged and I will allow the capsule to drift for a little while. |
| 03 12 04 | CC | Roger, and John suggests you try to look back, towards the darkness, at sunrise to see those particles. |
| 03 12 14 | P | - Toward the darkness |
| 03 12 16 | CC | Roger, at sunrise, try to look toward the darkness. |
| 03 12 18.5 | P | Okay, I have done that, and - and - tell him no joy. |
| 03 12 24 | CC | Roger. |
| 03 12 36.5 | CC | Aurora 7, are you in drifting flight? |
| 03 12 38.5 | P | That is Roger. |
| 03 12 40.5 | CC | Roger. |
| 03 12 46.5 | P | I am looking down almost vertically. It's possible to distinguish, I believe, 4 separate cloud layers. |
| 03 12 57.5 | CC | Understand. |
| 03 13 07 | P | Balloon - I'll maneuver enough to get the balloon out in trail so I can photograph its departure. |
| 03 13 35.5 | CC | Roger. |
| 03 13 55 | P | I, incidently, have those little particles visible in the periscope at this time. |
| 03 14 05 | CC | Roger, understand the periscope. |
| 03 14 22.5 | CC | Aurora 7, Cap Com. |
| 03 14 24 | P | Roger, go ahead. |
| 03 14 26.5 | CC | We're still fairly happy with your fuel state now. Don't let - we'd like for you not to let either on get down below 40 percent. |
| 03 14 33 | P | Roger, I'll try. I have balloon jettison on and off, and I can't get rid of it. |

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| 03 14 41 | CC | Understand that you can't get rid of the balloon. |
| 03 14 43.5 | P | That's right. It will not jettison. |
| 03 14 48.5 | CC | Okay. |
| 03 15 19 | CC | Aurora 7, Cap Com. |
| 03 15 21.5 | P | Go ahead, Cap Com. |
| 03 15 23 | CC | Give us your blood pressure and fuel reading. |
| 03 15 26 | P | Okay. Fuel is 45-42. Blood pressure on the air. |
| 03 15 32 | CC | Rog. |
| 03 15 58 | P | I have the particles visible still. They're streaming aft, but in an arc of maybe a 120 or 30 degrees. |
| 03 16 16.5 | CC | Aurora 7, Cap Com. Say again. |
| 03 16 19 | P | Roger, I have these particles drifting aft again, but they do not parallel the line to the balloon exactly. They drift aft within an arc of maybe 120 to 130 degrees. |
| 03 16 36 | CC | Roger. |
| 03 16 41 | CC | Aurora 7, Cap Com. Can you give us a comment on the zero g experiment? |
| 03 16 53.5 | P | Roger. At this moment, the fluid is all gathered around the standpipe, the standpipe appears to be full and the fluid outside the standpipe is about halfway up. There is a rather large maniscus. I'd say about $60^{\circ}$ maniscus. |
| 03 17 27.5 | CC | Aurora 7, Cap Com. Repeat as much of your last message as you can. |
| 03 17 32 | P | Roger. The standpipe is full of the fluid. The fluid is halfway up the outside of the standpipe - a rather large maniscus, on angle of about 60 degrees. Over. |

CANARY

| | | |
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| 03 20 31 | CC | Aurora 7, Aurora 7, this is Canary Cap Com on HF. Do you read? Over. |

| | | |
|---|---|---|
| 03 21 00 | P | Hello, hello, Canary Cap Com, Aurora 7. Reading you loud and clear, HF. Transmitting HF. How do you read? Over. |
| 03 21 32.5 | CC | Aurora 7, this is Canary Cap Com on HF. Do you read? Over. |
| 03 21 40.5 | P | Roger, Canary Cap Com. Reading you loud and clear, HF. How me? Over. |
| 03 22 04 | P | These pictures of the - small groups of closely-knit clouds are south of Canary, third orbit. |
| 03 22 48.5 | P | This must be crossing ITCV. I have never seen weather quite like this. |
| 03 22 34 | CC | This is Canary Cap Com on HF. Do you receive? Over. |
| 03 23 36.5 | CC | Aurora 7, this is Canary Cap Com. We had no transmissions from you. This is Canary Islands, signing out. |
| 03 24 33 | P | I have the Voasmeter out at this time. |
| 03 24 53 | P | Hello. |
| 03 25 01 | P | Hello, Canary Cap Com, Aurora 7. Reading you loud and clear. How me? |
| 03 25 08 | CC | Aurora 7, this is Canary Cap Com. Do you read? Over. |
| 03 25 12.5 | P | Go ahead Canary. Reading you loud and clear. |
| 03 25 18.5 | P | I am going - I am in the record only position now. I think the best answer to the autokinesis - is that there is none. I noticed none - and I tend to aline the horizontal with my head - it - a horizontal line under zero g is a line paralled to the line drawn between your eyes. I don't get autokinesis. I don't get - now wait a minute maybe I'm beginning to. |
| 03 26 40 | P | I should remark that at 3 26 33, I have in the sky, at any time, 10 particles. They no doubt appear to glow to me. They appeared to be little pieces of frost. However, some appear to be way, way far away. There are two - that look like they might be a hundred yards away. I haven't operated the thruster not for some time. Here are two in closer. Now a densiometer |

reading on these that are in close. Extinct at 5.5, the elapsed time is 3 27 39. I am unable to see any stars in the black sky at this time. However, these little snowflakes are clearly visible.

03 28 13 P The cabin temperature has droped considerable now, and the setting I have on the suit is 7.

03 28 20.5 P Am going to increase it just a tad more.

03 28 40 P My suit valve, water valve temperature now is - about 8.

03 28 53 P Hello, hello, Kano Cap Com, Aurora 7. Reading you loud and clear. How me?

03 29 24 P I've noticed that every time I turn over to the right everything seems vertical, but I am upside down.

03 29 34 P Now, for the record.

03 29 43.5 P I still feel that, I could easily feel like I am coming in on my back.

03 30 03 P I could very easily come in from another planet, and feel that I am on my - on my back, and that earth is up above me, but that's sorta the way you feel when you come out of a Split S, or out of an Immelmann.

KANO

03 30 48 CC Kano on HF. If you read me, the Sir John requests that you take a blood pressure check now, a blood pressure check for the onboard record. Over.

03 31 00 P Roger. Reading you, Kano, loud and clear. Blood pressure start at this time.

03 31 10 P Visor is coming closed now.

03 31 39 CC Aurora 7, Aurora 7, this is Kano Cap Com. If you read me, would you do a blood pressure check for the onboard records. Over.

03 32 55 P Okay. I'm taking the - I've taken the big back off, going to record only, at this time. Have taken the

| | | |
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| | | big back off of the camera and trying to get some more MIT film at this time. The filter is in. The cassette - is in the camera. |
| 03 33 43 | P | The zero g senta, sensations are wonderful. This is the first time I've ever worn this suit and had it confortable. |
| 03 34 07.5 | P | I don't know which way I'm pointed, and don't particularly care. |
| 03 34 23 | P | Roger. At this time I am hearing Kano calling for a blood pressure check. I will give it to him now. Let's see, I have fuel 45-43, still would like to get just a little rate - just a little one. |
| 03 34 49 | P | Let's see, we wanta go back that way. |
| 03 35 35.5 | P | I can't see any relationship between thruster action and the fireflies. |
| 03 35 43 | P | Mark MIT pictures to 3 35 36, crank two by - at infinity. |
| 03 36 36 | P | Coastal passage over Africa. |
| 03 38 33 | P | I'm taking many MIT pictures, at capsule elapsed 3 38 38. It will be the only chance we have, I might as well use up all the film. |
| | | INDIAN OCEAN SHIP |
| 03 38 54 | P | Hello, Indian Com Tech, Aurora 7. Loud and clear. How me? |
| 03 39 13.5 | CT | Aurora 7, this is IOS Com Tech, on HF and UHF. How do you read? Over. |
| 03 39 18.5 | P | Roger. Loud and clear. How me, Indian Cap Com? |
| 03 39 24 | CC | Aurora 7, this is Indian Cap Com. I did not read all of your transmission, but the part I monitored was loud and clear. Go ahead. |
| 03 39 31.5 | P | Roger. My status is good, the capsule status is good. I am in drifting flight on manual control. Gyros are caged. The fuel reads 45-42, oxygen 79-100. |

Steam vent temperatures both read 65 now, suit temperature has gone down nicely. It is now 62, and all the power is good. The blood pressure is starting at this time. I've just finished taking some MIT pictures, and that is all I have to report at this time.

03 40 16.5 CC Roger, Aurora 7. I copy your control mode manual, and gyro caged, fuel 45-42, oxygen 79-100, and I did not hear the last part of your transmission. How do -

03 40 31.5 P Roger. My status is good, the suit temperature has reduced considerably, steam vent temperatures now read 69 on cabin and suit, suit temperature is 62, and cabin temperature is 101. Over.

03 40 52.5 CC Roger, suit temperature 62, and cabin temperature 101. Your blood pressure is starting - and understand you are on the manual. Understand also you are drifting for awhile.

03 41 10 P That is Roger. I am.

03 41 12 CC Confirm.

03 41 13 P I am on manual control. I am allowing the capsule to drift. Over.

03 41 18 CC Roger.

03 41 19 P Also another departure from the plan is the fact that I have been unable to jettison the balloon. The balloon is still attached - should be no problem.

03 41 33 CC Roger, understand no problem expected but balloon is still attached. Stand by.

03 24 04 CC Aurora 7, this is Indian Cap Com. All our retro-sequence times are nominal. Do you want me to call them out to you? Over.

03 24 13 P Negative. I have them all, thank you.

03 24 19.5 CC Aurora 7, your last transcription was unreadable. You are fading badly, although intermittently. I will read retrosequence times in the blind. Area 3 Delta, 04 12 32, 04 12 32, Echo 04 22 27, 3 Echo 04 22 27, and the last --- we have is 04 32 26 ---

now and your capsule clock is still within one second.

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| 03 43 05 | P | Roger, Kano. I copied all that. |
| 03 43 08.5 | CC | Roger, Aurora. You were loud and clear. |
| 03 43 20 | P | The sunsets are most spectacular. The earth is black after the sun has set. The earth is black, the first band close to the earth is red, the next is yellow, the next is blue, the next is green, and the next is sort of a - sort of a purple. It's almost like a very brilliant rainbow. It extends at some - |
| 03 43 54 | CC | Indian Cap Com. Check you see about all colors between the horizon and the night sky. You seem to see more layers than Friendship 7. |
| 03 44 05.5 | P | Roger. These layers extend from at least 90 degrees either side of the sun at sunset. |
| 03 44 14.5 | CC | Aurora 7, I did not hear your whole sentence. Will you repeat, please? Over. |
| 03 44 19 | P | Roger. This bright horizon band extends at least $90^{\circ}$ north and south of the position of the sunset. |
| 03 44 45 | CC | Roger, understand. About the balloon, does Mercury Control Center know you did not - |
| 03 44 52 | P | Yes. I tried to release it over their station and was unable to do so. You might remind them that the balloon is still on. |
| 03 45 02 | CC | Roger, Aurora 7. Understand. |
| 03 45 25.5 | CC | Aurora 7, Indian Cap Com. Your inverter temperatures are 183 for the 150, and 195 for the 250. All your other primaries check out okay on telemetry. |
| 03 45 38 | P | Roger, thank you very much. |
| 03 46 15.5 | CC | Aurora 7, do you read? Over. |
| 03 46 18.5 | P | Go ahead, Indian Cap Com. |
| 03 46 21 | CC | Our medical monitor says that we are reading your respiration. I believe this is almost the first |

time it's came across.

| | | |
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| 03 46 28 | P | That's very good. I guarantee I'm breathing. |
| 03 46 35 | CC | Roger, understand. |
| 03 46 48 | P | The eye patch is in place, this time. |
| 03 48 16.5 | P | Going to record - record only at this time. |
| 03 48 50 | P | At 3 hours and 48 minutes and 51 seconds elapsed, I'm taking a good swig of water. It's pretty cool this time. Stretching my legs a tad. It's quite dark. I'm in drifting flight. Oh, boy! It feels good to get that leg stretched out. That one and the right one too. |
| 03 49 40 | P | I drank an awful lot of water and I'm still thirsty. As a matter of fact, I think there - there is a leak in the urinal, I'm sure. |
| 03 50 38 | P | Okay, line touch. |
| 03 51 13.5 | P | Okay. I'm shaking my head violently from all sides, with eyes closed, up and down, pitch, roll, yaw. Nothing in my stomach, nothing anywhere. There is, now, I will try to poke zero, time zero button. Well, I missed it. I was a little disoriented* as to exactly where things are, not sure exactly what you want to accomplish by this but there is no problem of orienting. Your - your - inner ears and your mental appraisal of horizontal, you just adapt to this environment, like - like you were born in it. It's a great, great freedom. |
| 03 53 25.5 | P | Don't let me forget about the shiny finish on the star chart. It makes it very hard to read. |
| 03 53 40.5 | P | At 3 53. |
| 03 55 30 | P | I'm using the - photometer now - to try and get - a reading. I saw a com - no, it's the balloon that I see, still drifting aimlessly, lighted by moon- |

* The result of this test is the same under 1 g and he describes no difficulty in re-establishing relationships.

light at this time.

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| 03 56 09.5 | P | None of the colors are - particularly visible, I think - |
| 03 56 19.5 | P | Excess cabin water light is on at this time, 3 56 24, am going to turn it down just a tad - so it will be just about where the suit is. I would say, let's see, from that, that it jumped down to freezing. |

MUCHEA

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| 03 57 00 | P | Hello, Muchea Cap Com, Aurora 7. Loud and clear. How me? |
| 03 57 06.5 | CC | Coming in loud and clear. |
| 03 57 08 | P | Roger, Deke, my control mode is manual, gyros are caged, the maneuver switch is off. My fuel reads 45 and 42, the oxygen is reading 76 and 100, steam vent temperatures are 68 on the suit and I just got excess cabin water light, the needle dropped down to 20. Reset cabin water at about 6 and in this capsule it seems optimum settings are right between 6 and 7. Outside of that, all things, all systems are good. And blood pressure is starting now. |
| 03 58 01.5 | CC | Roger, okay, starting blood pressure. |
| 03 58 04.5 | P | The visor has been open for some time, I've been taking some readings on stars through the haze layer with the photometer, the visor is coming closed now. |
| 03 58 16.5 | CC | Roger, understand visor coming closed. |
| 03 58 20 | CC | I'll give you retro time for end of mission and would like to have you set the clock to this at this time. |
| 03 58 26.5 | P | Roger. |
| 03 58 28.5 | CC | 32 34 |
| 03 58 31 | P | Understand, 04 32 34. |
| 03 58 35 | CC | Good. |

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| 03 58 35.5 | P | Okay, it's going into the clock now - whoop. |
| 03 58 46.5 | CC | We indicate 35. |
| 03 58 49 | P | I do, too, I overshot. Stand by. |
| 03 59 00.5 | CC | That's probably close enough for government work. |
| 03 59 07.5 | P | For you, to the second. |
| 03 59 15.5 | CC | Roger, still you indicate 1 second slow on GET, we indicate you on, on retrotime. |
| 03 59 20.5 | P | Roger. I am reading 04 32 34. |
| 03 59 24.5 | CC | Would you please exercise prior to your second blood pressure. |
| 03 59 29 | P | Roger, I'll give you the calibrated exercise, at this time. |
| 03 59 35.5 | CC | Roger. |
| 03 59 38.5 | P | Exercise start, now. |
| 04 00 11.5 | P | Okay, blood pressure start, not. That was 60 cycles in 30 seconds on the exerciser. |
| 04 00 19.5 | CC | 60 cycles in 30 seconds. |
| 04 00 25 | CC | Did you by any chance try T/M keying over the Cape on your last pass? |
| 04 00 31.5 | P | I think I may have to mark time for tensiometer reading on the balloon. |
| 04 00 40.5 | CC | Very good. |
| 04 00 43 | CC | Understand you still have the balloon with you. It's possible if you go to deploy position and back to release, you can - |
| 04 00 51.5 | P | Roger, I've tried that a number of times, Deke. I just can't get rid of it. |
| 04 00 57 | CC | Okay, well, she'll probably come into your face on retrofire, but I'm sure you'll loose it shortly after that. |

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| 04 01 02 | P | Yeah, I figure. I hope so. |
| 04 01 06 | CC | Okay, for your information, cloud --- is five-tenths and it's only one-eighth to the north over Port Moresby, so if you see some lights up in that area, we'd like to know about it. |
| 04 01 18 | P | Roger, I'll let you know. |
| 04 01 24 | CC | Could you give us a CET hack, please. |
| 04 01 27 | P | Roger, CET on my mark will be 4 hours, 1 minute, 35 seconds, stand by. MARK, 4 01 35. |
| 04 01 39 | CC | Roger. Still one second off; that's fine. |
| 04 01 45.5 | CC | The flight plan calls for you to have a drink of water over here. Do you feel like you need one? |
| 04 01 51 | P | Roger, I just, I have had three long drinks of water. The last one was, I think, about 10 minutes ago, Deke. |
| 04 02 00 | CC | You're probably loaded for bear, then. |
| 04 02 01.5 | P | Roger. |
| 04 02 14 | CC | ---? |
| 04 02 17 | P | Roger, Deke, the haze layer is very bright. I would say 8 to 10 degrees above the real horizon. And I would say that the haze layer is about twice as high above the horizon as the - the bright blue band at sunset is, it's twice as thick. A star, stars are occuluded as we pass through this haze layer. I have a good set of stars to watch going through at this time. I'll try and get some photometer readings. |
| 04 03 12.5 | CC | Roger, understand. It's twice as --- sunset. |
| 04 03 14.5 | P | It is not twice as thick, it's thinner but it is located at a distance about twice as far away as the top of the - the band at sunset. |
| 04 03 29 | CC | Understand. |

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| 04 03 33 | P | It's very narrow, and as bright as the horizon of the earth itself. |
| 04 03 41 | CC | Rog. |
| 04 03 59.5 | P | This is a reading on Phecda in - in the Big Dipper, prior to entry in the, the, into the haze layer. It occludes - it is extinct at roughly 2.5. The reticle extincts at 5.5. TM mark for the time in the middle of the haze layer. Spica - stand by. |

WOOMERA

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| 04 05 02 | CC | Aurora 7, Aurora 7, this is Woomera Cap Com. How do you read? Over. |
| 04 05 05.5 | P | Roger. Stand by, Woomera. |
| 04 05 08.5 | CC | Roger, standing by. |
| 04 05 15.5 | P | In the middle of the haze layer, Phecda will not - I can't even get a reading on it through the photometer. Phicda is now below the horizon, or below and mark about 5 seconds ago, now it emerged from the brightest part of the haze layer. It is now clearly visible. Woomera, my status is very good, fuel is 45 and 42. Standby, I'll give you a full report very shortly. |
| 04 05 55.5 | CC | Roger, standing by. |
| 04 06 01.5 | P | Visor coming open. |
| 04 06 03.5 | CC | Roger, visor open. |
| 04 06 27.5 | CC | Aurora 7, this is Woomera. Do you read? Over. |
| 04 06 29.5 | P | Roger, Woomera, loud and clear. |
| 04 06 32.5 | CC | You say visor is open? |
| 04 06 35.5 | P | That's negative. I did not open it, I won't open it until I get through with these readings. Phecda now extincts at 1.7 in the mid, in mid position between the haze layer, and the earth. Okay, Woomera, my - my status is very good. The suit |

temperature is coming down substantially. Steam vent temperature is not down much, but the suit environment temperature is 60. I'm quite comfortable. Cabin temperature is 101, cabin is holding an indicated 4 8, oxygen is 75-100, all d-c power continues to be good. 20 Amps, both a-c busses are good, fuel reads 46 and 40. I am in drifting flight. I have had plenty of water to drink. The visor is coming open now. And blood pressure is coming your way at this time.

04 08 00.5 P Hello, Woomera, Woomera Cap Com, this is Aurora 7. Did you copy my last? Over.

04 09 27.5 P Cabin temperature, cabin water flow is all the way off and reducing back to about 7.5 now, a little bit less. At this time cabin steam vent, going to record only.

04 09 52.5 P Cabin steam vent is 10, suit steam vent is 62. I would like to have a little bit more pad on the temperature, but I can't seem to get it. The suit temperature is 60, the cabin temperature continues at 102. I have 22 minutes and 20 seconds left for retrofire. I think that I will try to get some of this equipment stowed at this time.

04 11 07.5 P There is the moon.

04 11 31.5 P Looks no different - here than it does on the ground.

04 11 51 P Visor is open and the visor is coming closed now at this time.

04 12 28 P I have put the moon - in the center of the window and it just drifts very, very little.

04 12 49.5 P There seems to be a stagnant place in the, my helmet. The suit is cool, but along my face it's warm.

04 13 51 P And there is Scorpio.

04 14 46.5 P Alright, let's see.

04 15 04 P It's very interesting to remark that my attitude - and the - is roughly pitch up plus 30, roll right

130, and yaw left 20. The balloon at this time is moving right along with me. It's keeping a constant bearing at all times. There is the horizon band again, this time from the moonlit side. Let me see, with the air glow filter, it's very difficult to do this because of the lights from that time correlation clock. Visor coming open now. It's impossible to get dark-adapted in here, with that light the way it is.

04 17 23.5 P Alright for the record. Interesting, I believe, this haze layer is very bright through the air glow filter. Very bright. The time now is 4 17 44.

04 18 00.5 P Now, let me see, I'll get an accurate band width.

04 18 21 P That's very handy, because the band width - there is the sun. ---. The horizon band width is exactly equal to the X. I can't explain it, I'll have to, to -

04 19 22.5 P Sunrise. Ahhhhh! Beautiful lighted fireflies that time. It was luminous that time. But it's only, okay, they - Alright, I have - If anybody reads I have the fireflies they are very bright. They are capsule emanating. I can rap the hatch and stir off hundreds of them. Rap the side of the capsule. Huge streams come out. They - some appear to glow. Let me yaw around the other way.

04 20 25 P Some appear to glow but I don't believe they really do, it's just the light of the sun. I'll try to get a picture of it. They're brilliant. I think they would really shine through nine on the photometer. I'll rap, let's see.

04 21 39.5 P Taking some pictures at f of 2 8 and bulb. The pictures now, here, one of the balloon. The sun is too bright now. That's where they come from. They are little tiny white pieces of frost. I judge from this that the whole side of the capsule must have frost on it.

HAWAII

04 22 07 CT Aurora 7, this is Hawaii Com Tech, how do you read?

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| 04 22 10 | P | Hello, Hawaii, loud and clear. How me? |
| 04 22 19 | P | Hawaii Com Tech. |
| 04 22 21 | CT | Seven, Hawaii Com Tech, I read you momentarily, on UHF. How do you read? Over. |
| 04 22 26 | P | Roger, reading you loud and clear Hawaii. How me? |
| 04 22 31.5 | CC | Aurora 7, Hawaii Cap Com. How do you read me? |
| 04 22 35 | P | Roger, do you read me or do you not, James? |
| 04 22 39.5 | CC | Gee, you are weak, but I read you, you are readable. Are you on UHF-Hi? |
| 04 22 44.5 | P | Roger, UHF-Hi. |
| 04 22 47.5 | CC | Roger, orientate the spacecraft and go to the ASCS. |
| 04 22 53.5 | P | Roger, will do. |
| 04 22 59 | P | Roger, copied, going into orbit attitude at this time. |
| 04 23 13 | CC | Aurora 7, Aurora 7, do you copy? Over. |
| 04 23 16 | P | Roger, copy. Going into orbit attitude at this time. |
| 04 23 24 | CC | Roger. |
| 04 24 11 | CC | Aurora 7, Hawaii Cap Com, do you read me? Over. |
| 04 24 14 | P | Roger, go ahead, Hawaii. |
| 04 24 15 | CC | Is your maneuver switch off? |
| 04 24 18 | P | The maneuver switch is off. |
| 04 24 20 | CC | Roger, are you ready to start your pre-retrosequence checklist. |
| 04 24 23.5 | P | Roger, one moment. |
| 04 24 36 | P | I'm alining my attitudes. Everything is fine. I have part of the stowage checklist taken care of at this time. |

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| 04 24 47 | CC | Roger. |
| 04 25 11.5 | CC | Aurora 7, do you wish me to read out any of the checklist to you? |
| 04 25 17 | P | Roger, let me get the stowage and then you can help me with the pre-retrograde. |
| 04 25 24 | CC | Roger, standing by. |
| 04 25 55 | CC | Aurora 7, can we get on with the checklist? We have approximately 3 minutes left of contact. |
| 04 26 00 | P | Roger, go ahead with the checklist and I'm coming to retroattitude now and my control mode is automatic and my attitudes-standby, wait a minute, I have a problem in. |
| 04 26 33.5 | P | I have an ASCS problem here. I think ASCS is not operating properly, let me - . Emergency retrosequence is armed and retro manual is armed. I've got to evaluate this retro - this ASCS problem, Jim, before we go any further. |
| 04 27 04 | CC | Roger, standing by. Make sure your emergency drogue deploy and emergency main fuses are off. |
| 04 27 13.5 | P | Roger, they are. Okay, I'm going now to fly-by-wire, to Aux Damp, and now - attitudes do not agree. Five minutes to retrograde, light is on. I have a rate of descent, too, of about 10, 12 feet per second. |
| 04 27 46.5 | CC | Say again, say again. |
| 04 27 49 | P | I have a rate of descent of about 12 feet per second. |
| 04 27 54 | CC | What light was on? |
| 04 27 56.5 | P | Yes, I am back on fly-by-wire, trying to orient. |
| 04 28 06 | CC | Scott, let's try and get some of this retrosequence list checked off before you get to California. |
| 04 28 12.5 | P | Okay, go through it, Jim. |
| 04 28 26.5 | P | Roger, Jim, go through the checklist for me. |

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| 04 28 29.5 | CC | Roger, squib switch armed, auto retrojettison switch off, gyros normal, manual handle out, roll, yaw and pitch handles in. |
| 04 28 42.5 | P | Roll, yaw, and pitch are in. |
| 04 28 46.5 | CC | Retroattitude auto, retract scope auto, maneuver switch off, periscope lever up, UHF HI power, transmit on UHF, beacon continuous, VOX power on transmit and record, all batteries checked. Do you copy? |
| 04 29 10 | P | Roger, it's complete. |
| 04 29 15.5 | CC | Transmitting in the blind. We have LOS. Ground elapsed time is on my mark, 4 hours, 29 minutes and 30 seconds. Transmitting in the blind to Aurora 7. Make sure all your tone switches are on, your warning lights are bright, the retro manual fuse switch is on, the retrojettison fuse switch is off. Check your face plate and make sure that it is closed. |
| 04 29 59 | CC | Aurora 7. Did you copy? |
| 04 30 00.5 | P | Roger, copied all; I think we're in good shape. I'm not sure just what the status of the ASCS is at this time. |

CALIFORNIA

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| 04 31 36 | CT | Aurora 7, Aurora 7, this is California Com Tech, California Com Tech. Do you hear? Over. |
| 04 31 42 | P | Hello, California Com Tech. Loud and clear. How me? |
| 04 31 45.5 | CT | I'm reading you loud and clear also. Stand by for Cap Com. |
| 04 31 50 | CC | Seven, this is Cap Com. Are you in retroattitude? |
| 04 31 53 | P | Yes, I don't have agreement with ASCS in the window, Al. I think I'm going to have to go to fly-by-wire and use the window and the scope. ASCS is bad. I'm on fly-by-wire and manual. |
| 04 32 06 | CC | Roger, we concur. About 30 seconds to go. |

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| 04 32 21 | CC | About 10 seconds on my mark. |
| 04 32 23.5 | P | Roger. |
| 04 32 28 | CC | 6, 5, 4, 3, 2, 1. |
| 04 32 36 | P | Retrosequence is green. |
| 04 32 40 | CC | Roger, check ASCS quickly to see if orientation mode will hold. |
| 04 32 47 | CC | If your gyros are off you'll have to use attitude bypass. |
| 04 32 51 | P | Gyros are off. |
| 04 32 54.5 | CC | But you'll have to use attitude bypass and manual override. |
| 04 32 58.5 | P | Roger. |
| 04 33 00 | CC | 4, 3, 2, 1, 0. |
| 04 33 14.5 | P | Okay, fire 1, fire 2, and fire 3. I had to punch off manually. I have a little bit of smoke in the capsule. |
| 04 33 30 | CC | Attitudes hold, Scotty. |
| 04 33 31.5 | P | Okay, I think they held well, Al, the - I think they were good. I can't tell you what was wrong about them because the gyros were not quite right. But retrojettison - 3 fuse switches are on. |
| 04 33 51.5 | CC | Roger, we should have retrojettison in about 10 seconds. |
| 04 33 55 | P | Roger. |
| 04 33 56.5 | P | That was a nice gentle bump. All three have fired. Retroattitude was red. |
| 04 34 05.5 | CC | Roger. Should have retrojettison now. |
| 04 34 10 | P | Ah, right then at 34 10, on time. |

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| 04 34 15 | CC | Roger, how much fuel do you have left both tanks? |
| 04 34 19 | P | I have 20 and 5. |
| 04 34 23.5 | CC | Roger, I guess we'd better use - |
| 04 34 26 | P | I'll use manual. |
| 04 34 27.5 | CC | - on reentry unless ASCS holds you in reentry attitude. |
| 04 34 31 | P | Yes, it can, I'll have to do it with manual. |
| 04 34 39 | CC | Roger, recommend you try Aux Damp first, if it's not working then, go to fly-by-wire. |
| 04 34 45 | P | Okay, I'll have to do that. |
| 04 34 53 | P | The balloon is gone. I am aparently out of manual fuel, I have to go to fly-by-wire to stop this tumbling.* |
| 04 35 13.5 | CC | Roger. Using fly-by-wire to stop tumbling. |
| 04 35 24.5 | CC | Aurora 7, understand RSCS did not work. |
| 04 35 27.5 | P | I am out of manual fuel, Al. |
| 04 35 31 | CC | Roger. |
| 04 35 34.5 | P | .05 g should be when? |
| 04 35 37.5 | CC | Oh, you have plenty of time. It should be 04 44 elapsed time. |
| 04 35 45 | P | Roger. |
| 04 35 46 | CC | You have plenty of time. Take your time on fly-by-wire to get into reentry attitude. |

* Note: The spacecraft was rotating slowly at this point and was returned to proper attitude by the pilot before it had made $\frac{1}{4}$ revolution.

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| 04 35 50.5 | P | Roger. |
| 04 36 05 | CC | I was just looking over your reentry checklist, looks like you're in pretty good shape. You'll have to manually retract the scope. |
| 04 36 14.5 | P | No. I didn't. The scope did come in, Al. |
| 04 36 18.5 | CC | Roger. I didn't get that. Very good. |
| 04 36 29.5 | CC | How are you doing on reentry attitude? Over. |
| 04 36 32.5 | P | Stowing a few things first. I don't know yet. Take a while. |
| 04 36 46 | P | Okay. |
| 04 36 54 | P | Going to be tight on fuel. |
| 04 37 02.5 | CC | Roger, you have plenty of time, you have about 7 minutes before .05 g so take --- |
| 04 37 10 | P | Roger. |
| 04 37 28 | P | Okay. I can make out very, very small - farm land, pasture land below. I see individual fields, rivers, lakes, roads, I think. I'll get back to reentry attitude. |
| 04 37 39.5 | CC | Roger, 7, recommend you get close to reentry attitude, using as little fuel as possible and standby on fly-by-wire until rates develop. Over. |
| 04 37 50 | P | Roger, will do. |
| 04 38 03 | CC | Seven, this is California. We're losing you now. Standby for Cape. |
| 04 38 08.5 | P | Roger. |

CAPE CANAVERAL

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| 04 40 50.5 | CC | Aurora 7, Cape Cap Com. Over. |
| 04 40 52.5 | P | Hello Cape Cap Com, Aurora 7. Loud and clear. |

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| 04 41 08 | CC | Aurora 7, Cape Cap Com. Over |
| 04 41 10 | P | Hello, Cape Cap Com, Go ahead. |
| 04 41 12.5 | CC | Roger. Do you have your face, face plate closed? |
| 04 41 16 | P | Negative, it is now. Thank you. |
| 04 41 18.5 | CC | Roger, give me your fuel, please. |
| 04 41 20 | P | Fuel is 15 auto, I'm indicating 7 manual but it is empty, and ineffective. |
| 04 41 27 | CC | Roger, you have a few minutes to start of blackout. |
| 04 41 33 | P | Two minutes, you say? |
| 04 41 49 | CC | Aurora 7, Cap Com. |
| 04 41 50 | P | Go ahead, Cap Com. |
| 04 41 52.5 | CC | Just wanted to hear from you. |
| 04 41 54 | P | Roger. It's going to be real tight on fuel, Gus. I've got the horizon in view now, trying to keep rates very low, the, I just lost part of the balloon. The string from the balloon. |
| 04 42 10 | CC | - checklist. |
| 04 42 12 | P | Yes. We're in good shape for stowage. |
| 04 42 18.5 | CC | Aurora 7, have you completed your reentry--- |
| 04 42 20.5 | P | Roger. |
| 04 42 22 | CC | Check. |
| 04 42 28.5 | CC | The weather in the recovery area is good, you've got overcast cloud, 3 foot waves, 8 knots of wind, 10 miles visibility and the cloud bases are at 1000 feet. |
| 04 42 39 | P | Roger. |
| 04 42 45 | CC | Will give you some more as soon as we get an IP. |

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| 04 42 47 | P | Roger. |
| 04 43 05 | CC | Aurora 7, Cap Com, will you check your glove compartment and make sure it's latched and your ---. |
| 04 43 10.5 | P | Roger, it's tight. |
| 04 43 12.5 | CC | Rog. |
| 04 43 16 | CC | Starting into blackout anytime now. |
| 04 43 18 | P | Roger. |
| 04 43 21.5 | CC | Roger. We show you still have some manual fuel left. |
| 04 43 24.5 | P | Yes, but I can't get anything out of it. |
| 04 43 28.5 | CC | Roger. |
| 04 43 40 | CC | Aurora 7, Cap Com. Do you still read? |
| 04 43 42.5 | P | Roger, Loud and clear. |
| 04 43 52 | P | I don't have a roll rate in yet, I'll put some in when I begin to get the g build-up. |
| 04 44 07.5 | P | I only was reading point 5 g's on the accelerometer. Okay, here comes some rates. |
| 04 44 28.5 | P | I've got the orange glow. I assume we're in blackout now, Gus, give me a try. There goes something tearing away. |
| 04 44 52.5 | P | Okay. I'm setting in a roll rate at this time. |
| 04 45 06 | P | Going to Aux Damp. |
| 04 45 13.5 | P | I hope we have enough fuel. I get the orange glow at this time. |
| 04 45 30.5 | P | Bright orange glow. |
| 04 45 43.5 | P | Picking up just a little acceleration now. |

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| 04 46 17.5 | P | Not much glow, just a little. Reading .5 g. Aux Damp seems to be doing well. My fuel I hope holds out. There is 1 g. Getting a few streamers of smoke out behind, there's some green flashes out there. |
| 04 47 02.5 | P | Reentry is going pretty well, Aux Damp seems to be keeping-oscillations pretty good, we're at 1½ g's now. There was a large flaming piece coming off. Almost looked like it came off the tower. |
| 04 47 36.5 | P | Oh, I hope not. |
| 04 47 47 | P | Okay. We're reading 3 g's, think we'll have to let the reentry damping check go this time. Reading now 4 g's. The reentry seems to be going okay. The rates there that Aux Damp appears to be handling. I don't think I'm oscillating too much, seem to be rolling right around that glow - the sky behind. Auto fuel still reads 1 4 at 6.5 g's. Rates are holding to within 1½ degrees per second. Indicating about 10 degrees per second roll rate. Still peaked at 6.8 g's. The orange glow has disappeared now. We're off peak g. Still indicating 14% auto fuel, back to 5 g's. |
| 04 49 18.5 | P | And I'm standing by for altimeter off the peg. Cape, do you read yet? Altimeter is off the peg. 100 ft., rate of descent is coming down, cabin pressure is - cabin pressure is holding okay. Still losing a few streaming, no that's shock waves. Smoke pouring out behind. Getting ready for the drogue at 45. |
| 04 49 58 | P | Oscillations are pretty good, I think ASCS has given up the ghost at this point. Emergency drogus is, fuse switch is coming out not to on. |
| 04 50 20.5 | ? | --- |
| 04 50 29.5 | P | Roger, Aurora 7, reading okay. Getting some pretty good oscillations now and we're out of fuel. Looks from the sun like it might be about 45 degrees. Oww, it's coming like - it's really going over. |

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| 04 50 51 | P | Think I'd better take a try on the drogue. Drogue out manually at 25, it's holding and it was just in time. Main deploy fuse switch is on now, 21 indicated. |
| 04 51 12.5 | P | Snorkle orerride now. Emergency flow rate on. Emergency main fuse switch at 15, standing by for the main chute at 10. |
| 04 51 33.5 | P | Cabin pressure, cabin altimeter agree on altitude. Should be 13,000 now. Mark 10, I see the main is out, and reefed and it looks good to me. The main chute is out. Landing bag goes to auto now. The drogue has fallen away. I see a perfect chute, visor open. Cabin temperature is only 110 at this point. Helmet hose is off. |
| 04 52 39.5 | P | Does anybody read. Does anybody read Aurora 7. Over. |
| 04 52 54.5 | P | Hello, any Mercury Recovery Force. Does anyone read Aurora 7? Over. |
| 04 53 04.5 | CC | Aurora 7, Aurora 7, Cape Cap Com. Over. |
| 04 53 07.5 | P | Roger, say again. You're very weak. |
| 04 53 13 | CC | Aurora 7, Aurora 7, Cape Cap Com. Over. |
| 04 53 16 | P | Roger, I'm reading you. I'm on the main chute at 5,000, status is good. I am not in contact with any recovery forces. Do you have any information on the recovery time? Over. |
| 04 54 14 | P | Hello, any Mercury recovery forces. How do you read Aurora 7? Over. |
| 04 54 27 | CC | Aurora 7, Cape Cap Com. Over. |
| 04 54 29 | P | Roger. Loud and clear. Aurora 7 reading the Cape, loud and clear. How me, Gus? |
| 04 54 41.5 | P | Gus, how do you read? |
| 04 54 56.5 | CC | Aurora 7 --- 95, Your landing point is 200 miles long, we will jump the Air Rescue people to you. |

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| 04 55 06 | P | Roger, understand. I'm reading. |
| 04 55 27 | CC | Aurora 7, Aurora 7, Cape Cap Com, be advised your landing point is long, we will jump Air Rescue people to you in about one hour. |
| 04 55 36 | P | Roger, understand 1 hour. |