To MSC Archives. Comment: R.M. Dunham Ph.D Psychology Univ of Houston [illegible] author of questions

Also present
John Van Bockel - trng simulation
Paul Backer - MAC engr & performance expert

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CONTINUATION OF MA-6 DEBRIEFING

March 7, 1962

HANGAR "S"

This is Glenn on the 7th of March beginning debriefing in Hangar S at the Cape

Pick up with Section H - Observations.

Celestial Observations in particular.

Describe the general appearance of the sky and stars during night and during daytime.

The sky at night, I believe I have already described as completely as I can while we were at Grand Turk. It appeared much the same as the sky does on a very clear night out in the desert. I think the McDonnell estimate that the window would cut the light by about the same amount that the atmosphere cuts the light was probably a pretty good figure to go by. During daytime, the sky was black except for those periods when I could pitch up, let my eyes adapt until I could just start to see the brightest stars or planets and pitch back down. I never did completely night adapt during the daytime to see what I could see.

Question 6 concerns Gegenshein - I did not have time to night adapt enough, or to take time to look for Gegenshein. Many of these observation items through here are ones that went by the board as a result of paying attention to the control system problems I didn't get a chance to do most of these things.

I did not have a chance to do that.

Did I observe comets?

No.

Did you use the green pass filter to observe Aurorae and/or night air glow? Comment on its use, describe the appearances of Aurorae and night air glow as seen with and without the filter.

I did try to use the filter. I commented on it earlier in the debriefing. In particular, I tried to use it on the large storm centers were over the Indian Ocean to see if I could pick up any air glow coming from those clouds where I knew there was lightning and a lot of electrical activity, but I couldn't see a thing through it. This, perhaps, was due to not being as completely night adapted as would be desirable for using the air glow filter.

Question 10 - Did you observe nacreous clouds?

No.

Question 11 - Did you observe noctilucent clouds?

I do not believe I observed noctilucent clouds. It is difficult to say because the light of the moon was reflecting off of the clouds. I think probably any glow that would have been coming from the clouds was probably masked to a large extent by reflected moonlight from those same clouds.

Question 12 - Did you observe meteor showers?

No.

Question 14 - Compare the view of the sky from the same view from the surface of the earth.

It was completely different during the daytime. You have the narrow

bands that I have described earlier close to the surface of the earth when you are looking through the atmosphere. At night, I think the view of the sky is probably pretty much the same, either with or without the moon. The biggest difference is looking off toward the horizon where, here on the earth, you see there is a light blue or almost a white band sometimes as you look off through the atmosphere. All the whites and blues are compressed into a very narrow color band when you look at this same atmosphere when you are up in space. I described that in more detail, anyway, earlier in the debriefing.

Question 15 - When did celestial objects appear to move?

At no time did I have any perception of autokinatic movement.

This matter of maintaining orientation and not seeing things wandering around was no problem. It is much the same as flying an airplane, I guess. I do think, though, that you automatically rely much more completely on your vision there than you do in an airplane. In an airplane you still have the seat-of-the-pants feeling. You know what direction gravity is. You don't have that same sensation, of course, under zero g.

Question 16 - Did you use the star navigation device? Comment and give your recommendation for improvement of the device.

Yes, I used it just a little bit to identify some constellations. I didn't make extensive use of it. We had planned on all these observation items to concentrate them in the last two orbits of course and as a result of some of the difficulties, I did not use these things as much as I had planned.

Question 17 - Did you use a spectographic camera? What bodies were photographed? What exposure did you use? Comment and give your recommendations for improvement of equipment and technique.

With the spectographic camera, I got a few shots on the belt of Orion. These were roughly 15-second exposures. Handholding this camera is a little difficult. I don't know how we could improve it in that regard unless we made a gyros stabilized platform of some type, which would, of course, be very expensive weight-wise. When I took these pictures of the belt of Orion, as I recall now, ASCS was not holding the capsule right on the point, as it would if it were working properly. I think on later flights when ASCS is keeping attitude, we might be able to do a little better on handholding.

Question 18 - Were you briefed, trained and equipped for observing any celestial phenomena you encountered?

For a first look at things, I think I probably was far more accurate on scientific observations on later flights, I think specialized training will be more necessary. Perhaps on future flights we should concentrate on particular observations. I was trying to make various types of observations. We were and our methods were rather crude. We knew that when we were training for the flight.

Question 19 - Do you have any recommendation for improving the spacecraft lighting system and window to improve visibility for making celestial observations and still maintain good internal visibility?

I felt that I probably would have liked to have had a rheostat to control the lights even on the red position, rather than just the on-off type filter that we had. The sliding mechanism we had on those lights is not too satisfactory. I wouldn't want to make any big changes on it for the next flight but it leaves a little bit to be desired the way those things operate. They are difficult to get to and aren't too satisfactory after you do get to them. Main thing on visibility out the window is that I just wish the window was a lot larger. That's a problem I don't think we will whip immediately either.

Question 20 - General observations - Is there much difference in apparent color of the land areas, water areas or clouds as compared with their (a) appearance from a high-flying conventional aircraft and (b) from previous Mercury flight motion picture films?

I think the land areas and clouds are very similar to what you see from a jet aircraft at high altitude. Colors of the ground appear much the same. Water areas look the same. You're farther away from them but the colors are very similar. Previous Mercury flight motion picture films give a pretty good example of how these colors look. I think perhaps some of the pictures are more vivid in their colors of the ground and of clouds and of particular water areas. I'm sitting here now looking at some of the pictures that were taken on previous shots of some of the

ocean areas where we have the extreme colors of the blues and whites of the clouds silhouetted against the dark water. While they do look much like this, I think perhaps the blues that the color films records are more vivid.

Is there much difference in the color attenuation from an oblique view as compared to a vertical view of the earth?

This is very similar to a high-flying aircraft also. You always see less through the haze closer to the horizon. This is also true in space.

Question 22 - Is it possible to distinguish the Gulf Stream and other ocean currents by its color?

You can see different patterns in the ocean. They are not as clearly defined as I thought they might be. I could see lighter green areas around islands, for instance the Canaries. I didn't have a chance to observe too many islands. The Gulf Stream was visible, you could see the color differences.

Question 23 - Could you discriminate between snow and clouds?

I never had an opportunity to really see an area where I was positive there was snow and compare it with a cloud area near by. I had a pretty good cloud bank over the El Centro area. Way up to the north, it looked as though the cloud deck ended but I could still see some white area beyond that. I think probably these were snow areas, but I couldn't be very certain.

Question 24 - Could you determine the relative heights of different clouds?

Yes, I think you can to a degree. You couldn't pinpoint exact altitude but particularly when you are looking off into a distance, not straight down you can see clouds of vertical development or high cirrus-type clouds or altocumulus clouds and you can get a very definite impression of the relative heights of these clouds. I think this is apparent even from looking at some of our pictures and some of the hand-held photographs. I think you do this with much the same cues as in regular flying. Also, part of this is just being aware of what clouds are at what different altitudes normally. Shadows I think give you most of your clue on this, and you can see certain clouds silhouetted against others. So you can tell relative heights to a degree.

Question 26 - Could you detect winds on the earth's surface and were swell patterns detectable at sea?

Winds on the earth's surface were naturally only visible as they do something to the earth's surface. Over the Sahara Desert I could see great clouds of dust, and there were two large areas that appeared to be brush fires, although I couldn't see the actual flame I could see large smoke patterns drifting down across the country, and I commented on these I believe. The large dust storms were very visible over Africa. I called Kano and commented on them. They said that they had been having high winds in that area for about a week I believe they said.

Question 27 - What terrain observations surprised you?

I don't think there were any that particularly surprised me. The land looks much as it does from a high-flying airplane. Everything

looks reasonably flat unless you look off at a distance and see a mountain range silhouetted against the little background or see long shadows from a mountain. I think we could actually see more detail on the ground than I thought I could with the naked eye. Over El Centro and El Paso, looking at the irrigated areas near each one of those places, you could actually see the square patterns on the ground. I don't think these were right down to each little irrigated plot, but I could see the square outline of the irrigation districts that they have in both of those areas.

Question 28 - Is it possible to discern haze layers that might be associated with the tropopause or other stable layer of the atmosphere?

I described that earlier in the debriefing.

Question 29 - Could you see ships or comparable objects on land or sea?

The only time I thought I saw a ship was at the end of the first or the second orbit. I think it was at the end of the second orbit. I was looking down through the clouds on the water. I could see what looked like a little "V" as though it was the wake of a ship. I looked back on my chart again to make sure of where of what the area was and it was right on the time that I should have been over one of the major recovery areas, either F or G depending on which orbit it was. This little "V" was headed toward the south, mainly west little bit southwest. It would be interesting to learn what heading the ship was on at that time. I don't think this was the small wake immediately behind the ship

within a hundred yards or so. I think it was more like the pattern you see from high altitudes, a slick or disturbance in the water that leaves the impression of a wake that you can see for maybe 20 minutes or half hour after a ship has gone past. From high altitude, I know you can see this disturbance area in the water and I would guess that this probably included some area like that as well as the immediate wake area behind the ship.

Question 30 - On the horizon, was the transition of the light to dark smooth?

Yes, I described this in some detail earlier. There is, of course, a rather sudden transition when the sun goes down just after the sun sets. But then, for some lengthy period of time, much longer than I had anticipated, some 5 to 6 minutes, possibly longer, there is a gradual reduction in light intensity. I was surprised because I thought that once the sun went down, the horizon would be light for only a very short period of time. I was surprised that the light stayed, and that the horizon stayed light as long as it did.

Question 31 - Did you use any one display almost exclusively? If so, which one, window, periscope, rate and attitude indicator, for what external observation or capsule control?

I seemed to keep coming back to the window. It's a natural display to look outside and find your normal vision giving you your cues for your activities. The distorted view in the periscope was not as good as I thought it might be. For very precise control, I kept coming back to the rate instruments. The only attitude control dimension

that needs a little getting used to when you first get up there is yaw. It takes a little while to get a good yaw indication set up. I described that in much more detail earlier, too.

Question 32 - Did you notice any reaction response of the capsule to your movements?

No.

Question 33 - When did external observations distract you from flight procedures?

I don't think external observations ever distracted me from anything I should have been doing in the capsule. I made numerous outside observations, of course, but I kept scan pattern going.

Section I is on Specialized Equipment.

Comment on the adequacy of the following:

(a) Hand-held cameras - The hand cameras were all right for this flight. The one with color film was easy to use. The list of things we would like to have designed into a hand-held camera and that list of items should be repeated for future reference. The cameras operated okay. Changing film is a problem with a hand-held camera of the type we had. Having magazine loading would be better. Having all the controls on the back where you can see them as you are using the camera would also help.

(b) Binoculars - I used the binoculars a couple of times. They were all right. We got some blurring through the window from it.

(c) Exercise Device - The exercise device was all right. It provides exercise only for the arms and upper torso, but it seems to be adequate for our purpose, that is, to get a calibrated amount of work. For general exercise, for tone, I relied on tension exercises.

(d) Microfilm viewer - Not carried, which was (d) on this.

(e) Any Other Specialized Equipment Items - I don't want to comment on any of the other things we had. As a general comment, though, we need a lot of work on a means of stowing these types of equipment. This was completely inadequate. We thought we could put strings on these and keep them fairly well separated, but I wound up with a rat's nest of strings.

J - Flight Experiences

Question 1 - When were you disoriented?

I don't believe I was ever disoriented to the extent that I didn't have any idea of where I was. When you have the capsule pitched up to control on stars, I think there is a little more tendency to become disoriented, but never much.

Question 2 - Were you confused at any time? When?

There were a number of items I didn't know about, if that means confusion. But confusion to me means that there were so many things going on that you just couldn't keep up with it all. I never at any time reached that point. There were a number of things I had questions about, the luminous particles and the control system problems, for example. These were questions but they didn't cause confusion.

Question 3 - Were you aware of any illusory phenomena?

No, not at all.

Question 4 - What were the most reassuring or even comforting events or conditions of the flight?

The most reassuring and comforting events of the flight are things going off the way they are supposed to go. You have sort of four major hurdles during launch that you look forward to. You are glad when you get through each and you look forward to the next. You want to get off the pad successfully, then through the high q area at about one minute, then through the staging period and tower jettison, and finally getting up to speed and getting into orbit. As each one of these ticks off, it's good to see things going properly.

One high spot for me was the controls check. We practiced that so many times and, the first time you have the capsule under your own manual control, you wonder how you are going to control it compared to the simulations. There just wasn't any problem at all. I went over to manual control and started running the control systems check, and it banged off just like it did on the procedures trainer. This was a very reassuring thing to me.

Later on, during reentry, we had some unusual events. It was good to see the drogue come out, when it finally did, and even better to see the main chute come out. That was a pretty sight because we were running out of altitude rather rapidly. The chute looked like the text book diagram as it streamed out. It took only a couple of seconds for the whole sequence, but I could remember seeing that. Then, it reefed and then opened to its full blossom. That was very comforting.

Question 5 - When did time seem to pass rapidly?

Well, the whole flight was the shortest 5 hours in history as far as I'm concerned.

Question 6 - When did it seem to drag?

Never. There were periods when we were busier than others, but there was never any problem of time dragging.

Question 7 - When were you pressed for time?

I would like to spread a lot of these things out. Things were happening very rapidly during some phases of launch, and during reentry, in particular. If we were pressed for time it was during those periods.

Question 10 - What sounds occurred which you were not able to immediately recognize or did not expect?

I think most of the sounds were about the way I had expected them to be. Sounds inside the capsule in flight were much the same as when the capsule was running on the ground. I did not expect the clicking that carried over into the headset from fly-by-switches occasionally, but I knew what it was because I was operating the hand controller everytime it occurred. During reentry, about .05g, there was a low hissing sound that I hadn't expected. I assume it was from scrubbing action of the air or impact with the air.

Question 11 - What experiences from training came to mind during the flight?

There were many times that training came to mind, particularly training on the procedures trainer. I mentioned going through the controls check. In fact, I think I recorded this or called it out over the radio. As I recall now, I said that it was very similar to procedures trainer.

Can you give us an idea of the recollections during flight, for example, aviation experiences, friends or family, preflight events?

You think of many things like this. I remember thinking how ground colors looked just as they do from a high-flying airplane. Of course, you think of friends or family and preflight things, such as when you're checking out different systems and how they operated. But, none of these were items to be dwelled on. They would be things that came into mind momentarily, and didn't take over your thoughts for any period of time that would interfere with the flight. You're down to business when you're in the capsule, concentrating on the systems, making observations outside.

1. Did you test different kinds of vision?

Yes, I made a number of checks through the flight of the visual acuity card and the astigmatism chart. I could notice no change in my vision at any time. My vision was clear; I didn't notice any change in color perception. I tried following a little light spot during the oculogyric checks, had no problem at all with that. There just didn't seem to be any change in vision at all, at least for this period that we're talking about.

3. Was there a blurring of vision during acceleration, maximum noise, or weightlessness?

Well, during acceleration on the centrifuge may have a little tearing

out of the corners of the eye. I don't recall any on this flight. There undoubtedly is some blurring of vision, but I could always read the instruments and report on them.

Was your peripheral vision affected by your faceplate or by high "g" levels?

No, not that I noticed, other than just the normal cut-down in vision that you have when trying to turn your head inside the helmet.

6. Was there any time during the flight when you had difficulty hearing?

No, except for low radio transmissions or periods when something was a little garbled on the radio, that was much as normal.

7. Did you experience any ear pain?

No.

9. Did you have to adjust UHF volume?

I adjusted it a few times, but UHF line was left at its level for most of the flight.

10. Did you notice Tinnitus at any time?

No, I did not.

11. Did you notice vertigo at any time?

No, I did not.

12. Did you notice the presence of nasal discharge at any time?

No.

13. Did you experience dryness of the nose and throat?

No. On long runs on oxygen, in the suit circuit in the chamber

or in the capsule on the pad, the flow of dry oxygen comes right past the face. After a couple of hours, you find sort of a scratchy feeling in your eyes. This is more or less normal for the type system we have. I had that same dryness or scratchy feeling of the eyes, but that's all.

14. Did you have any sinus pain?

No.

15. Did you have any problems with oropharyngeal secretions?

No.

16. Were you thirsty at any time?

No, I wasn't particularly thirsty. I had water available there. But I didn't use it.

17. Was your mouth dry?

No.

18. Were you conscious of any specific odors?

During insertion into orbit, you have some flatus being passed. There was odor to that but it did't linger. Apparently, the CO_2 scrubber and the liquid hydroxide charcoal were screening these odors out.

19. Were you conscious of sweating?

I had very light perspiration, a time or two during the flight. The only time I was conscious of very heavy sweating was when the capsule heated up on reentry. And that time continued; I didn't seem to be cooling off any at all; it was very hot.

20. Did any unusual skin sensations occur?

No, they did not.

21. Did you feel warm or hot?

Most of the time in orbit, I felt reasonably comfortable. I could have been a lot more cool than I Was though. I think it would have been better had I been more cool. I kept turning down the suit circuit temperature and wound up with a very high water flow setting. I never could get the heat exchanger set and working correctly. The excess water light would come on; I'd turn the water down and then turn back up again; the water light would come on again. It was a continual process of adjustment all doing the whole flight on that. Never did come out with any setting that I thought was best.

22. Were you short of breath at any time?

No.

23. Was there any orthopea? Tachypnea?

No, I didn't have either one of those sensations.

24. Did you have any chest discomfort?

No.

25. Were chest motions limited during acceleration?

Only as you would expect at 8 g's. I had no problem, though. I think I made reports up to 6 or 7 g's.

26. Did you cough post acceleration?

I may have, I don't recall coughing. I have my own way of clearing my lungs. I take a big breath and do a very moderate malsalvo maneuver. It seems to pop the lungs out pretty good.

27. Were you aware of your pulse?

No, I was not aware of it. I could not hear it or feel it.

28. Describe eating, drinking, and swallowing.

I've described that earlier. It was no problem at all getting food in the mouth. It was just like eating sitting right here. The only problem was to control food under weightless conditions. I tried the applesauce. We had planned to use the other tube later, but I didn't because of other problems.

29. Did you experience abdominal discomfort?

No.

30. Did you have an urge to yawn?

No.

31. Did you feel particularly sleepy at any time?

No.

32. Did you feel like stretching at any time?

Yes, occasionally, you just want to stretch and sort of tone things up. It seems the natural thing to do about every 20 minutes or so. I would sort of stretch or exercise a little bit, and then at the regular exercise period of course, we have a regular series of exercise to go though.

33. Did you experience indigestion, belching, or excessive passage of stomach gasses at any time?

No, not excessive. I mean when you first go to reduce pressure, you expect to pass off some gas; I did; it's very normal.

34. Did you experience the urge to defect?

No.

35. Did you experience the urge to urinate?

No. Prior to launch, I had no particular urge to urinate, so I didn't. During the orbital phase, I built up to where I had the urge

to urinate, and I finally did about 10 minutes prior to retrofire. I emptied my bladder in preparation for reentry, and the bag did work satisfactorly which is question 37. Urinating was no particular problem.

38. Did you experience any difficulty with pressure points on hands, and feet, wrists and ankles, elbows, shoulders, others?

No, I did not. It was very comfortable. On the pad, a little more pressure across the back of the shoulders than you would like for a while, but, once in orbit, all this goes away and there are no pressure points. it is very comfortable.

39. Was there any tingling of any body members?

No.

40. Were there any unexpected flight events which caused fear or any other physicological response?

Well, guess we could get philosophical on that one. I think you always have fear; you're in an unknown situation. You have a fear of all kinds of things, but the important thing is what you do about it, not that you have fear. I certainly would be the last one to say that there were not portions of the mission where I was afraid. Having fear on something like this, I think, is pretty normal. I think you'd be abnormal if you didn't have some fear. But the fear never at any time got to the point where it interfered with what I was trying to do. I think probably the period of most concern on the whole flight was during the reentry where I thought the retropack had jettisoned. It obviously had not. I thought it had jettisoned and so when I saw these chunks coming off, coming back by the window, flaming where I could see them;

this was of some concern. So in direct answer to this question, yes, there was fear during that period but I remember thinking during that period, too, that, there wasn't anything to be gained by stopping, operation even if the heat shield was tearing up, might as well keep on working, which is what I did. Was there fear? Yes, there was fear but it never became an overriding thing.

41. Was comfort maintained in the suit and cabin?

I never could get the cabin down to the temperature I wanted. Suit circuit was comfortably warm, I could have used it cooler.

42. In your opinion, does 0 g feel much like being submerged in water?

That's rather difficult to answer. I know we've tried to simulate Zero g with water. I think for body senses, the answer is no, but for visual senses, yes. I think in very clear water, you get used to looking at things upside down. Diving straight down at something, you're relying not on body sensations, but strictly on vision. I never have felt that in the water, I completely lose my sense of g. If you turn your head upside down, you still feel that you're just turned upside down, usually. It's true that in the water you sometimes get so completely disoriented, all you can do is follow the air bubbles to get your orientation back, but, I think in the water, the main similarity, which I never really thought of before is probably the fact that in the water and in space, you rely much more completely on your straight vision. You ignore body sensations because in effect there, they're very minor. You don't have a sensation of your stomach rolling. You rely on what you see In that regard, I think probably the being submerged in water is very similar. Some of the floating sensation you have in water is

comparable, but weightlessness is carried so much farther. Being submerged in water, is just a beginning. It would be one plateau; Zero g would be beyond that.

c. Evaluation of Capsule Systems Operations counted on your suit.

1. Do you suggest any changes?

The suit worked fine. I always wanted a suit that was easier to get in and out of, easier to operate, and wasn't so bulky. There are lots of changes we'd like on a suit, of course, but they are all well-known; I don't want to go into those here. I had no particular suit problems on this flight.

2. Comment on the couch.

Very adequate. I think if I were going again, I would be tempted probably to do away with the leg cross and use just restraining harness on the knees to keep from bumping into the control handle or the abort handle. I think we can take g's required on this flight okay without the leg cross. There should be some tests, though, before we do this.

3. Comment on the slave harness. Changes.

I have no comment; it was adequate for this. I used the standard harness. I did use the chest strap which helps only at first if you have an abort.

4. With regard to the ECS, could you hear the fans; was there any apparent change in fan operation?

The fans sounded just the same as they did on the ground, in the altitude chamber. There were no apparant changes in the fan question.

b. Was pressure in your suit at any time, and if so, was this bothersome?

No, I never noticed any pressure in the suit at all.

c. Was there any noticeable negative pressure in your suit at any time? How severe? Did you take measure to correct this?

Suit operation and ECS operation, in that regard, were completely normal.

d. Could you hear the demand regulator . Could you hear oxygen flow through the helmet exaust ? affect your communication or your ability to concentrate?

I didn't hear the demand regulator clicking on and off except on the pad. I took the times on the pad, and I could hear the demand regulator clicking. In orbit, I don't recall having heard it. You can always hear the oxygen flow up around your right ear. It's not desirable, but it's not annoying because we're used to it. I don't feel that it really interfered with communications but it certainly doesn't do it any good. Any noise that you have in there is going to be a detriment on communications and this is not an exception. There are a number of things making noise. You can't say that it, the oxygen flow, adds to the sound total.

e. Did you use emergency oxygen?

Only at the end of the flight on the way down.

Was temperature control maintained in the suit and in the cabin throughout the mission?

It was warmer than I would have liked in the suit circuit, and the cabin was certainly warmer than I wanted it to be. The difficulty

controling cabin temperature and the water valve need some work.

g. Did you notice any leakage in coolant tank or circuit?

No.

h. Did the ECS signal light operate properly? Yes, it did.

i. Did the ECS quantity supply indicators operate satisfactorily?

Yes, they did. We had a high use rate on secondary oxygen.

I put us down about 10 percent.

I think, ah, I think then they must accept command

regulator

It can't

It has different pressure levels set on your two systems and, ah, the secondary system doesn't connect to the primary; it goes down to a pressure AEPSI.

Why did it change during flight?

That's the question. Well, it has, it still changed, still the

Yes, but I wasn't breathing

like that. My breathing was the same all the way through; I wasn't taking any particularly deep breaths at the last part of the flight.

I want to see an official report on it

Okay, well, that's one way look at it.

5. Were you aware of any the sensors?

No. They were okay. We need to some work on the cement used with them. It makes bumps on our skin. Scott, in particular, had some real sore spots when he used those. I had these same little bumps after the flight, too.

6. Were you aware of the cannon plug on your right side?

No, didn't cause any problem at all.

7. Do you have any suggestions for bio-sensor modification or change?

Only the one that I mentioned in number 5 above. Eventually, I think we will get away from the bio-sensors. Just as we don't use them in airplanes now, I see no reason to use them on spacecraft once a man has proven his capability to operate in this environment.

Do you have any comments on the overall operation of the rockets as far as their subsystems?

No, they worked just the way they're supposed to; I watched the escape tower go, it was . The posigrade worked okay; the retro-rockets worked okay; as near as I could tell all the squibs fired when they were supposed to. There were no problems at all.

9. Did the roll, pitch and yaw rate and position indicator function properly? No gyro tumbling, attitude hands on stop, etc?

Yes, they did operate properly. I had the working of the gyro that I described earlier, but that was the only malfunction. got away from most of that when I got on the free gyros.

10. Describe the capsule response to manual control system operation, automatic control system, and rate command system operation during the mission.

We didn't use rate command at any time. John Conlon predicted it would be a springy. The manual central system was not as crisp and

sharp in flight as it is in the trainer, as John Conlon predicted. It was more of a mushy inaccurate type system. I wound up using it either on or off with fast blips to try and control the action of the capsule rather than going to intermediate settings, and trying to get capsule control that way.

The fly-by-wire system and the automatic system worked just as I expected. It was just like the trainer. I found no differences in fly-by-wire reactions from what the trainer simulation gives us.

11. Was there any indication of thrusters leaking on automatic control system? Did tailoff seem excessive?

I never noticed any tailoff. I had the feeling at one time that I was getting some leakage in pitch, a little thrust I wasn't calling for. Several times when I sat on up rates that were right on zero, zero, zero, when I would check the rates again and they would be drifting off very slowly. I could confirm it by observation out the window.

12. Was there evidence of thrusters failing to start? Any delayed starts?

Well, I covered that earlier. I was discussing the one-pound thruster in yaw.

14. If used, was the manual periscope extension-retraction lever operation adequate?

Yes, it was and I did use it and it was adequate.

15. Was the periscope reticle light adequate?

It is very dim, but very good on the night side.

16. Was the periscope filter useable? Yes, it was, and I used it.

17. Comment on radio reception as to continuity, clarity.

UHF communication was very good, of course, when I was in range. HF was a little more spotty. It would be in and out. There seemed to be more repeats on HF. (Command voice). As far as I know, it was okay. I never specifically turned it up and down to check it. (One question arose on the HF and UHF was whether you were switching back and forth according to the flight plan. We couldn't tell from your comments.) Any time I dropped out of UHF communication, I switched

to HF. We were back and forth between HF and UHF numerous times. When you can get UHF, it is by far the most desirable communication. There is no doubt when you have UHF. When you don't have it, it is deader than a mackeral. There is no intermittent operation on it usually; on HF there is.

18. What was the relative noise level in audio?

I don't know what the intent of that one is, exactly. I would say the noise level was very similar to pad operation here, pressure chamber operation.

19. Is a 400-cycle or an 800-cycle tone prevalent?

The 400-cycle tone that we are used to was present in capsule during orbit. Sounds and tones, this was all very similar to what you experienced on the pad.

22. What volume control settings did you use during various phases of the mission? Did the controls work properly? Any dead spots?

I have already covered most of that. As for the numbers on the volume control, for UHF, I believe I was about three most of the time.

23. Was RF interference noticeable? Cross-talk?

No, didn't notice any particular RF interference.

24. Were there any differences in instrument readability from the static situations during powered flight, weightless flight, and during reentry?

There are some differences in instrument readability from powered flight, weightless flight. In powered flight with vibration and I'm sure you don't read quite as accurately as you do during weightless flight or when you are on the pad. However, none of these differences were such that I felt I had any problems of such magnitude that they were interferring with the flight or prevented me from getting information

that I needed.

25. Could you read the indicators easily at all times?

Yes, I never had any particular problem reading the instruments.

26. Did you encounter any unexpected problem relative to reaching any of the controls?

No. Fact I commented earlier on some of the reach problems.

27. Did you encounter any instrument malfunctions? I don't believe so. No.

30. Did sound cues offer any confirmation of sequence operations?

Yes, there wasn't any doubt about it. When these bolts fire, when the clamp ring goes, you hear a very definite bang inside the capsule. Mortars fire during reentry, chutes, you can hear those very clearly.

31. Were there any peculiarities in hand-controller characteristics? If so, describe.

No, the hand controller worked just about as planned.

33. Did you at any time think the capsule was tumbling when in fact it was not?

The only time I had this sensation was when I saw the luminous particles. My initial reaction was that I was looking out into a star field. Actually, I was looking out at these luminous particles still silhouetted against the dark earth back along the flight path. For a moment I thought I had tumbled, although I had no sensation that I had done so. But I saw where I was and knew at once that the particles were stars, and that I had not tumbled.

35. Were any fuse switches changed to the alternate switch position during the flight? If so, which ones and at what time during the flight?

These are all noted on the tape voice. As planned during the flight, we turned some of the switch fuses off. I didn't have to put any to the alternate position to get them to work. We didn't blow any fuses that I know of.

36. Did you observe any structural deformations or hear any noises that could have been caused by structural deformation of: Small pressure bulkhead and egress hatch? Oil-canning of cabin skin? Panting of entrance hatch? Working of window panes? Instrument panel and cabin equipment?

No, I didn't notice anything like that at all.

C. Flight Operational Procedures

1. Were voice procedures adequate?

Yes, I thought they were but there was too much talk back and forth. We had too many things planned in here to say in the way of reports. I finally gave up giving 30-minute reports, where we were supposed to run through everything in the capsule, because I didn't feel they were necessary. I didn't think they were contributing anything to the flight, felt I had better spend my time doing other things than sitting there calling off gage readings that everybody already was aware of by telemetry. The only ones I feel we should really be concentrating on reporting are the quantities of consumables. I don't think, however, that we need to give even those to every station. I think they could well be given maybe only every 20 minutes or so.

I think we can cut down voice procedures next time. I would have liked to have left more time over the stations for discussing various things that we were seeing. I think that if we stick to reporting on consumables at regular intervals, if everything else remained the same, that is all we need to do.

5. Did you have enough information from the ground on trajectory and impact prediction?

On capsule telemetry measurements?

Yes, on things that I needed to know on telemetry I was given or could ask for.

On advice on Astronaut Procedures from the Capsule Communicator(s)?

Perhaps I could have been given information a little earlier and a little more completely on the heat shield problem where they thought it possibly was loose. Apparently there was a very lengthy discussion on this that I was unaware of. If I had been aware that there was a problem in this regard, I would have watched more closely for little bumps on the capsule or anything that might have given a clue to our status. I was kept in the dark on this, although I realized from some of the questions that there was some problem with the heat shield.

7. How did the noise and vibration experience in the capsule compare with that experience training program?

I think booster noise was very similar. Some of these other vibrations, of course, noises in the capsule, and vibration in the helmet were not similar. I had not thought of this but some of the clanking and banging of the gimbals that we used to get at the lower g levels are not too dissimilar from some of the gimbaling and clunking you get on the booster. As a matter of fact, they are very similar.

8. Were there any physiologic effects experienced during the mission acceleration that were not experienced on the centrifuge acceleration or vice versa? Angular acceleration, etc.?

No, quite the opposite. I think you experience more physiologic effects on the centrifuge than you do on the booster. This is understandable since you are not in a steady g field. These sensations of starting and stopping on the centrifuge result in a feeling of tumbling. The only time I had any similar sensations on the booster was at SECO. It was a very slight sensation of pitching down some. I haven't seen the capsule record, perhaps it did pitch down. If it did, then this was a legitimate sensation.

Did you recall any visual focusing problem during the sensation? Normal eyeball

I don't feel I had any problem focusing. I went right to work checking the electric system, made an observation of the booster outside. It was very clear to me. I don't think I had any visual problem at that time at all.

Compare acceleration produced during the retrofire task in the last centrifuge program with that experienced in the actual retrofire.

The actual retrofire comes off more sharply than on the centrifuge. There is no doubt about it when the retrofire occurs. Al and Gus had both commented on this and I concur 100 percent.

Do you think it was a longer period of waitlessness . . . .

I couldn't say it did or did not. It was a good sharp acceleration that occurs all at once. After you have been weightless for a long period, you definitely feel a punch in the back. I had a very definite sensation of going back the other direction. When retrofire was over and you could look out at the clouds again and see the direction of motion, this sensation goes away. To answer this question directly, the accelerations produced were much sharper; they didn't ramp up and down as on the centrifuge.

What sound effects do you wish we had on the procedures trainer?

It might not be a bad idea to simulate some of these sounds, on the headset at least, but I don't think this calls for any great effort.

11. Was the periscope display in the Langley Procedures trainer valuable or not?

It was not. The yaw display, the blue lines and the dots , has not been very adequate. It doesn't look like clouds or like the picture in the scope.

12. In retrospect, was there proper balance between failure training and normal procedures training?

Yes, I think we had that pretty well balanced. The main thing is for people over here that are giving simulations to keep in mind that we are training for a normal mission, and you're probably going to get a normal mission. We should be aware that all these other things can occur, however. The trainer operators should not let you know when they are going to give a normal mission so that you keep your same scan pattern and expect things to go wrong. If you know for sure during a simulation that they don't plan to give you any emergencies, no matter how hard you fight it, there is a tendency to relax. Maybe a third of the training runs should be normal runs, but without the trainee knowing when he is going to get a normal run.

13. Was any area of training overlooked on the procedures trainer?

No, I don't think so.

14. Did you notice any difference in the operation of the rate and attitude indicator in the capsule as compared to that in the procedures trainer?

No, this was normal. The control was about the same as I had experienced on the procedures trainer except that as I noted earlier, I might have been able to cure this ASCS drift that we had, had I gone to gyro free. The inputs

of the horizon scanner are not simulated on the trainer. This might be a good area to study.

15. Compare the response of peroxide jets with the response of the controls of the ALFA trainer.

The ALFA trainer is more crisp in its response than the actual capsule was on manual system. We don't have an adequate fly-by-wire simulation on the ALFA trainer. That was not similar at all because of the balance problem on the ALFA trainer and the fly-by-wire system is the one you really depend on in orbit. The procedures trainer is the most crisp simulation on manual system. The ALFA trainer is a little bit more mushy than the trainer and the actual capsule on manual is considerably more mushy than either one of them.

16. Should we have had the ALFA trainer powered by the actual H_2O_2 control system?

That would be a complex and difficult thing to operate and I don't think we would get enough benefit out of it to justify it.

17. How did the overall angular response of the capsule compare with that of the ALFA trainer?

I think its reaction was probably similar. It is rather difficult to judge previous simulation.

18. What value was the periscope display training on the ALFA trainer in preparing you to fly the capsule using the actual periscope display? Did you notice any difference in sensitivity between the ALFA trainer and capsule scope displays?

I expected to use the periscope much more than I actually did. You automatically keep coming back to the window; it's a more normal looking display. It's like flying a photo airplane that has a scope like that in it. If you tried to fly the thing by looking in the scope, you find it is very difficult; it is not natural, you don't like it. It's something you make yourself do for a specific purpose, like getting a picture. As quick as you can like to look back outside to your normal visual cues. The scope does give you a bigger field of view but I kept wanting to come back to normal vision out the window.

19. How realistic was the horizon display on the ALFA trainer?

We could improve the colors on it, of course. I think the horizon display is probably pretty good on the ALFA trainer. Horizon display is nothing that you really have a problem with in orbit, however. There is no doubt where the horizon is. It is less distinct, of course, on the night side, you still can see it clearly. I think we discussed that earlier too.

20. Should we have had an ALFA trainer at Cape Canaveral in order to keep you peaked up just prior to flight?

It would have been desirable but I don't feel that it is necessary. It would be an expensive thing. If we had the star field on the procedures trainer, it would be just as good or better. If we could make the star field move smoothly enough, it would be a good simulation. I don't think the body sensing that you get on the ALFA trainer was of any value. In fact, it was probably of negative value.

21. Do you think you could have controlled the capsule satisfactorily if you only had had training on fixed-base trainers such as MAAC and the procedures trainer?

Yes, I think you could control the capsule satisfactorily with training only on a fixed-base trainer. One of the big things that you don't get on the procedures trainer is an adequate periscope display, so if you did have to come down to controlling the retro with scope, that would be valuable training. There just isn't any doubt about your control. Out the window you see the horizon. It is a little difficult to get set up properly in yaw. But once you are set up steadily in yaw, you can pick out a cloud formation or coast or something to keep your yaw and during retrofire, I don't think you would have any trouble with that. Window display is good; the only problem out the window is I think it was longer. I guess I'd like a glass capsule.

22. Did your previous zero g training in Project Mercury have any value in preparing you for this flight?

Maybe a little bit, but it was not of any great importance. Periods of weightlessness are so short in zero g training. It seems to me you are concerned about bumping the wall of the cabin and somebody else floating around and it's a good sensation to have had and to know that you like, but you know that it is a transient thing. You're looking for the pull out; it is a different feeling. Weightlessness is just a very pleasant sensation. You know it will stay. There is no changing field. On the airplane flight, you don't have the lengths of time to really settle down and really start working. I think it was probably good; it gave us more background of sensation to go by.

Was the MASTIF training good?

Once more, you had a little more confidence in being able to control yourself and do things. The MASTIF and weightlessness, even though they were short, let you know that you could be in this kind of a crazy environment and do what you were supposed to do. So they all fit into a background of confidence-building. But I would not say that our zero g training prior to flight was of real great importance nor would I say that the MASTIF was. Altogether though, they fit a pattern that gave you a good background for anything you might run into.

24. Should more or less emphasis have been placed on environmental training? If so, in what way?

I think that was adequate. You get so much environmental training just on the capsule down here when you are checking it out, that it is better than any other environmental training you can get.

25. Was the training you received on the transparent gimbal capsule of any value?

Yes, very much so. I think this was good training in regard to the reaction of the instruments, the rates. Once again, I guess, it's been shown through flight that we should have had the horizon scanner inputs to this probably. I think it is being put on now.

26. If any maneuvers were made in 2 or 3 axes simultaneously, how did the attitude display compare to the display on the procedures trainer, procedures trainer two, the centrifuge indicator mockup capsule, ALFA trainer?

Very similar.

Referring again to the 2 or 3 axes control. I don't think we intend to do a lot of three axis control, particularly in orbit where you're trying to control the same three precisely. Even with the little one-pound thrusters, I think I can almost exclusively control one axis very accurately then another axis and control it accurately. There were times when I didn't control all the axes but it was only when we were doing rougher-type maneuvers, or recovery from maybe a capsule dropping into orientation mode, something of that nature.

27. Were any Mercury trainers detrimental to your state of readiness?

No, I don't think so; I don't think any of the training was detrimental. I think it was all good training. How about the ? That was good at that time. I think though that to get better training on environmental control system, make the chamber runs down here . That was good thinking at the time it came out; it's better when you're in your own capsule down here. There's a note on here too, that any training method or simulation such as Johns, we have the control problem. Now I think our reentry control problems of Johns were pretty good. As we discussed a little while ago, I think the main problem is in the cage itself and once it gets out beyond the 60 degrees, I have any .

28. 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? In other words, you want a list of the values of trainers. Why didn't you say so?

Procedures trainer would be number one. I think number two, you probably like to get a few runs on the centrifuge. I'll correct that.

I think number two would probably be the ALFA trainer. Number three might be makin_ some rounds on the centrifuge. On the centrifuge, once you've been through that, experienced it, know that you operate in that g field, you have a confidence, I think.

Are you thinking in terms of preflight training?

Yes, I'm thinking specifically of preflight training. I think the centrifuge is mainly a benefit in the background once again, if you you confidence of being able to operate in that field.

29. Should the procedures trainer have been mounted on the centrifuge?

Well, the idea was you would like to simulate the mission as closely as you could; but I think the problems that we would have now in mounting the procedures trainer on the centrifuge would preclude any day-in, day-out procedures trainer operation of the way we use the procedures trainer now. I think we are better off having the procedures trainer where we can run over and hop in to get some good practice rather than having to drag up a whole centrifuge every time we want to make a procedures trainer run. I don't think that's practical right now, nor necessary to do it that way. We don't need that good a simulation. As I stated before here in this thing, one of the biggest things you know is how fast you adapt to the situation. There's no, no big problem here adapting to it. Probably the reason we adapt so rapidly is that we do have all this training in our background.

30. Should we have included a cloud cover on the ALFA trainer?

Yes, it probably would be good to have some cloud cover on the presentation. The main thing is to speed up that pictorial presentation. Somehow,

there's something wrong with that. I don't know where our simulation goes astray there, but it does.

(The intent there, I think, John, was that they were trying to get another piece of tape or film with the clouds on it and overlay it. We were trying to have this work at different speeds even. The clouds indicated cloud drift)

I think the film

31. Were the stars display on the ALFA trainer realistic?

Yes, we've already discussed that; we probably need more stars to make it more realistic.

32. Was there any comparison between the noise of the peroxide jets and the noise of the air jets on the ALFA trainer?

No, the peroxide jets were much, much less noisy in flight. You could hear them a little bit on the high thrusters. You could feel the vibration more than anything else. You feel the little when you use them. You know when they're operating and when they're not.

both thrusters?

Yes. Retrorocket jets, when you hear and feel those , there's no doubt when they come on.

33. Do you feel there's any future for submerged simulations for weightlessness training?

Well, we've never really done a submergent simulation where we've done scuba diving; the Little Creek frogman thing. We never really have been in one of these simulations where you very carefully balance out remaining motionless so I can't comment on that one.

34. Do you feel external displays helps on the various simulations?

No, I don't think so. I might add a little bit but hardly enough to pay the dog.

35. Were you considerably busier in flight as compared to the various trainers? In what respects or areas?

Well, you're very busy with all this equipment we had trying to use that, you've got to have everything pretty well planned out. You want to make a lot of external observations. You don't have any trouble finding things to do. I was very busy even though we had planned gaps in the flight plan just because we thought we would be pretty busy. And these, these gaps were well planned, too; I used this time to good advantage. Once we started having problems though, the flight plan sort of went out the window and I concentrated on those problems for the rest of the flight. And I was kept busy by those, of course.

36. List in relative importance the different aspects required in flight and which trainers best accomplished which.

Well, in attitude control you're comparing what you see outside against the scope against the instruments. No one trainer does all this. I think the procedures trainer comes closer to it than anything else. There's no problem looking out the window and seeing what your attitude is. You may have to check occasionally on the yaw reference to determine exactly what it is, but in pitch and roll there's just no problem. Procedures trainer gives the best presentation of instruments. The ALFA trainer would be next with

regard to scope display. As to systems monitoring, procedures trainer is by far the best on that. Environmental effects - the best training on that will come right in your own capsule here in the altitude chamber. We've had some centrifuge training before at Johnsville, also better training on the Doctor's, so-called Doctor's capsule in Philadelphia; that was good, but I think by far the best training for the environmental system is right here in your own capsule in the pressure chamber. Failure analysis, the procedures trainer by far the best on that. Task loading, procedures trainer would be the best on that because that's where you're having to keep up your scan pattern and monitoring and all the functions in addition to performing other tasks.

37. From a pilot's point of view, what did you get out of this flight?

Wow! Well, I think the biggest thing and the most major, I think we've already covered this largely in our discussion down at Grand Turk, the biggest single thing we've found most important is a general statement that a pilot can operate in this environment satisfactorily. I think we can even judge from just this one flight that we probably know enough to say that in future designs we can rely on the pilot to be an operable part of the system, at least for missions of this length. We don't need quite so many automatic systems. We don't need systems designed so that we can completely perform the mission whether the man is or is not aboard. This can get us away from a tremendous amount of automation. That's probably the biggest single thing that we got out of this flight. From a pilot's point of view, we also know that zero g, at least for this length flight, is not the bugaboo that a lot of people thought it was. This was nothing but the most pleasant of sensations for this time period.

Pleasant is a word you used a number of times to describe this and it hasn't been clear what kind of pleasures you're referring to.

Simply that. Not a pleasure in the usual sense range, meaning body senses. You have no pressure points, no problems with the couch, you feel good in the suit, no pressure points in the suit at all. It's probably a good feeling in that we have talked about the possibility of so many ill feelings inside that when we don't run into these and feel completely normal, just in very good shape, that it's a good feeling to know that you have no problems. That's part of it, undoubtedly. By saying that it is a pleasant sensation, I don't mean to think that we have a completely detached, off into the wild blue, wild black yonder type sensation or anything like that. I just didn't have any of this detachment phenomena or anything like that at all. Never even thought of it as a matter of fact. (Very often when people have their first experience in water, where they're really free to move in three dimensions, and relatively free of gravity, they talk about it as a great pleasure.)

Some of it might be similar to that. I didn't have any of these feelings as though I had suddenly been released from the bonds of earth or any of that kind of feeling at all. It's a new feeling, it's a feeling that you can only experience in the capsule; or in the simulations, of course, for very short periods of time.

This free floating feeling, I don't know how to describe it except that it's very pleasant. It's an interesting feeling; you're interested completely in your environment that you've never been in before for this time period, and yet now you are. You're operating fine, you're thinking clearly, you're controlling just like you control under 1 g. I guess a lot of the pleasantness from it mentally may come from the fact that it's a completely new

environment that you have met and it is no problem. You feel a feeling of - not elation - but a very happy feeling that you have covered this challenge that has been a problem in so many people's minds and you've met this thing and here you are right in the middle of it, and you just feel fine. You're operating just as capably as you ever did on the ground; and there's a good feeling because you have come to this challenge and met it and it's yours - you've got it whipped - no problem.
That's part of the feeling, I'm sure; that's probably just as clear as mud but I don't know how else to describe it.

No, that's one that I was referring to a minute ago, this breakoff phenomena, maybe some people get it, I don't know. People have claimed they had this and had such a strong desire to go on out; I didn't experience any of this.

Well, you feel depressed only because you are, but as far as having a feeling of suddenly wanting to leave what I was doing, and go out among the stars or something like that - like they described - I didn't experience any sensations such as this, sorry to say.

You mean in an aircraft, you've never wanted to just

Well, sure I've wanted to get higher faster, particularly when there were Migs around, but as far as wanting to head my airplane upward and make three trips around the moon, like I've heard people describe, I've never experienced this in the past, I'm afraid.

2. What capsule systems need improvement the most?

Well, I think that's taken care of at systems debriefings.

3. What flight control procedures should be improved and in what way?

Well, I particularly like the way the fly-by-wire system worked. I was able to control the capsule accurately with it. I would like to have had a system aboard where I could have caged and uncaged the gyros at different points other than orbital attitude unless the capsule was sitting in that attitude. In other words, I'd like to be able to cage the gyros in any position, uncage the gyros and have the capsule maintain that orientation. This would permit you to get set up on a particular group of stars you want to make observations on. Uncage and let the capsule hold its position while you made your star pictures, for instance. As we stand now, go to these new positions and all you can do at this point is set the capsule up in a drift.

4. In retrospect, would you have liked to train more than you did on any particular trainer or any particular systems study area?

I think you're always going to have questions if you have another year to get ready. You still find things you wish you had more time to do at the last. I wish I had more time for star study and for map study. You always need review on systems right at the last minute. In fact, I went back through the flight controller handbook I don't know how many times, I went back through it once more the night before the flight. In fact, it was rather ironic the last section I was studying when I went to bed before the flight was on the automatic stabilization control system. I think in the future we could outline flights ahead of time as to their purpose and what we expect to accomplish on some of these flights. I think this may require a lot more changes. I would like, for instance, if I was going to

make a flight, say I knew right now that I was going to make a Gemini flight a year from now, this would let me set up my whole training program, if I knew what the purpose of that flight was going to be. If I knew we were going to make ultraviolet pictures or we were going to make observations of the earth IR weather patterns or something like that, then I can go to the weather bureau, become a real expert in the time period available and make much more sage and sensible observations. If I come right up to the final time period for selection just a couple of months before launch, then I suddenly have to cram everything in this short period just before launch. If we could assign missions or something, I don't know how this can be done. It seems to me that it is wasteful of our recources to have all seven of us tied up on an indeterminate schedule for unspecified missions at unspecified time. We could do a much better job if we can possibly just assign people tentatively to certain missions that are going to have certain purposes to them. And let us then route our own training program for a year or so, building up to that. A summers training will be necessary for everyone if we run more central programs or things that are general training for everyone, or physical examinations, we will run all of those as a group of seven. It seems to me it will be much better to run this to assign people as far in advance as we possibly could and let them build up their training program for this specific flight. Seven trainees running concurrently here just on trying to cope with everything in the whole field doesn't seem to me as the way to do it. I know it is difficult to try to assign people ahead but if this was done it would be ideal. Missions may change and some of your training goes down the drain and maybe you don't get to fly the mission

you thought you were going to fly, but even at this, some percentage of the time at least, the missions are going to be much better prepared than the way we are doing it now. What we come down to at this point, perhaps, the way we had has been fine. I think it has been too tight on time, I think we have had to cram too much last minute preparation into the couple of months before launch. But our missions up to now, for these first few man flights, will be pretty much the same type missions. There may be some specialized equipment to go aboard and may be some specialized activity that a guy has to prepare for, but they are pretty much the same type mission, so we all run through the same type training. But it seems, from here on, these missions will start getting more specialized and we will get a lot more out of it, if we could set up much more in advance than we have on these. And the more complicated these machines come, the more expense the missions become. Gemini, Apollo with big lead time you are going to have in assigning pilots. Pilots on the X-15, for instance, knew a couple of years ahead of time who was going to fly the X-15. The X-15 type flying is all very good but it is probably not going to be comparable to Gemini missions or Apollo missions. So I hope we can possibly name tentative crews or name tentative people for these things a long way in advance, much more than we have now.

5. How do you feel about your ability to perform during longer periods of weightlessness:

I have no problems whatsoever. I do not see why I could not have gone much longer. I saw no approaching problems. When we get into longer flight, a week perhaps, exercise and things to keep the body toned up will be important. I think we can cope with that when we come to it by keeping the body exercised properly in flight to maintain body functions. For periods of weightlessness extending anything up to a day or so, I see no problem whatsoever.

6. What is your advice to the Astronaut who will man the next Mercury capsule?

I think we proved on this flight enough about our abilities to take over and fly. I recommended that he try to make his mission as much as possible a manual flight, leaving the sequence system. He could, for instance, jettison tower about 2:30 instead of 2+34.

What about manual retrofire?

I would like to see the man run this mission completely and let the automatic system back him up, instead of vice versa. If he wants to use the automatic system for a while, while he makes certain observations, he can let the automatic hold the capsule where he wants it, but if he wants to maneuver, to arrange himself differently, to fly upside down, backwards, or however he wants to do it, let him go into manual flight. I think that would be the best way to confirm what we found on this flight and would help us on our decision on how much automation is needed for future flights. I think that would be a big contribution.

7. In your opinion, is the present debriefing adequate?

More than adequate. I think it's been good. Once you've been up and back, you don't enjoy having to plow through all these questions, but the only way we can gain information from these for people who have not gone yet is by such detailed questioning as we've gone through. I regret that we didn't finish our debriefing all at one time; we got all mixed up with the return to the Cape, New York, etc., but I think it would have been better had we gone straight through the debriefing as we were out at Grand Turk while everything was fresh in our minds. If we plan to make as complete a debriefing as this is, it might be better to allow a little more time to complete it out there. There are certain questions in there that are questions that are considered opinion. Some of those could be held to a later time when you have looked over your initial impressions.

Questions like "What is your advice to the Astronaut who will fly the next Mercury capsule?" I want to go back over the record and see what they found out on systems before I give advice to anybody. All I can give on an initial debriefing is what my feelings were. I can change some of my opinions after I look back at some of the records.

Do you think debriefing is the best conducted?

I think the initial medical screening should be out there. After that, we could have flown back here to the Cape, landed on the skid strip and come up here and done our debriefing, just as well as we did out at Grand Turk. The only objection to this I've ever heard was news media would be available and there would be a clamor at the gate to talk to the crew, but I think this is certainly controllable here. We're in a fenced-in area; we can take whatever time is necessary here for the debriefing.

All the experts are right here. If there's any question about the man's medical status, then he could stay down there, but if he is in good shape, I see no reason at all to shuffle everyone downrange. I requested before the flight that we just do away with that shipboard part and get on to Grand Turk and do the whole thing all at once. I don't think your impression of these vents is going to change materially in the few hours it takes to get you ashore.

If I were going again, I would like to make more complete use of an onboard recorder. I knew that a lot of this stuff was going out over the air. I probably would have tended to give a lot more description of things had I been just talking to a recorder.

If you run into something you just don't want to say, then you have to turn off the radio. It isn't desirable to turn that off. But if you knew you were just talking into a tape, I think you'd probably be more descriptive than you do when you're trying to make a normal radio transmission.