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MR-3 FILE

NASA - Space Task Group
Langley Field, Virginia
August 22, 1961

MEMORANDUM For Associate Director

Subject: MR-3 post-flight debriefing of Alan B. Shepard, Jr.

1. The enclosures to this memorandum constitute Commander Shepard's complete debriefing of MR-3. The first enclosure is a complete listing of the questions prepared for the debriefing. The second enclosure is the general portion of the aeromedical debriefing (questions on page 13 through 15 of enclosure one). The third enclosure is an index of enclosures four, five, six and seven which are Shepard's comments relative to capsule engineering, operational procedures and pilot performance.

2. The basic concept of the debriefing was to allow the pilot to freely discuss the flight before entering into the direct question and answer session and delete those questions previously answered in the free discussion from this section. This factor, combined with the fact that discipline during the debriefing was extremely poor, makes it impossible to present this material in a clean question and answer form. To partially alleviate this problem, an index was prepared which it is hoped will help direct the various systems specialists to the information pertaining to their area of interest. A few questions of the prepared debriefing (enclosure one) were not asked and a few not listed were used.

3. To take full advantage of the information gained from the MR-3 pilot debriefing, it is suggested that a copy of this material be distributed to each branch of the Space Task Group. It is requested that all comments on the debriefing be forwarded back to the Training Office.

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Enc: Debriefing

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Copies to: All STG Branches

100-05-100-1000 NICO & MER

Memo: 100-05-100-1000
Post-flight Debriefing
of Shepard

100-05-100-1000

OUTLINE FOR
ASTRONAUT DEBRIEFING

- I. Exposition of highlights of flight by Astronaut without regard to chronological sequence of events and without interruptions of any kind by debriefing team.
- II. Moderately detailed exposition of flight by Astronaut, paying attention to chronological sequence of events. Astronaut will describe his impressions of complete mission starting from insertion into capsule to boarding of recovery ship. Debriefing team will again not interrupt.
- III. Debriefing team will ask about a half-dozen very general questions designed to summarize the flight and to determine the Astronaut's present condition.
- IV. Chronological exposition of flight as in II except that debriefing team will ask prepared questions covering all areas of interest at the proper times; questions will, however, be restricted to those which should logically be asked in a chronological framework. Questions will be grouped in following headings:
 - A. Prelaunch
 - B. Launch and Powered Flight
 - C. Zero-g Phase
 - D. Reentry
 - E. Landing
 - F. Post-Landing
 - G. Recovery
- V. Debriefing team will be free to ask any and all remaining questions regarding flight. These questions will, however, be grouped in the following general areas:
 - A. Aeromedical
 - B. Evaluation of Capsule Systems Operations
 - C. Flight Operational Procedures
 - D. Assessment of Preflight Training Program
- VI. Debriefing team will ask a few general questions intended to summarize the complete Mercury operation and to allow Astronaut to impart advice to Astronauts who will man succeeding Mercury missions.

Enclosure 1
NASA - Space Task Group

ASTRONAUT DEBRIEFING QUESTIONNAIRE

I. Astronaut Discussion

"What would you like to say first?"

II. Chronological Discussion of Flight by Astronaut

"Starting from your insertion into the capsule and ending with your arrival aboard the recovery ship, tell us about the entire mission in your own words."

III. General Questions

1. Evaluate your general condition at this time. Any discomfort? Describe.
2. What are your most outstanding impressions of the flight? Describe.
3. Were there any major surprises during the flight? Describe.
4. Were any significant physiological problems encountered? Describe.
5. Were any significant operational or capsule systems problems encountered? Describe.
6. Did the period of weightlessness have any unexpected effects on your feelings or performance? Explain.

IV. Specific Questions Keyed to a Chronological Review of the Flight

A. Prelaunch

1. Were there any problems with the insertion and countdown procedures?
2. Were your communications satisfactory at all times during the countdown?
3. Were you always aware of the status of the countdown?
4. Did you have any problems with pressure points, stiffness, ventilation, etc., during the countdown?
5. Comment on the length of the prelaunch period.
6. Choose three adjectives to describe yourself at the following times: During insertion _____, during countdown _____, at the instant of lift-off _____.

7. Do you feel you had sufficient training in prelaunch operations directly involving you?
8. Did the Mercury Control Center Capsule Communicator take too much time making his reports?
9. Was the ground checkout procedure with the Control Center Capsule Communicator and other MCC operators satisfactory? Were you satisfied that MCC operators were happy with the capsule T/M measurements at lift-off?

B. Launch and Powered Flight

1. What were your predominant sensations during powered flight? Relate these sensations to the overall flight environment and to your previous piloting experience, if possible.
2. Choose three adjectives to describe yourself during lift-off _____, maximum noise _____; and at burnout _____.
3. Did the ECS perform properly during the powered flight phase?
4. Was there any appreciable change in headset noise before and after 10,000 ft. altitude?
5. Did vibrations interfere with the readability of any of the instruments? Which ones? Describe.
6. Did any capsule components vibrate excessively during powered flight? Describe.
7. Did all telelights operate correctly through separation? If not, what did you do?
8. How good were the voice communications during the powered flight phase? Describe.
9. Are you satisfied with the procedure for reporting cabin and suit pressure during the critical phase from 73 to 86 (Redstone) from both a "ground" and your point of view? Is it a proper abort procedure?
10. Could you discern booster cut-off and tail-off characteristics? By which of your senses?

C. Zero-g Phase

1. Choose three adjectives to describe yourself during weightlessness _____.
2. Comment on ECS cooling during weightlessness.
3. What motions did the capsule go through at separation?
4. Did the telights between "RETRO SEQ" and ".05 G" all work properly? If not, what did you do?
5. Could you sense separation of the tower clamp ring? Describe.
6. When the escape motor fired, could you see the exhaust?
7. When the escape motor fired, what was the sound level?
8. Did the motor shake the capsule or make the shingles flutter?
9. Did you think the tower either hung up or struck the antenna fairing during separation?
10. Was there any deterioration of visibility through the window as a result of escape motor firing?
11. Did you observe tower separation? If so, how?
12. Could you sense separation of the capsule clamp ring? Describe.
13. Could you determine capsule separation had occurred immediately? How (sight, noise, feel, acceleration, sequence panel)? Was the booster pitching, yawing, or rolling at this time?
14. Could you detect posigrade rocket firing? Describe.
15. What sensations were observed during retrorocket firing? Describe.
16. Could firing of individual retrorockets be detected?
17. Could you sense separation of the retropackage and did it affect the capsule in any way?

18. Did retropackage straps spring back and strike the capsule?
19. Did the ASCS sequence properly and did it hold the correct attitude (rate damping, turnaround, orbit, reentry)?
20. Could you hear operation of the control system? (i.e., firing of the control rockets, action of solenoids, control linkages, etc.)
21. Comment on the response of the hand controller for each manual control mode tried (i.e., effectiveness, backlash, slop, binding, lag).
22. How did performance of the manual control systems compare with what you expected as a result of training on the various Mercury simulators?
23. Did you have any unusual physical sensations from capsule motions?
24. Could you predict anything about the rates and attitude of the capsule from your physical sensations and your actions with the control stick or did you rely completely on your rate-and-attitude indicators for orientation information?
25. Did the periscope attitude references agree with the gyro attitude instruments during the programmed phases of the mission?
26. Could yaw be determined from drift through the periscope? From observing the booster through the periscope?
27. Did the light-shafting effect of sunlight influence the visibility of any of the instruments or controls? If yes, was it necessary to adjust the capsule light to compensate for this effect?
28. Describe the appearance of the earth, sky, and stars relative to colors and light intensities.
29. Describe the view from the windows and through the periscope. What could be seen? Did you note any particular landmarks? Was the prepared weather map generally correct (cloud cover and position)?

30. Were the controls easier or harder to reach under zero g?
31. Could you hear or feel the tape recorder running at zero g?
32. Could you hear or feel the cameras running?
33. Could you feel if the batteries were heating up?
34. What items, if any, vibrated during zero g?
35. Could you detect which components contributed to most of the cabin noise during weightless flight?
36. Did floating objects in the cabin during weightless flight distract your attention?
37. Compare the retrofire sensations in the actual capsule with those presented to you in the ALFA Trainer. In the Centrifuge. In the Procedures Trainer.
38. What was the difference in the degree of difficulty in controlling actual retrofire as compared to controlling the retrofire simulations presented to you during your training?
39. Did the whole-body-motion training you received on the ALFA Trainer help you in flying the capsule at zero g?
40. Were you aware of any resemblance between the angular acceleration cues you experienced during weightlessness with those you experienced on the ALFA Trainer?
41. Did you see the booster at any time during the flight? Describe.

D. Reentry

1. Compare your reactions to the reentry acceleration profile to corresponding reactions experienced on the Centrifuge.
2. Comment on ECS cooling during reentry.
3. Did the telelights all work properly between ".05 G" and "MAIN"? If not, what did you do?
4. Were cabin or suit pressure changes excessive during reentry?
5. Did you lose communications during reentry? For how long?
6. Did any capsule components experience excessive vibration during reentry? Could you pinpoint time of occurrence?
7. What was your first cue of "g" re-occurring upon reentry?
8. Were there any oscillations of the capsule during reentry? Could you estimate their amplitudes?
9. Were you aware of lateral accelerations during reentry? If so, do you feel it is important to simulate these on the Centrifuge?
10. Did you detect the re-occurrence of "g" by noting the settling of floating objects? Did this occur before you could feel "g"?
11. Was there any noticeable difference between the linear acceleration sensations experienced in the capsule and on the Centrifuge? If so, do you consider them important?
12. Choose three adjectives to describe yourself during reentry
_____ and at maximum
"g" _____

E. Landing

1. Choose three adjectives to describe yourself at main chute opening _____, at impact _____, and at post-impact _____.
2. Did the snorkel door eject properly (did the cabin inlet and outflow function properly)? At what altitude did each occur?
3. At landing did the vacuum relief valve function properly and did the snorkel valve prevent seepage?
4. Describe the voice communication with the ships and aircraft during the parachute descent.
5. What was the indicated altitude at drogue opening?
6. Describe the drogue opening shock. Did you see any chaff?
7. Did the drogue canopy "pulse"?
8. Was the capsule stable before drogue deployment? If not, describe motions.
9. Could you estimate the capsule to drogue angle at drogue opening?
10. Did the capsule stabilize after drogue opening? If so, how soon?
11. Did you hear the drogue mortar?
12. Did the drogue deploy automatically? If not, did you deploy the drogue manually? What failure indications did you have?
13. Was the capsule stable when the antenna section jettisoned? If not, describe capsule motions prior to jettison of antenna section.
14. What was the indicated altitude of antenna jettison?
15. Did you hear antenna mortar?
16. Did the antenna jettison automatically? If not, did you deploy the antenna section manually? What failure indications did you have?

17. Could you hear the ejection bag inflate?
18. Could you hear the opening of the main chute?
19. Did the sounds coincide with the acceleration pulses?
20. Did any noticeable angular accelerations accompany the main chute opening?
21. Could you see the main chute deployment?
22. Describe the opening shock to the reef condition.
23. Could you see the chute at full inflation? If so, did you see any chute or riser damage? Was the capsule turning relative to the chute? Estimate amount. Was the chute canopy stable?
24. Describe the capsule motion after main chute deployment.
25. Did the sequence light work normally?
26. Was it necessary to use a reserve chute? If so, what were the indications of main chute failure? What was the type of failure?
27. Were angular accelerations noticeable at deployment?
28. Was it a clean deployment?
29. Did the impact skirt deploy normally or did you deploy the skirt manually?
30. At what time did the skirt deploy relative to main chute deployment? Did the heat shield drop have any shock effect?
31. What was the approximate capsule attitude at impact with respect to you?
32. On what part of the chute swing did landing impact occur?
33. Describe the capsule motions at impact.
34. How long did it take for the capsule to right itself?
35. What was the final trimmed angle of the capsule in the water?
36. Did the chute disconnect?

37. Describe briefly the landing impact. Compare with any other common experience, if possible.
38. Did any equipment break loose at impact?
39. Could you anticipate the landing time and prepare for the landing shock?
40. Could you estimate your horizontal speed at impact?

F. Post-Landing

1. Comment on egress from the capsule. Any changes required?
2. Comment on survival gear. Any changes required?
3. Comment on one-man life raft. Any changes required?
4. Comment on the period of time while you were waiting for recovery vessels or aircraft.
5. Comment on ECS cooling during the post-impact period.
6. Was there any leakage into the capsule from any source?
7. Describe the voice communications with the ships and aircraft during the post-impact period.
8. After landing could you tell the status of the following rescue aids: SOFAR bombs? Chaff? Beacons? Dye marker? Light?
9. How rapidly did the battery voltages deplete after landing? How did the current vary?
10. Could you detect the erection of the HF antenna?
11. How did the inverters perform?
12. Was steam noticeable at any time?
13. Did you think the heat shield was still hanging below the capsule while floating?
14. During egress was any difficulty experienced removing the instrument panel or the escape hatch? Describe.
15. During egress did you encounter any hot spots on the capsule?
16. How much of the survival equipment was used? Was everything adequate? Was the voice monitor turned on?
17. Was the explosive hatch detonated? If so, describe.
18. Did you notice any deficiency in the status of training relative to capsule egress? Was the capsule more or less stable hydrodynamically than the Egress Trainer?

G. Recovery

1. Were there any difficulties during the ship or helicopter pickup? Describe.
2. Were any recovery ships or search aircraft sighted while the capsule was still descending on the parachute?
3. Was adequate information obtained from the recovery helicopter or ship to allow you to decide to egress or not before capsule pickup? If not, what was lacking?
4. If you did egress prior to capsule retrieval, did you receive assistance from recovery forces and was it adequate?
5. If you remained in the capsule until it had been retrieved by recovery forces, did you receive proper and adequate assistance from shipboard personnel during capsule egress? Do you have any recommendations in this area?

V. General Questions by Debriefing Team

A. Aeromedical

1. Were you asleep at any time? When?
2. Were you confused at any time? When?
3. Were you aware of any illusory phenomena? When? Describe fully.
4. How well could you see from the capsule window?
5. Did you test different kinds of vision? When? Describe.
6. Did you experience visual difficulty at any time? When? Describe.
7. Was there any blurring of vision during acceleration, maximum noise, or weightlessness? Describe.
8. Was your peripheral vision affected by your face plate or by high g levels?
9. Did you notice any tearing? When?
10. Was there any time during the flight when you had difficulty hearing? Describe.
11. Did you experience any ear pain?
12. Did you have to make "say again" requests? Why?
13. Did you have to adjust UHF volume? When?
14. Did you note tinnitus at any time? When?
15. Did you note vertigo at any time? When?
16. Were you able to feel capsule motions during weightlessness? How?
17. Did you note the presence of a nasal discharge at any time? Describe.

18. Did you experience dryness of the nose and throat? When?
19. Did you have any sinus pain? Describe.
20. Did you have any problem with oropharyngeal secretions?
21. Did you try to eat or drink? Was swallowing any problem? How?
22. Were you obliged to cough after or during swallowing? Why?
23. Were you thirsty at any time? When?
24. Was your mouth dry? When?
25. Were you conscious of any specific odors? What? When?
26. Were you conscious of sweating? Where? When?
27. Did any unusual cutaneous sensations occur? Describe.
28. Did you feel warm or hot? Where? When?
29. Were you short of breath at any time? When?
30. Was there any orthopnea? Tachypnea?
31. Did you have any chest discomfort? When? Where?
32. Was thoracic excursion limited during acceleration? Any other time?
33. Did you cough post-acceleration? Were you aware of palpitation? When?
34. Were you aware of your pulse? How?
35. Were you hungry? When?
36. Did you experience abdominal discomfort? When? Where?
37. Did you experience an urge to defecate? When?
38. Did you experience an urge to urinate? When?
39. Did you attempt to urinate? Describe.

40. Was the urinal satisfactory?
41. Did you experience any difficulty with pressure points on:
Hands and feet? Wrists and ankles? Elbows? Shoulders?
Other?
42. Were there any unexpected flight events which caused fear or
other physiologic response? Describe.
43. Was comfort maintained in the suit and cabin? If not, explain.
44. What were your impressions of the acoustic environment during
the flight?
45. In your opinion, does zero g feel much like being submerged
in water?
46. Were you asked too many aeromedical questions during the flight?

B. Evaluation of Capsule Systems Operations

1. Comment on your suit. Do you suggest any changes?
2. Comment on your parachute harness. Changes?
3. Comment on your couch. Changes?
4. Comment on your restraint harness. Changes?
5. With regard to the ECS, could you hear the fans? Was there any apparent change in fan operation? If so, when? Was there any noticeable overpressure in your suit at any time? If so, was this bothersome? Was there any noticeable negative pressure in your suit at any time? How severe? Did you take any measures to correct this? 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? Did you use emergency oxygen? When? What difference did this seem to make?
6. Comment on the biosensors. Were you aware of any of the biosensors? Why?
7. Were you aware of the cannon-plug on your right thigh? Why?
8. Do you have any suggestions for biosensor modification or change?
9. Did you notice whether the clock stopped at any time during the flight?
10. Was it necessary to use retroheat at any time during the flight?

11. Do you have any comments on the overall operation of the rocket and pyrotechnic systems?
12. Did the roll, pitch, and yaw rate and position indicators function properly (no gyro tumbling, attitude hands on stops, etc.)?
13. Were there any deviations from programmed automatic control modes during the mission?
14. Describe the capsule response to the manual control system operation, automatic control system operation, and fly-by-wire control system operation during the mission.
15. Was there any indication of thrusters leaking on automatic control system? Did tailoff seem excessive?
16. Was there evidence of thrusters failing to start? Any delayed starts?
17. In general, do you have any comments pertaining to the reaction control system?
18. Was adequate temperature control maintained in suit and cabin throughout the mission?
19. Was the temperature control variation adequate?
20. Did you notice any leakage in coolant tank or circuit?
21. Was the rate of oxygen consumption high or low?
22. Did the ECS signal lights operate properly?
23. Did the ECS supply quantity indicators operate satisfactorily?
24. Was the manual periscope extension retraction lever operation adequate? (If used.)
25. Was the periscope reticle light adequate?
26. Was the periscope filter usable?
27. Did the retract-extend motor overheat?

28. Comment on radio reception as to continuity, clarity, (indicate excellent, good, fair, poor, unintelligible) for those radios used (UHF main, UHF backup, HF orbital, command voice receiver).
29. What was the relative noise level in audio?
30. Is a 400-cycle or an 800-cycle tone prevalent?
31. Is HF fading present or prevalent?
32. Comment on any difference in quality between HF, UHF, and command system outputs.
33. Did the volume controls work properly? Any dead spots? What were the relative positions for intelligible signals? Any difference in answers to the foregoing between boost, weightlessness, and descent phases?
34. Was RF interference noticeable? Cross-talks?
35. Were there any differences in instrument readability from the static situations during powered flight, weightless flight, and during reentry?
36. Could you read the indicators easily at all times? Any glare?
37. Did you encounter any unexpected problem relative to reaching any of the controls?
38. Did you encounter any instrument malfunctions? If so, describe.
39. Did any of the ejected items collide with the capsule?
40. Did noise and vibration interfere or aid in the execution of your control tasks or communication tasks? Explain.
41. Did sound cues offer any confirmation of sequence operations? If so, comment.
42. Were there any peculiarities in hand-controller characteristics? If so, describe.
43. Were you ever uncertain of the capsule attitude relative to the earth?

44. Did you at any time think the capsule was tumbling when in fact it was not?
45. Was the cabin display adequate throughout the flight?
46. 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?
47. What was the maximum current noted and the minimum main bus voltage noted? At what time in the flight did these occur?
48. 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? If so, were these noises oscillatory or on-off? What frequency and when did they occur?
49. Is there much difference in the apparent color of the land areas, water areas, or clouds as compared with their appearance from a high-flying conventional aircraft?
50. Is there much difference in the color attenuations from an oblique view as compared to a vertical view of the earth?
51. How do colors as seen with the eye compare to color photographs such as those taken from MR-2?
52. Is it possible to distinguish the Gulf Stream and other ocean currents by its color?
53. Does one get an impression of the relative heights of different clouds?
54. Are the different types of clouds distinct enough so that one might get an idea of cloud height from the cloud type?
55. Is it possible to discern haze layers which might be associated with the tropopause or other stable layers of the atmosphere?
56. Did you use any one display almost exclusively? If so, which one (window, periscope, rate-and-attitude indicator)?

57. Did you notice any reaction response of the capsule to your arm movements?
58. Was the earth-path indicator useful (orbital missions only)?

C. Flight Operational Procedures

1. Were voice procedures adequate?
2. Was there too much talk from the ground?
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?
4. Was there too much standardized talk procedure to perform? Would you have preferred a more impromptu procedure for reporting your flight impressions during the flight?
5. Did the abort light ever come on?
6. Would you have liked to be informed about how the booster and the ASIS was performing in real time?
7. Would you prefer to abort the mission yourself if required or are you satisfied with the system of "abort by ground command"?
8. Were you able to assess properly the operations of all the capsule systems by reference to the onboard instrumentation?
9. Would you like to know from the ground what the capsule attitude is? When the retrofire command was given? How many retro-rockets had fired? (i.e., ALL major capsule events).
10. Were you adequately briefed on all phases of the mission?
11. Is the present debriefing adequate in your opinion?

D. Assessment of Preflight Training Program

1. Were you sufficiently trained for the mission? Explain.
2. Has your flight experience pointed up any areas where you felt you had no training and needed it?
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? Orbital task? Retrofire task?
4. How would you compare the control characteristics of the actual capsule with the control characteristics of the various trainers? For example, maximum effectiveness, cross-coupling, lag in response, and tail-off?
5. Which Mercury trainers could have been omitted without loss in your state of readiness in this flight?
6. Do you have any suggestions relative to retiming of the training program? For example, were you rusty in any particular control task?
7. When were you the most anxious? Would extra training have helped?
8. How did the noise and vibration experienced in the capsule compare with that experienced in the Centrifuge training program?
9. Were any physiological effects experienced during the mission accelerations that were not experienced on the Centrifuge accelerations or vice versa? (Angular acceleration, etc.)?
10. Was the acceleration produced during the retrofire task in the October Centrifuge program a help or a hindrance in preparing you for the actual retrofire task?
11. What sound effects do you wish we had had on the Procedures Trainer?
12. Was the periscope display in Procedures Trainer No. 1 valuable or not?
13. In retrospect, was there proper balance between failure training and normal procedures training?

14. Was an area of training overlooked on the Procedures Trainer?
15. 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?
16. In what particular way did the response of the H_2O_2 jets differ from the response of the controls of the ALFA Trainer?
17. How did the overall angular response of the capsule compare with that of the ALFA Trainer?
18. Of what value was the periscope display training on the ALFA Trainer in preparing you to fly the capsule using the actual periscope display?
19. How realistic was the horizon display on the ALFA Trainer?
20. Should we have had an ALFA Trainer at Cape Canaveral in order to keep you peaked-up just prior to the flight?
21. Do you think you could have controlled the capsule satisfactorily if you only had had training on fixed-base trainers such as the EEAC and the Procedures Trainer? (Orbital stabilization? Retrofire? Reentry?)
22. Did your previous zero-g training in Project Mercury have any value in preparing you for this flight?
23. How important was your training in the MASTIF Trainer relative to this flight?
24. Do you feel you had sufficient training in the MASTIF Trainer?
25. Should more or less emphasis have been placed on environmental training? If so, in what way? (Procedures Trainers training or Surgeon's Capsule training?)
26. Should we have had an ALFA Trainer powered by the actual H_2O_2 control systems?
27. Was the training you received on the transparent gimbal capsule of any value? If yes, why?

28. How close did the scenes from the periscope display trainer resemble those viewed on the flight in regard to form and color?
29. If any maneuvers were made in two or three axes simultaneously, how did the attitude display compare to the display on: Procedures Trainer I, Procedures Trainer II, Centrifuge, Indicator Mock-up Capsule, ALFA Trainer?
30. Were any Mercury trainers detrimental to your state of readiness?
31. 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?
32. Should the Procedures Trainers have been mounted on a Centrifuge? In your opinion, is this worth ten million dollars?
33. Was the star field simulation on Procedures Trainer No. 1 useful in any way? What cabin lighting did you use and could you see the stars at any time during the flight?
34. Should we have included a cloud cover on the ALFA Trainer or Ground Recognition Trainer visual display?
35. Was the star display on the ALFA Trainer realistic or not?
36. In your opinion, do the incorrect lg cues that exist on the ALFA Trainer negate all positive training value of an ALFA-type Trainer?
37. Was there any comparison between the noise of the H_2O_2 jets and the noise of the air jets on the ALFA Trainer? Control jets? Retrorocket jets?
38. On future manned space projects, how much (if any) effort should be expended on trying to develop a "zero g" simulator?
39. Do you feel there is any future for submersion simulations for weightlessness training?

VI. Summary Questions

1. Is this a safe operation at the present time? Should more unmanned flights be made before any more manned flights are made?
2. What capsule systems need improvement the most? In what way is improvement needed? Is the capsule ready for orbital missions?
3. What flight control procedures should be improved and in what way?
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?
5. How do you feel about your ability to perform during longer periods of weightlessness? Are we ready for 4 1/2 hours of zero g?
6. What was the most difficult part of the mission?
7. What is your advice to the Astronaut who will fly the next Mercury capsule?
8. Is there anything further you wish to say?

GENERAL (AEROMEDICAL) QUESTIONS

1. Were you asleep at any time? Answer: No.
2. Were you confused at any time? Answer: Yes - at the short interval of time between peak reentry g and altimeter indication.
3. Were you aware of any illusory phenomena? Answer: No.
4. How well could you see from the capsule window? Answer: Vision was limited through the portholes of Capsule 7, it will be improved in later flights. (Capsule 7 had two small ports at some distance from the pilot's head).
5. Did you test different kinds of vision? Answer: Not directly, however, color vision, near vision, and distant vision were unimpaired.
6. Did you experience visual difficulty at any time? See pilot's report.
7. Was there any blurring of vision during acceleration, maximum noise, or weightlessness? See pilot's report.
8. Was your peripheral vision affected by your face plate or by high g levels? Answer: Visor brim and margin of face piece does affect peripheral vision somewhat. There was no apparent narrowing of peripheral vision during high g.
9. Did you notice any tearing? Answer: No.
10. Was there any time during the flight when you had difficulty hearing? Answer: No.
11. Did you experience any ear pain? Answer: No.
12. Did you have to make "say again" requests? Answer: No.
13. Did you have to adjust UHF volume? Answer: No.
14. Did you note tinnitus at any time? Answer: No.
15. Did you note vertigo at any time? Answer: No.
16. Were you able to feel capsule motions during weightlessness? Answer: Capsule motions were felt and observed through periscope simultaneously.

Enclosure 2

17. Did you note the presence of a nasal discharge at any time?
Answer: No.
18. Did you experience dryness of the nose and throat? Answer: No.
19. Did you have any sinus pain? Answer: No.
20. Did you have any problem with oropharyngeal secretions?
Answer: No.
21. Did you try to eat or drink? Answer: No. Was swallowing any
problem? Answer: No.
22. Were you obliged to cough after or during swallowing? Answer: Not
noticed.
23. Were you thirsty at any time? Answer: No.
24. Was your mouth dry? Answer: No.
25. Were you conscious of any specific odors? Answer: The odor of
urine was present for a time after voiding in the suit prior to
launch.
26. Were you conscious of sweating? Answer: Aboard the helicopter
prior to climbing out of the suit after recovery and aboard ship,
sweating became profuse since I had not opened the suit.
27. Did any unusual cutaneous sensations occur? Answer: No.
28. Did you feel warm or hot? Answer: Comfortable except for staying
in the intact suit too long after leaving the capsule.
29. Were you short of breath at any time? Answer: No.
30. Was there any orthopnea? Or tachypnea? Answer: No.
31. Did you have any chest discomfort? Answer: No.
32. Was thoracic excursion limited during acceleration? Answer:
Straining during acceleration causes limitation of thoracic
excursion, however, this is voluntary.
33. Did you cough post-acceleration? Answer: No. Were you aware of
palpitation? Answer: Palpitation was present prior to lift-off,
however, it was easily controlled by paying attention to the cock-
pit activity and therefore was no problem.

34. Were you aware of your pulse? Answer: No.
35. Were you hungry? Answer: No.
36. Did you experience abdominal discomfort? Answer: No.
37. Did you experience an urge to defecate? Answer: No.
38. Did you experience an urge to urinate? Answer: Yes, prior to lift-off.
39. Did you attempt to urinate? Answer: Yes, urinated in suit approximately one and one half hours prior to lift-off.
40. Was the urinal satisfactory? Answer: No urinal was carried on this flight.
41. Did you experience any difficulty with pressure points on hands, feet, wrists, ankles, elbows, shoulders, or other body areas? Answer: No specific difficulty was encountered with the suit or pressure points.
42. Were there any unexpected flight events which caused fear or other response? Answer: No.
43. Was comfort maintained in the suit and cabin? Answer: Yes, except for urine in suit.
44. What were your impressions of the acoustic environment during the flight? Answer: Noise was not a problem.
45. In your opinion, does zero g feel much like being submerged in water? Answer: Zero g was barely noticeable while restrained in couch.
46. Were you asked too many aeromedical questions during the flight? Answer: No aeromedical questions were asked during this flight.

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SECTION A

CARRIER DEBRIEFING

IMMEDIATELY AFTER FLIGHT

MAY 5, 1961

1. The following is a transcription of a tape recording made by Astronaut Shepard aboard the aircraft carrier approximately one to two hours after flight. This tape recording constitutes an essential part of the planned debriefing of Shepard and covers the time period from his entrance into the capsule to his arrival aboard the aircraft carrier. The period of the flight between retrojettison and main chute deployment was not described aboard the carrier. A description of this part of the flight was made on the day after the flight and is included herein.
2. "This is the first flight debriefing, and before I go into the formal debriefing kit, I would like to say, as a general comment, that I quite frankly did a whole lot better than I thought I was going to be able to do. I was able to maintain control of the capsule fairly well throughout all of the manual maneuvers I made. I was able to follow the sequences fairly well throughout the entire flight, and, as a general comment, I felt that even though I did not accomplish every single detail that we had planned for the flight, I still did much better than I had originally thought I would.
3. "With that general comment as a start, I'll go into the first question of the debriefing kit which says 'What would you like to say first?' and I've just said it.
4. Question No. 2 'Starting from your insertion into the capsule and ending with your arrival aboard the recovery ship, tell us about the entire mission.'

"Starting with foot over the sill back at Pad 5, I make these remarks. The preparations of the capsule and its interior were indeed excellent. Switch positions were completely in keeping with the gantry check lists. The gantry crew had prepared the suit circuit purge properly. Everything was ready to go when I arrived, so as will be noted elsewhere, there was no time lost in the insertion. Insertion was started as before. My new boots were so slippery on the bottom that my right foot slipped off the right elbow of the couch support and on down into the torso section causing some superficial damage to the sponge rubber insert - nothing of any great consequence, however.

Enclosure 4

From this point on, insertion proceeded as we had practiced. I was able to get my right leg up over the couch support and part way across prior to actually getting the upper torso in. The left leg went in with very little difficulty. With the new plastic guard I hit no switches that I noticed. I think I had a little trouble getting my left arm in, and I'm not quite sure why. I think it's mainly because I tried to wait too long before putting my left arm in. Outside of that, getting into the capsule and the couch went just about on schedule, and we picked up the count for the hooking up of the face plate seal, for the hooking up of the biomed. connector, communications, and placing of the lip mike. Everything went normally.

5. "The suit purge went longer than usual because of the requirement of telemetry to change the potentiometers on the EKG cards; so, as a result, I got a fairly good long suit purge and a comfortable one. The temperature was certainly comfortable during suit purge. Joe¹ seemed to have no trouble with the straps as he was strapping me in. Everything seemed to go as scheduled. I think we would have saved a little time at this point, since we were already in a very long suit purge, if Joe had tightened the straps up immediately rather than going out and coming back in again. However, at this point, he may have been getting a little bit tired, so it was probably just as well that the sequence went as we planned it according to the SEDR. As a result of this very long purge, I was surprised that the suit circuit oxygen partial pressure was only 95 per cent.
6. "The oxygen partial pressure in the suit circuit apparently is not necessarily a function of the length of the purge. If it is, then there is a leveling off point so that 95 per cent seems to be a fairly good endpoint for the present system that we are using. After suit purge, of course, the gross suit-pressure check showed no gross leaks; the suit circuit was determined to be intact, and we proceeded with the final inspection of the capsule interior and the safety pins. I must admit that it was indeed a moving moment to have the individuals with whom I've been working so closely shake my hand and wish me bon voyage at this time.
7. "The point at which the hatch itself was actually put on seemed to cause no concern, but it seemed to me that my metabolic rate increased slightly here. Of course, I didn't know the quantitative analysis, but it appeared as though my heartbeat quickened just a little bit as the hatch went on. I noticed that this heartbeat or pulse rate came back to normal again shortly thereafter with the

¹Joe Schmidt, NASA Suit Technician.

execution of normal sequences. The installation of the hatch, the cabin purge, all proceeded very well, I thought. As a matter of fact, there were very few points in the capsule count that caused me any concern.

8. "As will be noted by members of the medical team, it became apparent that we were going to hold first for lack of camera coverage as a result of clouds. At this point, I decided that I better relieve my bladder, which I did, and felt much more comfortable. It caused some consternation. My suit inlet temperature changed, and it may possibly have affected the left lower chest sensor. We can check back to see if the moment at which the bladder was relieved actually coincided with a loss or deterioration of good EKG signal from that pair. My general comfort after this point seemed to be good. Freon flow was increased from 30 to 45, and although I suspect body temperature may have increased slightly, I at no time really felt uncomfortable. I, of course, shifted around continuously to try to get proper circulation, particularly in the lower limbs, and found that normal upper torso and arm movements and following sequence items were such that proper circulation was provided. The couch fit was fine. The helmet fit and sponge support was fine for the static condition. I'll describe other deviations later.
9. "The parachute is definitely in the way of a yaw movement. When you make an attempt to yaw left, the wrist seal bearing on the right wrist bumps into the parachute, not to the point where it makes less yaw possible, but it certainly does interfere with it. It also, of course, interferes with the voice-operated relay sensitivity control and voice-operated relay shutoff switch which I did reach later in the flight using the 'window pole'. So then we had several holds during the count, but my general comfort was maintained, and I found as we did finally proceed down to the last part of the count that my pulse rate did appreciably increase.
10. "I felt no apprehension at any time, but I did find that if I thought that some people were a little slow in reporting that their panel was in GO condition, I started to get a little bit flustered. I think that I was anxious² to go at this point after having been in the capsule for some time.² The transition from freon flow to suit and capsule water flow was made smoothly even though we were very late in the count at that time.

²About 4 hours by now.

11. "The transfer from MOPIS circuitry to RF was made smoothly. I was able to transmit and get an RF check with the Control Center and with the chase planes as well as with the blockhouse in plenty of time prior to T minus one minute, when, of course, attention did naturally shift to the umbilical and the periscope.
12. "Backtracking here slightly, I see that I have slipped by gantry removal at -55 which, as far as I was concerned, posed no problem to me. I was well tied in by that time, and at -45 the panel check posed no problem. I had no difficulty at any time with the CTC³ on any of the check-off items -- I think primarily due to his foresightedness in reading off check-off lists when he had the opportunity, rather than following the launch count document to the second. Escape tower arming at -22 was no problem -- all you had to do was throw a switch, and, as we all know, the escape tower did not fire. The T-15 panel check was satisfactory, the -5 status check was satisfactory, and I would say that the countdown right up to the point of umbilical pull indeed was satisfactory. This ties me back in where I was before, to the periscope.
13. "I noticed the umbilical go out and I saw the head of the boom start to drop away as the periscope retracted electrically. This fact was reported as well as main bus voltage and current over RF prior to lift-off. I had the feeling somehow that maybe I would've liked a little more over RF with respect to the booster countdown steps. I remember hearing firing command, but it may very well be that although Deke was giving me other sequences over RF prior to main stage and lift-off, I did not hear them. I may have been just a little bit too excited. I do remember being fairly calm at this point and getting my hand up to start the watch when I received the lift-off from the Control Center on RF. The time-zero relays closed properly, the onboard clock started properly, and I must say the lift-off was a whole lot smoother than I expected. I really expected to have to use full volume control on UHF and HF to be able to receive. I did not have to -- I think I was legible to Tel 3⁴ because all of my transmissions over UHF were immediately acknowledged without any repeats being requested.
14. "Again, insofar as the mission itself is concerned, lift-off was very smooth. I noticed no vibrations of any consequence at all during the period of about the first 30-45 seconds (I would say as a guess).

³Capsule Test Conductor

⁴Capsule Communicator in Mercury Control Center.

⁵Mercury Control Center.

I got an extra transmission in primarily to insure myself of a good voice link and also to let the people on the ground know that I was in good shape. The 30-second scheduled transmission went according to schedule, right on time. I did start that a little bit early, I remember, as I wanted to again let the people know that I was in good shape. It seemed to me then that somewhere about 45 seconds to a minute after lift-off, I started noticing an increase in vibrations at the couch. It was a gradual increase; there was not any concern. As a matter of fact I'd really been looking for an increase in sound levels and roughness just after one minute because, of course, going transonic, and because of the max q point, so I wasn't too upset by this. I think maybe if we look back at film (the pilot coverage film) we'll be able to see my helmet bouncing around vibrating. Actually there was vibration there to the degree where it distorted some of the reading of the instruments. I made the voice report at one minute on schedule and from there on up to max q noticed the increase in sound level and increase in vibration.

15. "The cabin pressure, as we know, sealed properly at 5.5. It seemed to slow down a little bit at 6. As a matter of fact, I almost reported it as being sealed at 6, but it gradually came down to 5.5. A quick glance at the suit circuit absolute-pressure gauge confirmed this. After this, things really started to smooth out. The booster noises seemed to fade away, and booster vibrations got a lot smoother. As a matter of fact, I mentioned that over RF, so we'll have that on the record. There was a very definite transition in vibration, not a sharp one, but a gradual one, nonetheless noticeable. The report at 1 minute and 30 seconds was made on schedule. We, of course, included the main-bus and isolated-battery voltage at that time. I found that my scan pattern was not as good as it might have been, and I don't remember looking at the electrical panel as much as I probably should have, paying more attention, of course, to the oxygen panel and the fuel panel.
16. "At 2 minutes, normal periodic transmission was made, and, of course, I gave all systems 'GO' at that point. I remember feeling particularly happy at that point because the flight was proceeding very smoothly here, the capsule was working very nicely as far as I could tell. I also called out an additional acceleration of, I think 5-1/2 g here.
17. "Cut-off as far as I could tell on the clock came exactly on schedule, right around 142 seconds, 2 minutes and 22 seconds on the count. The tower jettisoned. Immediately I noticed the noise in tower jettisoning. I didn't notice any smoke coming by the port-hole as I expected I might in my peripheral vision. I think maybe I was riveted on that good old 'tower jettison' green light which looked so good in the capsule. I threw the 'retrojettison' switch to disarm at this point as I noted over RF, and 'capsule separation' came on

green right on schedule at 2 minutes and 32 seconds. Aux damping at this point, I thought, was satisfactory. I don't remember reporting it specifically because I reported the periscope coming out, and I think at this point I was going to report it, but the turnaround maneuver actually started on ASCS.⁶ I remember reporting the turnaround maneuver, and at that point, at about 3 minutes, I went through hand control motions⁷, as was noted, and I started switching to the manual control system. I switched of course to pitch first, pitched to retroattitude, and back to orbit attitude. The ASCS controlled in yaw and roll as I was doing this. I then switched next to manual yaw, and ASCS roll still continued to function. I switched then finally to manual roll. I was in the full manual system and found that controlling the capsule was just about the same as it had been on the trainers.

18. "I did not pick up any noticeable noise of the jets. I think if I'd had time I might have been able to decrease the volume control of the voice radio circuits and picked it up but at this point I didn't have time to investigate it. I remember thinking that I did not hear the noise of the manual jets firing at this time.
19. "I controlled fairly close to orbit attitude on manual and then switched to the scope, and the picture in the scope certainly was a remarkable picture. Unfortunately, I had a filter in the scope to cut the sunlight down on the pad, and I did not feel that I had the time to reach it and change it on the pad. It was difficult for me to reach the filter-intensity knob with the suit on without bumping the abort handle with the wrist seal bearing of the left arm, so as a result I remember saying, 'Well, I'll leave the periscope filter in this position and try to remember to change it later on even though it may get me in trouble.' Of course, actually, it did, because I had in the medium gray filter which very effectively obliterated most of the colors. Clarifying that last remark, there is no question about being able to distinguish between cloud masses and land masses. This is very easy to do even with a gray filter, and I was able to distinguish the low pressure area as described⁸ in the southeastern part of the United States. As I think I mentioned over RF, Cape Hatteras was obliterated by cloud cover. The cloud cover of 3 to 4 tenths, low scattered on the east coast of Florida, was most apparent. The west coast of Florida and the Gulf were clear. I could see Lake Okeechobee. As I described, I could see the shoals in the vicinity of Bimini. I could see Andros Island. The Bahama Islands, Grand Bahama Island itself, and Abaco

⁶Automatic Stabilization and Control System.

⁷A psychomotor test of positioning the hand controller at predetermined positions.

⁸In preflight weather briefing.

were confusing because there was cloud cover there, just enough to confuse my view. I think if I had a little bit more time with a periscope here, though, I would have been able to definitely distinguish these islands, but the cloud cover was confusing to me at that point. I noticed also that I apparently had in a slow pitch rate because I noticed that I wasn't controlling the manual pitch too much at this point. I think I was paying too much attention looking out at the awe-inspiring sight in the periscope.

20. "The countdown to retrosequence helped me. It helped me come back to the next sequence which was to occur. The next sequence of course was retro. The onboard timer started retroessentially on schedule; the retrosequence and retroattitude lights came green, as expected. I went manually to retroattitude, and I wasn't quite as happy with the pitch control here as I was with yaw and roll. Somehow I got a little bit behind with my pitch control, and I got down fairly close to 20 to 25 degrees rather than staying up around the 34 degrees. Of course, as we all know, the index of this particular capsule is at 45 degrees, but I don't think this added to the confusion; however, I think the confusion was my own here. Okay, with respect to retrofiring -- there is no question about it, when those retros go, your transition from zero g of weightlessness to essentially 5g is noticeable. You notice the noise of the retros and you notice the torque⁹ of the retros. I think I did a fairly good job of controlling the retros outside of the pitch deviation which I mentioned, and I thought that I was able certainly to control them within reasonable tolerance.
21. "At the end of retros, the plan was to go to fly-by-wire, which I did. I switched to fly-by-wire, pulled manual, and then, at this point, the plan was to go to yaw and then roll fly-by-wire, but I noticed I was a little lower in pitch than I wanted to be at the end of retrofire itself, so I started back on the pitch -- then, at this point, it was either a yaw or a roll maneuver that I made, I'm not sure which one. I think it's probably yaw because that is the one I was supposed to make first -- a fly-by-wire yaw maneuver -- and, about the time the retros were to have jettisoned, I heard the noise and saw a little bit of the debris. I saw one of the retropack retaining straps. I checked and there was no light at that time. Deke¹⁰ called up and said he confirmed retrojettison, and about this time I hit the manual override and the light came on. This, as I recall, is the only item sequence-wise in the capsule that did not perform properly. I did not do the specific roll

⁹Misalignment Torques.

¹⁰Astronaut Donald K. (Deke) Slayton, Capsule Communicator in the Mercury Control Center.

20 degrees and back as we had planned, because it took a little extra time to verify that retropack jettison had occurred.

22. "I went on down to reentry attitude on fly-by-wire, and I think I made the general comment already that as far as I am concerned, the trainers -- all the trainers that we have -- the procedures trainer as well as the ALFA trainer, are all pretty close to the actual case. I say this now, because on these I have a tendency to be able to control these trainers on the manual system better than I can with the fly-by-wire system. And I think it's just a matter, really, of not using fly-by-wire very much. By that I mean that normally we're controlling retros manually and normally controlling reentry manually, and when you switch to fly-by-wire as we had been doing here, the first tendency is to over-control in rate -- at least for me -- because the microswitch distances for the high and low thrust jets are very small, and we've had trouble on this. With these microswitches, particularly capsule seven, you get high torque right away, whether you want it or not, and so I noticed the same thing on the capsule. The first thing I do is over-control and get a higher rate than I thought I should have gotten.

23. "On fly-by-wire I went to reentry attitude, switched to ASCS which stabilized at about 40 degrees, then at this point, the periscope came in on schedule, and I remember reporting 'periscope in.' Then I got involved with looking out the windows for the stars and anything else that I could see. At this time in the flight, of course, this window looks generally at the horizon, at the moon and the stars.¹¹ There was nothing there at all -- I couldn't see anything in the way of stars or planets out in that area, and I did move my head around. I got a little confused because I thought I ought to get my head up to see the horizon out that window, but I never did get a horizon out that window at this point, and I think it was because of the attitude. We had figured out it was 15 degrees above the horizon as I recall, and I thought I ought to be able to see the horizon but I never did see it. Well, that, plus the fact that I was looking for the stars that I couldn't see out of that window, actually got me behind in the flight -- this was the only point in the flight that I felt that I really wasn't on top of things. What happened here was that .05g came quickly, as I reported, and I started switching to manual control, and I thought I had time to get on to manual control, but I didn't. The g-build-up started sooner than I figured it would. I don't know whether it was just that

¹¹The stars he was to look for.

I was late because of being late on the time, or whether we don't have the same time difference between .05g and g-build-up on our trainer that we actually had in flight -- we can check this later. What I'm talking about is the time period between .05g and the g-build-up in reentry. As I can remember on the trainer, I would have time to go ahead and get on manual control and get set up before the g's built up, but I was surprised when the g's started building up as soon as they did. I wasn't ready for it, but I thought we were in good shape because we were still on the ASCS when the .05g relay latched in. As a result, the roll¹² started on schedule" END OF RECORD.

24. (There is a portion of Astronaut Shepard's report missing from the tape recording at this part of the flight. During a later debriefing at GBI the next day, Shepard described this portion of the flight essentially as follows:)

25. The acceleration pulse during reentry was about as expected and as was experienced on the Centrifuge during training, except that in flight the environment was smoother. During the early part of g-build-up, Shepard switched to manual-proportional control on all axes. He allowed the roll put in by the ASCS to continue. He controlled the oscillations somewhat in pitch and yaw during g-build-up only. The oscillations during and after the g-pulse were mild and not uncomfortable. He arrived at 40,000 feet sooner than he expected and at that time switched to ASCS in all axes in order to give full attention to observing drogue chute deployment. The drogue came out at the intended altitude and was clearly visible through the periscope. The capsule motions when on the drogue chute were not uncomfortable. The snorkel opened at 15,000 feet which Shepard thought was late. The main chute came out at the intended altitude.

Astronaut Shepard's recording made on the carrier continues:

26. "As to the chute, I was delighted to see it. I had pushed all hand controllers in so that I noticed that all the peroxide had dumped on schedule. At this point I shifted to the R/T position of the UHF-DF switch. The UHF-select was still normal, and I think at this point I reached over and flipped off the VOX relay switch which was obviously, I realized after I had done it, a superfluous maneuver because the transmitters were keyed anyway. I was a little confused here, I guess. I felt that the carrier¹³ was coming in and out for some reason, so I went over there and threw that VOX power switch off.

¹²Programed reentry roll rate of 10 to 12 degrees per second.

¹³The hum of the carrier frequency.

In any event, after going to the R/T position, shortly thereafter, I established contact with the Indian Ocean Ship¹⁴ and gave them the report of the parachute being good, the rate-of-descent indicator being at about 35 ft/sec and everything looked real good. The peroxide was dumped, the landing bag was green, and, of course the 'Rescue Aids' switch was off at that point. They relayed back shortly after that, as I recall.

27. "CARDFILE 23, the relay airplane, came in first of all with a direct shot and then with a relay, so that I was able to get the word to the Cape prior to other sources that I was indeed in good shape up to this point. The opening shock of the parachute was not uncomfortable. My colleagues will recognize it was a reassuring kick in the butt. I think I made the hand controller movements after the main chute. I can't vouch for it. The exact times of this sequence I do not recall at this point but we can cross-check again. Altitude-wise, the drogue and main came out right on the money, as far as indicated altitude was concerned.
28. "I put the transmission through that I was okay prior to impact. I was able to look out and see the water, with the capsule swinging back and forth. It was not uncomfortable at all. As a matter of fact, I felt no uncomfortable physiological sensations, really, at any point during the flight. Excited, yes, but nothing uncomfortable at all. Prior to impact, I had removed my knee straps; I had released my face plate seal bottle and had removed the exhaust hose from the helmet. Back to the impact now -- the impact itself was as expected. It was a jolt but not uncomfortable. The capsule went over on its right-hand side, down pretty close to the water, and, of course stayed at about 60° off the vertical. I reached down and flipped the 'Rescue Aids' switch at this time to jettison the reserve chute and to eject the HF antenna although I did leave my transmit switch in the UHF position. At this point, I could look out the left window and tell the dye marker package was working properly. The right window was still under water. I began looking around for any indication of water inside but did not find any. I had broken my helmet at the neck ring seal at this point, and I did no transmitting here. I left the switch on R/T because I didn't want any discharge from the UHF antenna.
29. "The capsule righted itself slowly to a near vertical position, though I thought to myself 'It is taking an awfully long time to get up there,' but it did get up there, and about the time it did get up

¹⁴This ship was being exercised for the MR-3 mission and had been positioned in the landing area.

there, I started to relax a little bit and started to read off my instruments. I had made a report to CARDFILE 23 after impact over UHF that I was indeed all right, and it was relayed back to the Cape. Then, getting back to the point where the capsule was close to the vertical, I was going to get a read-off of the instruments at this time prior to shutting down the power. I got the main bus voltage and current, and I got a call from the helicopter and thought that communicating with him was much more important. So I did. I communicated with him and established contact with the chopper. I am not sure he heard me at first, but I was able to get through to him that I would be coming out as soon as he lifted the door clear of the water. In the meantime, I experienced very little difficulty in getting the cable from the door around the manual controller handle and tightened up so that when I called the helo and told him I was ready to come out and he verified that he was pulling me up and I told him I was powering down and disconnecting communications. The door was ready to go off. I disconnected the biomedical packs. I undid my lap belt, disconnected the communications lead, and opened the door and very easily worked my way up into a sitting position on the door sill. Just prior to doing this, I took my helmet off and laid it over in the position in the -- as a matter of fact, I put it over the hand controller.

30. "The helo was right there. I waited before grabbing the 'horse-collar' for a few minutes because I hadn't seen it hit the water. They dropped it down in the water and pulled it back up again, and I grabbed it and got into it with very little difficulty, and shortly thereafter, was lifted right directly from a sitting position out of the capsule up toward the chopper. The only thing that gave me any problem at all, and it was only a minor one, was that I banged into the HF antenna but, of course, it is so flexible that it didn't give me any trouble. I got into the chopper with no difficulty at all, and I must admit was delighted to get there. Of course, the pickup of the capsule went very nicely. The sea conditions were such that they were able to get it up right away, and the next thing I knew we were making a pass on the flat top. My sensations at this time were very easy to describe and very easy to notice. It was a thrill, and a humble feeling, an exultant feeling, that everything had gone so well during the flight.
31. "I have not used the script¹⁵ here, so I will go over it now to be sure that I have covered most of these items. Item 3 - the most outstanding impression of the flight in special sensory areas. I think

¹⁵The debriefing form.

it is really very difficult to describe any one thing as being more outstanding than the other. It was all fascinating, and interesting, and challenging, and everything, all wrapped up into one. But I don't really remember noticing the weightless condition until I noticed a washer flying by. 'Well,' I thought, 'you are supposed to be making some comment on being weightless.' So I did think about it a little bit. Of course, as we had known before, in the backseat of the F-100's, it is a real comfortable feeling. Being strapped in like that, there is no tendency to be thrown around at all and no uncomfortable sensations. I guess the most outstanding impression that I had was the fact that I was able to do as well as I did. A very good flight.

32. "Major surprises? No major surprises. Some minor ones which I have described. I expected to be able to see the stars and planets, which I did not do. I think I could have found them with a little more time to look. The fact that I did not hear the jets firing -- although I do remember now hearing the control jets working just after reentry, after I went back to ASCS. I remember hearing some of the high-thrust jets going at this time. In reference to the sky and stars, I have described the stars which I did not see and which I tried to see. I described the landing in the water; I described check points; I remember mentioning over RF that I was able to see Okeechobee, also Andros and the Bimini Atoll which was (the latter) most apparent because of the difference in color between the shoals and the deep water.

33. "I did not describe the perimeter¹⁶ too well because of cloud cover around the perimeter. The predicted perimeter cloud cover was most accurate. The clouds were such that the ones that had any vertical formation were pretty far away, and I didn't really notice much difference in critical cloud heights. I think had I been closer to them, I would have been able to notice this a little more. They were pretty far from the center of the scope where some distortion occurs. We talked about the horizon. Essentially, there was only the one haze layer between the cloud cover and the deep blue.

34. "Weightlessness gave me no problem at all. The last question: 'Describe any sound, smell, or sensory impressions associated with the flight experienced.' Sounds? of course, the booster sounds, the pyros firing, the escape tower jettisoning and the retros firing. Of course all these sounds were new, although none of them were really loud enough to be upsetting. They were definitely noticeable. The only unusual smell in the capsule was a gunpowder smell after - it seems to me - after main chute deploy. I think this was after the main antenna can

¹⁶The perimeter of the field of view through the periscope.

went off. I don't remember smelling it before, but I did get it after main chute and, of course, I didn't get it until after I opened my face plate. It didn't appear to be disturbing to me, so I didn't close the face plate. No other sensory impressions that I noticed that I can recall at this time that we did not have in training. The g-load, the onset and relief of g were familiar during reentry and powered flight. They were not upsetting. They were not unusual.

35. "I am sorry that I did forget to work the hand controller under g-load during powered flight as we had discussed, but I thought that I was operating fairly well during powered flight. I think the fact that I forgot this is not too significant. Well, I think that's just about the size of it for now. We will continue this on a more quantitative basis later on. This is Shepard, off."

SECTION B

ASTRONAUT DEBRIEFING

AT GRAND BAHAMA ISLAND

MORNING SESSION, MAY 6, 1961

1. I We can't seem to find that part of the debriefing that comes between retrojettison and main chute that you recorded on the carrier. Is this available?

A Well, I don't think so. I think what happened was this; we had to break to answer a phone call. I think you might be a little upset about it but since the phone call was from no less than the President, we thought you might allow us to break to go for a little chat.

2. I I think we've got the end of the retrosequence. I think we heard you say something about seeing straps.

A All right; at the end of retrofire, the plan was to go to fly-by-wire, which I did. I switched to fly-by-wire, pulled the manual handle, and then the plan was to first make a yaw maneuver and then roll on fly-by-wire. I noticed at this point that I was a little lower on pitch than I ought to be after the end of retrofire itself, so I started back up on pitch. Then, at this point, it was either a yaw or a roll maneuver that I made. I'm not sure which one it was. I think it was probably a yaw maneuver, came back, and about the time that retros were to have jettisoned, I heard a noise, and saw a little bit of debris. I saw one of the retro pack restraining straps. I checked and there was no sequence light at that time. Deke called up and said he confirmed retrojettison and, about this time, I hit manual override and the light came on. This, as I recall, was the only item, sequence wise, in the capsule that did not perform properly. I did not do the roll, the specific roll of 20° and back, as we had planned because it took a little extra time verifying the fact that retros had jettisoned, and I went on down to reentry attitude on the fly-by-wire and I think I made the general comment already that, as far as I'm concerned, the trainers - all the trainers that we have - the Procedures Trainer as well as the ALFA Trainer, are all pretty close to the actual case. I say this now, because on these I have a tendency myself to be able to control using the manual system better than I can the fly-by-wire system. I think it is just a matter really of not using the fly-by-wire very much. By that, I mean that normally, we're controlling the retros manually and the reentry manually and when you're switching to fly-by-wire as we have been doing here, just to effect a

Enclosure 5

few maneuvers, the first tendency is to over-control in rate. At least, for me, because the microswitch distances for the high and low thrust jets are very small and we've had trouble on this. These microswitches, particularly on Capsule No. 7, give you a high torque right away, whether you want it or not. And, so I noted the same thing in the capsule; the first thing I do is to over-control and get a higher rate than I wanted. OK! Fly-by-wire went to reentry attitude, switched to ASCS which stabilized at about 40° . Then at this point, the periscope came in on schedule and I remembered reporting "periscope in." Then, I got involved with looking out the window at the stars and anything I could see. Of course this window looks generally at the horizon and at the time of the flight this occurred, I couldn't see any stars - nothing there at all. I couldn't see anything in the way of planets and stars out in that area. I did move my head up to see the horizon out that window, but I never did get a horizon out that window at this point, and I think it was because of the attitude; you had figured out it was 15° above the horizon as I recall.

3. I Yes, I think that's right.

A I thought, "Well, I ought to be able to see the horizon," and I never did. Well, that, plus the fact that I was looking for the stars and couldn't see them out that window, actually got me behind in the flight. This was the only point in the flight where I felt like I wasn't really on top of things. What happened here was that .05g came quickly and I reported it and started switching to manual control. I thought, "Well, I got enough time to go on manual control and control reentry manually," but I didn't because the g-buildup started sooner than I figured it would; I don't know whether it was just that I was late because of being late in time or whether we don't have the same time difference between .05g and g-buildup on the trainer that we actually had in flight . . . we can check this.

4. I I believe your reentry was something like a minute ahead of time compared to what it was in the trainer. Max g came right on the button.

A This is not what I'm talking about. I'm talking about the time period between .05g and the g-buildup for reentry. I can remember on the trainer I had time to go ahead and get on manual control and get set up before the ASCS reentry roll rate started and I was surprised the g started building up as soon as it did. I wasn't ready for it, but we're in good shape, I thought, because we were still on ASCS when the .05g relay latched in and, as a result, the roll started on schedule and so, all I did was switch and didn't bother to change rate of roll at all. I thought, "The rate of roll is OK," so I hit the thing a couple of times manually to correct the rates that were building up prior to max g, and it was oscillating slowly at max g but not to any disturbing degree.

5. I Well, at this point, were you still on ASCS or had you gone back to manual?

A I had gone back to manual.

6. I You had gone back to manual?

A Right. Now, here's another thing . . . it's a time consuming process to switch to manual because you have got to make four moves, you know.

7. I Yes.

A Another thing I noticed during the g-buildup that I put on the other tape was that I noticed and imagined, probably a combination of both, a buildup in the background noise on the RF, and my volume controls were set so that I was receiving HF and UHF about on equal strength, about at equal signal ratios. There was a little background noise in the UHF throughout the flight, but I'm pretty sure I noticed a buildup in the background noise or interference during the buildup to max g which is probably a function of ionization. And, I was transmitting g-figures during the reentry, which I believe you heard.

8. I Yes, we heard you.

A I noticed no tendency to really lose control of myself, although, as I say, I wasn't making any attempt to control rates at this time because as you know, the jets just don't have much effect at high g. After peak g, there were some oscillations, and I switched back to ASCS at this time to let it take care of these rates. The reason I did this was again because the timing surprised me. We'll have to find out what altitude I first reported it. It was way down and I remember on the trainer, we would go through the buildup and max g and back off again to one or two g somewhere in there and at this point, my routine was to look at the altimeter and the rate of descent to make sure we were programming down and I was always able to get a reading of say 80 or 90,000 feet. I'd correlate this with the amount of fuel I had left and make a report, you know. But, all of a sudden, I realized that I was way on down and I had to start thinking about drogue chute primarily, and this is the reason I went back to ASCS at this point. If the ASCS will do its work, fine; I want to put my attention on other things. Well, I think it was somewhere in there where I first made a report of altitude. It was a lot lower than I wanted to be.

9. I First report they got through was 30k.

A The point is that I was interested in getting ready at this point for the next sequence and was feeling hurried right in here.

10. I Did the ASCS damp rates at this point? When you got it back in?

A Yes, not completely, but I think it was working. I could hear the jets squirting. I didn't do much between that report of 30,000 and drogue . . . well, there wasn't a lot of time, actually. The drogue came out at 21,000 and . . . that was right on, at least insofar as the cabin altimeter was concerned, it was right on 21,000 when the chute came out. As a matter of fact, just shortly after the drogue had stabilized the capsule, the periscope was out, and I could see the drogue right up at the top. It wasn't very large, but we had drawn this out before on a scale. Because of the distortion at the edge of the scope, we realized we couldn't see much of it, but you can see enough to realize it was the drogue, and it looked like a drogue - it was pulsating, and it was firmly hooked on and it was doing the job! I reported drogue I'm sure. The next thing; the inlet snorkel valve, it seemed to me, kicked off late. You have to check this from the records, but the first time I noticed the emergency flow rate, and I am sure that it was shortly after it happened because, the emergency rate handle flies up, and you get a good sound cue, I looked at the altimeter and it was about 15,000 feet. So, it may have been a little bit late in there - not too much, but a little bit late, maybe. We can check that point. Then at 10,000 feet, of course, the antennae cannister went off and you could see it come off, and pull the main chute with it, and then go off in the distance. You can see the chute in the reefed condition. It looks just like it should fortunately. Then, it dereefed just like it should, and there it was. The opening shock of the chute was very mild, I thought, and rather comforting.

11. I Can you compare it with what we simulated on the Centrifuge?

A Unfortunately, the Centrifuge, being set up mechanically, is a lot rougher in simulating retrofire and chute opening than the actual case itself. The capsule is as smooth as silk! Retrofire was just perfect! You just make up your mind ahead of time it's going to be a slight jolt. You have a slight jolt; you can hear it fire, and it starts moving around very slowly. There's not as much noise as you have on the ALFA Trainer. If you can get the same movement, but just cut the noise down, you'll have pretty close to the same feeling on the trainer as far as training reactions are concerned. Of course, you won't be able to simulate the g, but the movements, of course, would be the same.

12. I Could you appreciate the motions? The body motions?

A You can feel it going around, and you can feel the torque.

13. I You felt as well as saw the movement? Were you cross-referencing with the periscope at this point?

A Yes. The only confusing thing here is, of course, the retros are firing back there and you try to look through the scope, so there is a little difference when you try to correlate them.

14. I But did you use both during the retrofire, both the instruments and the scope?

A Not to control the thing. No, I didn't.

15. I What did you use to control?

A I used the instruments.

16. I The instruments?

A For reference. The only thing I remember being disturbed a little bit about was the fact that I seemed to be holding roll and yaw pretty well, but I let pitch get down a little bit lower than I thought. This is not in the way of an excuse, but you know Capsule No. 7 was originally set up on the instrument display for 45° retro so I just had to guess the needle position. Of course, in our training, we were using pitch in the zero reference, the zero referent being level with the rate needle.

17. I Yes, with all hands straight across when in retro.

A 45° , you see, is the position on Capsule No. 7 and we were holding 34° so the needle was not level, which was a little bit different than what we were doing before. I don't think that was what really disturbed me, but . . .

18. I And you thought you had held it almost level so that the capsule . . .

A No, I was trying to hold it in this region, but it got closer to orbit attitude.

19. I Oh, OK, OK. So, the capsule ended up closer to level?

A But this is the only capsule in which this will be the case. In all others, this instrument is reoriented so we have 34° right even with this needle. And I think that it's just a small perturbation here but if you train trying to keep these needles all together, you develop that training habit which makes it a little easier to fly the capsule that way. For example, if we had been trained to hold the pitch needle up in this orbit block just hypothetically, it would have been all right to do it that way. It just depends on how you train, I think, just a small deviation. So, that takes care of the mission period of the carrier debriefing between retrojettison and main chute. Now, you say you have from main chute on down?

20. I Yes, yes, we have.

A OK, that fills in the lost link that you had in the carrier debriefing.

21. I Let's go back and start some of these questions on the formal debriefing. Item III. I think we've got most of these, but let's each of us go through the list and if there's any question that bothers you or myself, we'll ask him that and then go on to the next section. I think you said there were no major surprises during the flight, didn't you?

A Well, no major surprises, no. I think, personally, I was happily surprised to a small degree, that I was able to do as well as I did. As I say, I really only felt like I was behind the machine at one point when we hurried through the reentry. Outside of that, I felt like I was really on top of the program, the lift-off, our conversation and interchange of information, the first part of the flight and during retrofire. The only time I started feeling like I was getting behind the game and being hurried was during reentry.

22. I Well, as a result, on any further Redstone flights, would you recommend cutting down the length of the program? The length of the "programmed" program, you know?

A I would think so, yes. Gus and I were discussing it just briefly yesterday and I think that particularly, approaching events where you're going to require some fairly exact qualitative measurement or data taking or anything from us, we ought to allow a time period for a little "slop" from some of the other things. If we do take a little bit longer, for example, we will have a few minutes, or a few seconds, to get ready for the particular maneuver. I don't know. We can talk this over. Maybe if we plan it completely, we ought to say to ourselves, "Well, OK, I've got a personal cutoff point here." Maybe it was my own fault for not saying, "Well, I'm trying to do too many things here," and at this point, should have stopped myself during the flight and re-adjusted my schedule. I probably should have done this. In retrospect, I can see that I should have, but maybe we do need a time period there to force you to do that.

23. I We're on Page 1 on Item 3, Roman numeral III. Did you have anything to add to that question?

A No.

24. I I think perhaps question five, we could maybe rephrase it a little bit. Are there any real problems that we can start working on immediately? That came out of this flight?

A Well, now you're thinking specifically of Capsule No. 11, I guess. MR-4, right?

I Yes, also Atlas orbital capsules.

I You might specify what capsule in general, and if it applies to some capsule farther down, you might specify which one.

A Well, yes. Let's take operational problems; let's take those first. We're going to have an operational problem in hold time on that gantry for the orbital flight. There's no question about it! I think primarily here, this is a physiological problem. We've got to provide relief up on the gantry during these extended holds. Other than that, I think you can move around enough to relieve any circulation problems you have, by moving your feet, hands and arms around and generally, you're not too uncomfortable. I didn't really feel like I had any bad pressure points.

25. I Did you get too warm at any time?

A No, not prior to launch. We'd better provide ourselves with a relief receptacle. And I think that if you do get to the point where you're getting little aches and pains and a little stiff here and there, that it will take care of itself in the orbital flights probably by being weightless; that is, you're going to feel so much better. Just the same, we've got to take steps, I think, to try to cut down that period inside the capsule if we can.

26. I Yes, well, you were in there 4 1/2 hours, a little better, I believe, so this was quite a bit more than was expected.

I Could you comment on this? Was this about as long as you'd care to . . .

A Well, I was just going to say that this is a real qualitative question. Just how well I would have performed had we not been there so long or how much more poorly I would have performed if we'd been there another hour is pretty hard to say. I think it's just a general comment that we want to hold this down to what is presently scheduled. This will be easier to do. Now that we've had a successful flight, people aren't going to hang on to their own little area of responsibility quite as long as they did yesterday. I realize tensions and things were pretty tight down there and everybody wanted everything to be just as perfect as it could be before they were willing to say "go," but I think, operationally, we want to cut that time down. OK, other operational problems: I don't think communications-wise, we were in any trouble. The voice procedure as far as I was concerned, back and forth from the ground was satisfactory. I think that the ground rules

that we established for abort and so on were satisfactory. You've got to renegotiate these anyway prior to the flight - prior to each individual flight, of course, because they will be different. Voice procedure downrange was great! I was totally surprised in the recovery area. Whether people were just not listening or they weren't talking, the radio discipline was good and everything worked out real fine, I thought. I expected a number of simultaneous transmissions downrange that would confuse the issue, but the people downrange were very well briefed obviously and they performed according to their briefing. I had no problems at all, procedures-wise, with communications down there. Everybody did exactly what they were supposed to do. So, I think we can use the procedures developed for this flight as the operational procedures for the next flight. I think most of the problems are already solved there. Other operational procedures: recovery certainly went nicely as you know. I think maybe the only significant operation problem, if it is considered to be significant, is that we want to try to keep the pre-launch time pretty much on schedule, so we don't have to hang around in there too long. Are there any other operational aspects you want to discuss before we leave that one?

27. I I think that's pretty good. We know you had one sequence failure.¹

A That one sequence light failure and the inverter problem. We flew, as you know, with the standby inverter switch in the "fans" position so that the 250 standby was actually feeding the fan bus. We had both 250 inverters working - the standby on the fans and the ASCS inverter on the ASCS bus. There's a switch-over problem here and I'm not sure that we're in the position where we can manually select or switch these inverters with impunity in the present capsule. Everybody's aware of this down here at the Cape, but we ought to look into it a little more from the operational standpoint. What happens is if the voltage isn't quite right on the bus when you switch to it, the inverter doesn't start up. It draws an abnormally high current and it just hangs. We did switch the inverters yesterday but it was on a rather rapid procedure of throwing the ASCS switch off, the ammeter switch off, the ASCS, inverter fans, ASCS back, ammeter switch back on and the inverter switch back on, some kind of routine like that.

28. I Kind of a complicated routine?

A It was hard to get away from this and they were sweating because they figured the standby inverter might hang up on us.

¹Retrojettison sequence telelight did not illuminate when the retros jettisoned.

29. I They sure didn't want to switch back!

A No, they didn't want to switch back either, so this is a little tricky problem on the electrical systems. ASCS, as far as I could tell, we had no complaints with ASCS. It worked just fine and I noticed that when I went on manual control, one axis at a time, that the ASCS was damping and controlling in the axes still activated.

30. I What period were you talking about?

A I was talking about the period after turnaround.

31. A Well, it was controlling in the orientation mode on the other two axes that I was not controlling manually. The capsule was apparently real clean, too. I guess they have gotten their techniques down now so that we didn't have any problems at all with the RCS.

32. I Al, on your problem with the pitch on the retrofire, do you think this was purely a display problem or did you feel the pitch axis manual proportional was giving you a problem?

A No, I don't think there was really any difficulty with it. I didn't have any difficulty controlling it fairly well when I first switched to it and I don't think that the system was malfunctioning. A combination of display and just getting just a little bit behind it. Let's see, we covered electrical.

33. I Yes.

A Environment: No problems at all. They did increase freon flow to keep me a little cooler during the "hold" period. ECS-wise, I felt comfortable during the entire flight. I did notice that between crawling out of the capsule and finally getting the suit off, I got pretty warm during the time period. It really wasn't important because if I'd really had any trouble, I could have stopped at any time and opened the suit up in order to get ventilation. I chose not to.

34. I Manual control system: How about the forces? Did you feel like you had to work awful hard to deflect the handle?

A I didn't notice it a bit. I didn't have any problem moving that handle. Oh, one point here: I've discussed it with Gus briefly, but the parachute got in the way for left yaw. When you come over for left yaw, the wrist seal bearing of the suit bumped against the parachute. You just have to push hard against the chute in order to get the full left yaw. I think this problem can take care of itself.

35. I Very good problem to point out.

A You can relocate the parachute - relocate it completely outside the capsule.

36. I You figure maybe the "reserve" will work, huh?

A Well, I don't know. This ought to be left up to each individual, really.

37. I Please! (Another Astronaut)

A No, no. I don't want to make up somebody else's mind. You know, if you try to categorically say that you need the chute, you can't do it. You can say, "Well, the reliability is such that if you ever need the chute that you've already gone through so many things and taken up so much time doing it that you have already hit the ground." I think we ought to leave it up to the individual. I think we ought to consider it pretty carefully before we take it out.

38. I OK. Well, maybe we've hit that one hard enough for this time.

A Well, no, I don't think so; go ahead.

39. I Well, no, you go ahead if you have some more system problems to discuss.

A We're taking care of the answers to a lot of these questions here.

40. I Yeah. I know we are. I realize we are.

I Well, I just noticed that there are two areas of concern; both, I think, with you, and also with the ground prior to and during the flight. The max altitude timer² which is recognized as always being a problem and the impact switch³. Such as the direct operational procedure to take care of these during a flight.

A Right, I agree. The problem with the maximum altitude timer is, of course, that it's an electronic integrator and as expressed by Glenn at the launch, they didn't feel that the thing was completely clean and that it could accept all kinds of glitches (electrical voltage pulses of extremely short duration) and still time out properly if it was called

²Initiator for the parachute landing sequence for abort.

³Landing impact switch.

upon to do so. So, there was a lot of banter back and forth and MAC has already considered this, but I think maybe we ought to get a separate power source of more even voltage for this max altitude timer. And then, the other point as Gus mentioned, we flew with the "rescue aids" switch on Capsule No. 7 in the "off" position. This was a double protection against the impact switch inadvertently letting the main chute go and the reserve parachute go unattached as it would on an impact. In other words, the opening shock on the main chute making the impact switch think that in fact, it had impacted and let the chutes go. So we flew with the switch in the "off" position. This, of course, is an occupational hazard for if we had had problems such as not being able to throw the switch, of course, the reserve parachute would not have ejected and the CG would have been high, the HF antennae would not have come out. We still, of course, had UHF-DF, but we felt that it was a problem.

41. I Well, is this problem susceptible to easy solution, or is it a case of not arming this switch until sometime after the main chute comes out?

A It's not supposed to be armed, but we just thought it might possibly be armed. This is just an operational precaution that we took.

42. I I think we need a little bit safer system.

I So, for this portion of descent, you have the switch in the "off" position and this pre-supposes that you will be in good condition when you land. OK.

A Support and restraint system?

A No trouble with the support system. The restraint system? We can always kick this one around for a long time. This, here again, is a personal problem. I felt that it was satisfactory. I didn't have any real bone of contention about the restraint system. Once I got in there and got all strapped in with all the hoses and "Comm" leads and TM and BioMed leads, plus face plate seal hose, and strap and everything, I thought to myself, "Well, if I ever have to get out of this thing, I'll never make it." You sort of have the feeling like you're well strapped in. Fortunately, we didn't have the opportunity to discover how well our plans for bailout would have worked, but I just had the feeling that I would have a lot to do to get out of that capsule. You know, in an airplane, if something goes wrong, maybe even under a high-g condition or a short time period, you can still pretty well get out because you only have a few simple motions to make to get out of it. In the Navy, you reach over your head and pull and in the Air Force, you reach down here and pull - we're talking about ejection seat techniques - so this is one of the more "rustic" areas in the capsules.

43. I Well, maybe this is another problem area we ought to consider, and this is to get your recommendation on a one-point hookup system. This we've talked about before.

A Only thing that clouds the issue here is that it's not a single problem. What makes it a problem is related to the situation where you say, "Well, I'm going to use the personal parachute." If you don't try using this chute, it's not a problem. If you come down and the main chute comes out at 10,000 feet as a result of a return from either an orbit or a ballistic flight, then you, of course, still have plenty of time to start taking straps off, which I did. But, if you think about using that parachute, then you'd feel pretty uncomfortable under all those straps.

44. I Yes, it's pretty intimately tied up with your plans for using the chute.

A Well, if a guy says, "Well, I'm not going to take a personal parachute with me," then it's not much of a problem.

45. I What if you develop a gross leak after impact?

A Yes, but you have time to get most of your straps off. For example, I had taken the knee straps off, the chest strap off, I'd opened the visor and taken the face plate seal hose out, I'd taken the suit exhaust hose off, so that I only had the lap belt buckle and the BioMed lead on the Comm lead to take off after impact. So, I felt like I was in pretty good shape. OK, that's the restraint system, I guess.

46. I Could I ask about the periscope as a system? What did you think about it as a system for controlling attitude? Particularly, I was wondering why you didn't mention whether you tried to maneuver with it. You were looking through it. I just wondered whether you tried to maneuver with it and had come to any conclusions about it as a reference system.

A I just got a real general impression on this. I had planned before the flight to position the scribe mark on the periscope so that I'd have a yaw referent but I got to the point where I didn't have time. Deke started counting down on the retrosequence and I just didn't have the time. So, can't give you what I feel would be a quantitative comment on the use of the scope. Qualitatively, I don't think we're going to have any problems. I think we've realized before that it's not as quick a reference for attitude as the instruments. We've always considered it, I think, as being a backup for our instruments. Qualitatively, I noticed nothing that would prevent it from being a good backup for the instruments, for attitude reference and for control.

47. I Were you able to verify orbit attitude when you switched to the scope? That is, was the earth sphere shaped?

A I didn't do that, no. I think I could have, but I just didn't. My primary concern was how well could we see through the scope and you know I've gone through a whole page of stuff that I was supposed to spend 15 seconds on. I think I got most of it.

48. I You got a good deal of it. We all were amazed, I think, at how much you saw and did comment on during that time.

A The fact that the ALFA Trainer was such a good presentation and that we do fairly well with the retros and attitude control there, is enough of an indication to me that we can do the same thing in the capsule. As the capsule drifts along, you can see land masses moving, and it is essentially the same as we have it on the trainer.

49. I You did notice slight drifts, then, as the capsule was drifting slightly?

A Yaw reference-wise, it was. Here again, as I've discussed before, we've got a beautiful yaw reference in Cape Canaveral. I knew this ahead of time, so when it was drifting off, I said, "Well, there's a good yaw reference, there's no question about it!" But we won't always have a promontory, on track, 100 miles away when you're making the yaw maneuver, so that's a special case.

50. I But you feel you would not have had any trouble making a yaw maneuver with Canaveral there in front of you.

A No.

51. I From what you described over the voice link, you were saying, it appeared that the area covered was essentially like these pictures.⁴ Can you comment on that?

A That's pretty good! I thought to myself when I first looked at those pictures that I would be able to see Cuba better than this thing showed, but I couldn't see it well enough to say at first glance, "Well, that's Cuba, you know." I remember having the feeling I just didn't want to express an opinion about what I could see down here because it wasn't too well defined.

52. I When you looked through the periscope, did you notice a black ring around the earth?

⁴Photograph of area as viewed through the periscope.

A I didn't notice it, no. I was looking more at the land areas, and the cloud patterns. I had personally decided to look down into this area for references to different sizes of land masses to get an idea of what we could define. I think, as you may recall, I mentioned being able definitely to define Andros Island, and the Bimini shoal primarily because of the color changes and knowing about where it should be. Over in the Bahama area, the cloud cover was such that I didn't want to say, "OK, this is Abaco Island or this is GBI." I think maybe if I'd had time to study that area, a little bit longer, I would have been able to say, "OK, this is what it is." But, a glance down in that area didn't produce anything that I wanted to say I recognized as being this or that. In fact, the Florida area was perfect. You could see Okeechobee down here and you could see the Cape. This area of cloud cover up the East Coast, I think, was maybe 3 to 4 tenths or thereabouts. Of course, the onshore breeze was keeping it back away from shore so that was clear all the way up along the Coast. Back on the West side of the state, you could see that it was also clear. You could see Tampa Bay and the other things which I've mentioned. The vertical cloud development wasn't quite as definitive as I thought it should have been.

53. I How about relative overall size? Did you get any impression of whether this photograph was roughly correct, or did it seem a lot bigger? Did Florida fill up a lot more of your periscope?

A Well, it seemed to me that it looked a lot farther away than it should have. The first impression I had, of course, was that it was a beautiful sight. But the next impression I had was that it was a little bit farther away and a little smaller than I thought it was going to look like.

54. I It's probably this negative power of the periscope that does it. It's .11 power.

A I didn't think I'd gone too high in apogee as a result of that.

55. I Could you see anything that you could define as a city? Could you see Miami, for instance?

A I don't remember.

56. I You don't remember anything that looked different from . . .

A No, I don't remember.

57. I You don't remember anything about water color?

A Yes. As I said, I had the wrong filter in the periscope because it was wrong from lift-off. I thought to myself, "When the periscope comes in, reach up there and put the thing back on clear so it will be ready for you when it comes out after turnaround." When I reached up to change the filter, my pressure gauge on my left wrist banged into the "Abort" handle and I thought, "Well, Sonny, that's the last time you're gonna try that for a while." So, I didn't and as a result, I never did get the filter changed. And, I was so busy looking at the scope later that I didn't think to reach up and change the filter.

58. I When did you make this attempt? Was this after launch?

A Well, no. I was sitting on the pad and I put the filter in to cut the sunlight out. I thought, "This is fine and comfortable now, but this is going to be a bad filter to use for looking down so you'll have to change it." And I said, "All right, when the periscope comes in, there won't be any sun shining in and this is just a few seconds prior to launch, so I'll reach up there and flip it." And, as I reached up there, I noticed that my wrist seal bearing and the pressure gauge banged against the "Abort" handle, because it was real tight in there and I thought, "Now, you don't want to be doing that."

59. I You thought, "This is a poor time to be fiddling with this thing!"

A But even with that filter there, right down in this area particularly, there was an abrupt color change between the reefs, and in the area of Bimini and the surrounding water, I noticed this even with that gray filter in, so I feel sure that there will be good color definition. The color definition between the land masses and the clouds is most noticeable.

60. I Anything that looked like the Gulf Stream?

A No. Nothing I think I would want to define as such. I think with a little more time, you'd be able to distinguish things like this because I remember looking down in that area and saying, "Man, there's a real difference in color right there around that reef line."

61. I Do you recall at any time the sun coming in the window during launch or reentry and bothering you?

A Yes, it came in at one time, but didn't bother me too much.

62. I Was this during launch?

A No, it was while I was looking out for the stars. I thought it was coming in the left window.

63. I You didn't see it directly then? It was reflected?

A I was never bothered by direct sunlight at any time except prior to launch through the scope.

64. I You didn't notice it coming in the corner of your eyes during the rolling on the reentry?

A It didn't bother me. I probably did notice it, but I wasn't surprised or upset by it.

65. I At the time you were looking for stars out the window, was the capsule rolling at that time or not?

A No. I quit looking out the window when it became apparent that I was getting behind on my schedule.

66. I Did you notice that the sky did look real black?

A Oh, yes. I noticed this a couple of times. Once out that window and once out the right-hand window during the roll at reentry. Yes, it's very dark blue, the same sky that we've seen at 40 or 50,000 feet.

67. I You don't have the feeling that everything is dark outside?

A Oh, no. It's just the sky that's dark.

68. I Well, it's a question of degree, too. Do you think the sky looked dark enough that you could have seen the stars had you had a bigger window and enough time to look for them? Or do you think your eyes are acclimated to the amount of light you've got inside the capsule and that this keeps you from seeing the stars?

A On the basis of this flight, I wouldn't want to say one way or the other. There are so many things that enter into it; the reflected light, etc.

69. I This will probably have to wait until a later flight with a bigger window and more time to observe.

A Yes.

70. I Your impression though, was that of a dark blue and not of a black out the window?

A Yes, it's pretty dark blue, but no, it's not black.

71. I Did you notice a sharp color band at the horizon, a blue band?

A The horizon, surprisingly enough, looked just about like the pictures we have of it. I was looking at this time out the right window up in the area of Chesapeake and Hatteras and there was cloud cover in this area so I remember saying, "Well, it's not a real sharp line between the sky and the clouds." It was a little hazy, or what looked like haze. This was, of course, because it was a cloudy area up the Coast and it was masked in the clouds themselves. So there was no real sharp definition between clouds, haze layer at the horizon and sky. I think if there had been a pure land mass there, then you would have seen the difference between the land mass, this little haze layer, and then the sky. Now, we describe it as a haze area. I don't think it is. I think it is a layer of diffuse refraction, probably.

72. I Yes, sort of like seeing the atmosphere on edge.

A Yes.

73. I What about capsule lighting? Did you have full white lights throughout the flight?

A Yes.

74. I Was it adequate?

A Yes, it was adequate. I never felt the need for more light and I never felt blinded at any time. I didn't change it.

75. I How about this business of weightlessness? I think we ought to hit that one one more time. Just a couple of remarks. "Did the period of weightlessness have any unexpected effects on your feelings or performance?"

A No!

76. I Were you aware that you were weightless?

A No. As a matter of fact, I said to myself, "Well, OK, you've been weightless now for a minute or two and somebody is going to ask you what it feels like. You'd better stop and think what it feels like." In other words, I wasn't disturbed at all by the fact that I was weightless. I noticed a little bit of dust flying around, and there was one washer over by my left eyeball that I tried to grab and missed, so I gave up. I was not uncomfortable and I didn't feel like my performance was degraded in any way. It felt just like in the back seat of the F-100F's. When you're strapped in, it's a pleasant ride. There is

nothing uncomfortable about it. I didn't notice that my stomach felt any worse or better than it had prior to lift-off, or any more uneasy. No problems at all.

77. I When the weightlessness was over, did you see the .05g switch light before you felt the g? Or, did you feel a little bit?

A Oh, yes. I would say that I noticed the light before I noticed the g.

78. I You didn't notice any objects settling in the cabin?

A No. There wasn't that much.

79. I There wasn't that much junk floating around?

A It was pretty clean.

80. I You didn't mention, Al; possibly this is because you didn't feel you felt anything about the transition from the zero-g to high reentry g. Did you notice anything at this time?

A No, all the transitions were very smooth. I thought maybe at cutoff, I might have the feeling of getting thrown against the straps because you are going from a reasonable load factor, you know, to zero-g. But the tail-off of the main engine was so gradual there wasn't any sharp definition between six and 0. It's a lot smoother than the Centrifuge! When you get cutoff in the Centrifuge, the gimbal angle is stepped down and you're slammed around in there. In the capsule, all of a sudden, you get a light and hear a tower roaring away and there you are. No problem.

81. I In the Centrifuge, you are whirling when you are getting the g-buildup. In the capsule, did you notice any change in apparent dizziness relative to the Centrifuge? Did you feel just like the Centrifuge except for the rattling and vibrations?

A No, I'm glad you brought that up. You don't have any real feeling of motion. In the Centrifuge, you have that feeling of being whirled around and in the rocket ride, you don't. There is no feeling of unusually high rates of motion, during powered flight at all. Here again, the flight was an easier ride than the Centrifuge. We're getting away from weightlessness and I think I want to describe some of the other vibrations that were associated with the flight.

82. I Were the vibrations during powered flight a problem with any task, such as reading instruments, and so on?

A From the period of about 45 to 50 seconds after lift-off on through about a minute and a half, and we can check this on the tape, there was some vibration. I did say after the vibration was stopped that it was a lot smoother. Since I knew about when max q and transonic flight would occur, I knew about when this was going to happen and it sure enough did! I could feel vibrations building up, and the sound level came up a little bit until at one point, I'm not sure whether it was at max q or not, there was so much vibration in the capsule that my head was bouncing around so that the instruments actually blurred. Then, after we got through max q, everything smoothed out.

83. I Can you give any impression on the length of time that it was blurred? Ten seconds, 30 seconds, or what?

A It wasn't too long, Harold. It wasn't any longer than 10 seconds.

84. I We're now talking about the launch period; therefore, we're getting into Section IV. Maybe we can just run through this section and as we're doing so, ask any questions that are not clear, on the basis of what has been said so far.

85. I I think you said that you could discern booster cutoff and that it was more gradual than you expected. Is this a correct characterization?

A Yes, you are aware of several things. You're aware of the fact that the load factor has been removed. You're aware of the fact that there is a lot of noise from the tower jettisoning. By the way, I thought I might see smoke and flame passing the window, but I didn't. Or, if it did, it was so fast that it didn't impress me at all. And the third thing you notice which you are really looking for is the green light on the panel. So, you notice these things all at one time.

86. I Was there a vibration as well as a noise when the tower went?

A No, not that I noticed.

87. I Is there much noise after you're at supersonic speed? Did you notice a big change from when you were at subsonic?

A There is a gradual noise and vibration buildup just prior to going through Mach 1 and the max q region. After that, it drops off. I told Deke yesterday that I was really surprised that I could hear over the radio so well. I was fully prepared to throw full volume on immediately after takeoff, but I didn't need it. The noisiest part of the flight was when they purged the cabin before takeoff.

88. I Could you compare the general quality of the sound in the flight as against this record that we used on the Centrifuge? Was there a noticeable difference in the quality, pitch or whatever?

A I'd say that the Centrifuge record made more noise. I'd say if you'd turn the volume down, that would be all right.

89. I What went along with the separation of the tower clamp ring? What did you hear? What vibrations did you feel, and so on?

A I cannot define the difference between the pyros, the tower clamp ring and the noise of the tower itself. There are only microseconds between the two. I was not able to tell. Perhaps if I had been listening for it, there's a loud report and then a big roar.

90. I You did get both a bang and a roar though.

A No, I said I did not. Maybe I could have, but the thing I was looking for was that green tower jettison light.

91. I How about the capsule separation . . . the Marman clamp separation itself?

A Same thing. I was aware of the posigrade firing, aware of the g-load and of just one general noise pulse. I wasn't able to define clamp ring separation versus posigrades.

92. I Did you get a vibration at this point? Did you feel the g-load? Did it put a little load on you?

A It wasn't uncomfortable.

S E C T I O N C

ASTRONAUT DEBRIEFING

AT GRAND BAHAMA ISLAND

AFTERNOON SESSION, MAY 6, 1961

I InterrogatorA Astronaut

The following is the second session of the debriefing by the debriefing team at GBI on May 6, 1961, at approximately 2:00 p.m.

1. I We'll start off with the zero-g phase here. Was there any deterioration of visibility through the window as a result of escape motor firing?

A I couldn't notice any, and I looked at the windows later on and they looked pretty clean.

2. I Did you determine capsule separation had occurred immediately? How?

A Well, the case here, and also with the tower jettison, we had simultaneous cues, primarily because everything worked all right. The cues here are the noise of the rockets firing. You notice the noise and the slight acceleration that you get. You've gone through about two and one half minutes of "g" to cutoff, a gradual roundoff, and then you get a little kick in the tail which you are aware of, plus, of course, in both cases two little lights that you're looking at on the sequence panel light up. Since everything worked fine this time, these cues all came together, so that you're collectively aware of it at the same time.

3. I Could I ask one question? I just got a call from Tom Chambers and he said the indications seem to be that you didn't turn the manual control system off. Did you? In other words, when you went to fly-by-wire he thinks that you were both on manual control and fly-by-wire at the same time. Do you recall?

A I don't recall whether I did or not. I think I may have, but maybe I didn't.

4. I The records seem to indicate that you were on both.

A Well, maybe I was.

5. I He just wanted to get this clarified.

A I couldn't say definitely. I would say, offhand, that I probably pulled manual handle out, but I'm not sure.

Enclosure 6

6. I OK

A This might show on the film. But that would be out of the field of view, I guess.

7. I Probably so. There is one other question. It looks as though the tower sep initiator blew. Could you hear anything that could have been that?

A No, I just heard one noise. We were discussing that this morning. I wasn't able to distinguish between the clamp-ring noise and the rocket firing. There was just one rush of sound. I can't think of anything else that was a sharp report at any time that I can remember that was out of sequence.

8. I Those were the only things. Everything else was real plain, except the onboard voice which was of exceptional quality.

A It was. It didn't pick up the noise.

I Well, they said it was much better than at the receiver in Tel 3.

9. I Going back to the capsule separation. Were there any booster pitching, yawing, or rolling motions at that time?

A I didn't notice any at all at that time. The damping worked very well. There was no indication of any wild capsule motion after separation. Just about the time I decided it was working very well, the turnaround started.

10. I We're still on zero-g. Were the controls easier or harder to reach under zero-g as compared to one g?

A I'd say, if anything, quantitatively speaking, it's easier. I really didn't notice any difference. Qualitatively it's this way - you're able to reach any way you want to reach and to move the way you want to move. So I'd say a positive statement would be, we anticipate no problem at all reaching anything - it was not more difficult for me, if anything, a little less difficult.

11. I Could you hear or feel the PLD tape recorders or the cameras running?

A No, I didn't feel, hear, or notice them, but I took a look at them when they turned them on at takeoff. The only thing I noticed after that was that the light stayed on. I made no specific attempt to look

down at the recorder to see if it was still turning and, with all the other things going on, in order to check the cameras, you have to put your hand on them to be sure. I didn't make any attempt to do this.

12. I What items, if any, vibrated during zero-g?

A Vibrations during zero-g?

13. I Yes. Were there any? Did you notice any?

A I didn't notice any vibrations.

I OK

14. A Even when you've got the helmet on, there is a lot of noise inside the capsule with the inverters and gyros and everything going.

15. I You can hear the inverters and gyros whenever they are going?

A Whenever they're going you can hear them.

16. I Can you hear the inverters through the communications system?

A Well, it depends. If you have your volume control set so that you can receive UHF and HF, the slight background noise drowns out the inverter noise. But if you have the RF volume all the way down then you're conscious of the noise. I'm not sure whether the vibration is coming through the couch, or the structure of the capsule or not, but you definitely notice the noise.

17. I Is the inverter noise more noticeable than the compressor noise, or do you get any compressor noise?

A I didn't notice that the fan noises really bothered me at all. I guess they blend in with the overall noise level. That's not uncomfortable from the standpoint of a short voyage. I think that you've got so many things to do and listen to that you're not bothered by it. I think you sort of get used to it after a while because you've been in the cockpit, an hour or two, and you sort of get used to the noise.

18. I This sort of leads to the next question and perhaps you've answered it. Could you detect which components contributed most to the cabin noise during zero-g?

A I'd say here, based from experience in sitting in the capsule under one "g" conditions and hearing the gyros come on and off and the inverters come on and off, that the inverters actually make more noise than

anything else. And the fact that it's a lot more quiet in a rarefied atmosphere is not a function, necessarily, of zero-g. So I don't think the noise is really a function of zero-g.

19. I Could you compare the retrofire sensations in the actual capsule with those presented to you in the ALFA Trainer? Centrifuge? Procedures Trainer?

A Yes, we've already done that, but we'll run over it again. With respect to the dynamic functions, of course, we use only the Centrifuge for that purpose. As we said this morning, the Centrifuge provides a much jerkier ride. The actual retrofire case in the capsule is very smooth. You hear the noise of the rocket, you feel the vibration of the structure, you feel the g input, and you notice the capsule being slowly turned by the offset of the thrust axis. Dynamically speaking, for the moment, it's a lot easier in the capsule than it is in the Centrifuge because it really jerks around as it is programmed. Now, from the standpoint of comparing the moments, I would say that those we've used in the ALFA Trainer at Langley and the Procedures Trainer at Langley are just about right for practice. They're a little more difficult than the actual maneuver itself. The Procedures Trainer at the Cape has a smaller fixed offset input, and we should do something about beefing that one up. It's not enough of a training maneuver for the actual retrofire itself.

20. I We should beef that one up? (retrofire misalignments on Cape trainer)

A Yes, it's a little too low.

21. I OK. It's too low for training purposes, but is it about the same level as you got during the flight?

A Probably about the same. It's really pretty hard to tell because when you control retros, you don't really control qualitatively. You try to watch the attitude and rate and hold them all as close to the desired values as possible and you have no idea what moment or input you're sticking in there. From the way the rate needles reacted I would say the moments are probably about the same as the Cape trainer. But in view of this I think we ought to go to a higher level of offset for practice. As I said this morning, I noticed that I got a little bit off in pitch, but otherwise I felt like I was controlling it fairly well.

22. I When you were telling people that you were going to the manual pitch axis and manual yaw axis, did you wait until after you had said you were going before doing so?

A Yes.

23. I This is another question that Chambers had. Thomas Chambers of Flight Systems Division analyzed the attitude control systems. He said he wasn't clear on whether the voice report preceded the action in each case. In other words, your comment always preceded the act?

A Yes. Preceded my act. The ASCS worked in the other channels while I was controlling on manual.

24. I While we're on this question, is there any difference in your controlling on the ALFA and the Procedures Trainer? The ALFA provides the actual motion. Does this make it more like what you did during the flight? Can you comment on this?

A I don't know. The rates are fairly slow to start with on the ALFA trainer, and I do get a cue from the g on this Trainer. Since when you go over your side in yaw you definitely feel you are being pushed to one side of the couch. I definitely felt this was a cue, but from a standpoint of controlling from the scope or the horizon reference it is a lot better than the Procedures Trainer. It is a dynamic trainer. I didn't mean to indicate that it is not. From the standpoint of scope and horizon controlling, I think it is definitely worth practicing on.

25. I I'd like to pursue that just a little bit further. Admittedly, the attitude cues are wrong in that trainer, but it does have angular acceleration. The question is, I think, were you aware of angular acceleration cues at zero-g?

A No, I was not.

26. I You were not. Was this because they were too small or was there something connected with zero-g?

A I think because the rates were too small to detect.

27. I Because they were too small to feel or below the threshold. OK.

A I think I remember telling you this morning that you do notice the capsule is moving.

28. I Yes, you told us that.

A If you consider the angular acceleration, I'm not sure you notice it but you are aware of the view shifting in the periscope and maybe you are actually getting some kind of communication also. Maybe a combination of both.

29. I You felt the linear acceleration, in any case.

A No question about that.

30. I Reentry phase. Did any capsule components vibrate excessively during reentry?

A I don't recall anything vibrating. Your attention during reentry is primarily focused on the instrument panel and if any of those relay boxes or anything in your peripheral vision were vibrating I don't think you'd notice it.

31. I When did you first look at your accelerometer during reentry? What was your first cue of g?

A Well, of course, the .05g relay was my first cue, but again the g build-up occurred a lot sooner after the .05g relay than I thought it should have. I think this is because of the wrong timing on the trainer. But the first indication was the feeling of the g load coming back on. Then, of course, I went to the accelerometer.

32. I Were there any oscillations of the capsule during reentry? Could you estimate their amplitude?

A No, because I was controlling rate primarily. The amplitude, I would say, was on the order of a degree or less and the rates were varying prior to peak g from 2 to 4 degrees per second, plus or minus. This was the limits of oscillation of pitch. Then, of course, they went against the stops when the amplitude increased and the frequency decreased. The amplitude was greater after peak g, but what it was exactly in degrees I don't know. I was going back on ASCS at that time.

33. I Were you aware of any lateral accelerations during reentry?

A No, the only acceleration I was aware of during reentry was in the longitude axis. I wasn't thrown around inside or anything of that nature.

34. I You weren't pushed around the sides of the couch or anything of that nature?

A Couldn't feel that at all.

35. I I think we can go on to landing. I think he has already described the drogue opening shock, has he not?

A Yes. And because the capsule is more stabilized at this time, there was a little jerking motion that threw me around in the seat. It was just the load factor, the transverse load factor in the longitudinal axis.

36. I Did you see any chaff?

A Didn't see any. Didn't look.

37. I Did you hear the drogue mortar?

A Yes.

38. I Did you hear the antenna mortar?

A Yes.

39. I Could you hear the ejection bag inflate?

A No, I didn't. I wasn't able to distinguish that particular noise.

40. I Did you hear the opening of the main chute?

A No. I don't think I could say that I could. I felt it, of course, and watched it, but I can't say I heard it.

41. I Did you see the chute at full inflation?

A Yes, I would say probably three-fifths of the chute area - over half anyway.

42. I Could we ask about the chute g phase? I think you've already mentioned that you felt it, but was it a pulsing shock or just a single shock?

A It was a smooth input, I believe. I wasn't looking at the accelerometer at that particular time. I was watching the canopy.

43. I I'm sure you were.

A What it was in terms of g's you'll have to look at the records to find out.

44. I There was no relative rotational motion between the capsule and the chute?

A I didn't notice any.

45. I Was the chute canopy stable?

A Yes, it was and very little pendulum effect, just enough to be noticeable. Not disturbing at all.

46. I At what time did the skirt deploy relative to main chute deployment?

A Landing bag? I think it was just about on time, 10 or 12 seconds after main chute. I remember looking at the chute for quite some time and then glancing down and the landing bag light came on about that time.

47. I Did the heat shield drop have any shock effect?

A Didn't notice it. As a matter of fact, I don't imagine it would come down too far in the airload. I don't imagine it would come down and drop all the way like it would do under a zero airload, one "g" condition. As a matter of fact though, we are pretty well slowed down here, so we should have felt something. It wasn't enough to give me a start, since I didn't notice it.

48. I Well, I guess the bag has got to fill up with air, doesn't it? This would take some time and tend to ease any shock.

A It might. It was probably there. I just didn't notice it.

49. I What was the capsule attitude at impact?

A I wouldn't even want to try to estimate the attitude because I didn't have a good reference. I could look out the window and occasionally see the water out the right window when I would swing out to one side. I was aware I was getting close to impact, but just exactly where it was in this swing when I did impact I couldn't say.

50. I Let's pursue that one a little more. Could you tell beforehand the impending impact? Could you sense about when you were going to hit, or was this totally unexpected?

A Well, I knew within a few seconds from watching the altimeter. Insofar as looking out the window, that particular porthole doesn't give you much of a reference.

51. I How about the periscope? Were you looking out the periscope at that time?

A Yes, but you can see too much and it is so distorted close to the edge of the scope. I didn't see any airplanes out of the scope until after I had hit, but I saw the choppers through the scope after impact.

52. I After impact. But you did not see any of the choppers or airplanes before impact?

A I didn't see any airplanes before then.

53. I You couldn't tell whether you had any horizontal velocity or not, could you?

A You can't tell about drift.

I Did you get any cues, Al, from the restraint pulling against your body at impact - if there were any other vectors other than those pulling down?

A Yes. We mentioned that this morning. You are pushed down into the couch with a pure vertical load and shortly thereafter you go off to your right side. You get a fairly low-order deceleration there. Then it goes over to the right side of the couch in the water.

I Almost all of yours was vertical.

54. I There was no indication to you that the heat shield had impacted under the bottom of the capsule?

A No. There was a lot of water noise when the capsule hit the water, but I didn't notice anything I could describe as being impact on the heat shield.

55. I Were you airlifted before the whip antenna was extended? You were, were you not?

A No. We flew with the rescue aids switch off, as you know, to get around possible malfunction of the impact relay. After impact, I turned rescue aids on and the HF antenna came up at that time. It was definitely up when I got out of the capsule.

I Well, you know there's a time delay of about 150 seconds.

56. I Did you see the antenna?

A It was sitting up by the time I got out of the capsule.

57. I Did the chopper snip the antenna?

A Well, I've never seen one that is not snipped. How tall is it?

58. I About 15 feet.

A Well, they chopped part of it off because it wasn't that long.

59. I This was a question that was asked. There was about 7 feet missing. They didn't know whether it was snipped off or whether it was blown off.

A Well, they didn't say whether they had snipped it, and I didn't get a chance to talk to them. It was not 15 feet long.

60. I Could you tell whether it was snipped?

A Well, I would think so.

61. I You haven't seen the end yourself?

A No, it wasn't 15 feet long, I'm sure of this.

62. I Did hitting the water feel like anything else you've ever felt before?

A What you're getting at is how severe is the impact?

63. I Yes. Generally, is it severe enough to really shake you up?

A No. I don't think it was a real violent impact at all. It was just about what I expected in the order of 4, 5, or 6g and maybe a lateral load of 2 or 3g.

64. I How would you compare it with a carrier landing?

A I'd say it was about the same. Peak g for a carrier landing is about 4g.

65. I How about a catapult takeoff?

A It wasn't as abrupt as a cat shot, from the standpoint of being slammed around.

66. I You would be immediately in control of the vehicle at that time?

A Yes, I didn't feel like I was knocked out or dazed. I may have been but I wasn't aware of it. I'm pretty sure I reached over and threw the rescue aids switch just about as soon as the thing settled down and stabilized.

67. I Did you notice any deficiency in the status of training relative to capsule egress?

A No. As I indicated this morning, I felt real comfortable about going out the door if I had to. Since the chopper came in so soon, I never even entertained the thought of removing the right panel and going out that way. I never felt like I was trapped or in trouble at all.

68. I Was adequate information obtained from the recovery helicopter to allow you to decide to egress? Obviously, yes.

A Yes. The procedures we had planned, preflight, of course, had been laid out and agreed to. As a matter of fact, the fellows that picked me up were the same ones that developed the procedure and had picked me up before in the bay at Langley, and so there wasn't any problem here and I understand that they also briefed the rest of the chopper pilots pretty well so there wouldn't be any problem all the way downrange. Communication was established with them over UHF on the butterfly antenna almost immediately. They called down and wanted to know if I was ready to come out and I said "no" for two reasons: one, it looked like the window was still under water so I asked them to please pull the capsule up a little more; and, two, I hadn't disconnected all of my harness. So they said "OK, we'll pull it up a little more," which they did, and I started disconnecting the leads and coming out. But in any event, even if we had not had communication, the fact that they hooked on is apparent inside the capsule. You can hear the noise and you can feel the capsule come upright, and I think as soon as the water had gone out of sight of the window I would have opened the door and come on out. I would have worked out all right without communications but it's still nice to have them.

Did I make the comment this morning on recovery that I thought the operational procedures and training worked out very well? There was no confusion in the recovery area, either from the standpoint of relaying back to Deke at Tel 3 or from the standpoint of general discussion with the recovery forces. That procedure that we used - don't speak unless you're spoken to - worked out very nicely and they abided by it very well. So that should be a part of the report.

69. I This is evaluation of capsule systems operation. Comment on your suit. Do you suggest any changes? I think we mean rather obvious ones here.

A I found that the general suit comfort was good for me. As Astronauts Scott Carpenter and D. K. Slayton know, we have a harness that goes around the shoulders which I did not use. I just put on the parachute harness and found that, pressurized, my mobility was good. I was able to get in and out of the couch all right with it that way. This applied only to flight where they used the parachute on the right side. From the standpoint of the other harness which provided for use with or without a parachute harness, that was pretty satisfactory also. General suit comfort and mobility was very good. The leak rate was within the specs. There were no pressure points as a result of the suit. I would relocate the pressure gauge. The left wrist pressure gauge is difficult to see when you're strapped in and you have your left hand on the abort handle. You can't see it, and to raise up to look at it is difficult under acceleration loads. So I think we'll have to try to find another place to put it, maybe up on the knee, somewhere where it will be

easier to see. In the spec capsule we had the suit pressure gauge on the panel. This gauge, then, becomes a backup. Even so, we ought to put it where we can see it. I would feel a little better. I did have some circulation problems at the ends of the fingers because of the rubber cots on the ends of the fingers of the gloves. You just have to keep pulling them away from the ends of your fingers to maintain a certain amount of circulation which I think is something you probably can't help. The helmet was comfortable. I had modified my helmet. I cut part of it off and I was glad to have the additional vision. Outside of that, I think it was real good.

70. I Any obvious changes in the parachute harness?

A The parachute harness, I think, is fine. Mine was modified since they found that the stitching took up some of the length of the straps. So the one which I had, had a little bit of additional material to take care of the shortening due to stitching. It was comfortable since it was long enough, and I had no problem with it.

71. I Comment on your couch.

A No strain on the couch. It's comfortable. I had no pressure points as a result of the couch except a couple up in my shoulders. We may have to ream the couch out just a little bit more in that area. These were minor pressure points. No petechia on the back as a result of anything pushing in to me from below during the g phase of the flight. We put, as you know, that foam rubber liner in the bottom of the couch. That was sufficient but we found that the production foam underneath the helmet was not enough. You picked up some vibrations when the helmet would run back against the headrest so we filled the whole area with foam rubber to support the helmet, and the only time I got any vibrations was when the whole thing was shaking. Outside of that, it was fine.

72. I With regard to the ECS could you hear the fans?

A Well, you notice the fans when you turn them on because you are listening for them, in the case of the cabin fan. In the case of the suit fan you notice it because you wait until you feel the flow of air through the suit. Once I had established the fact that they were running, I didn't pay any attention to them any longer.

73. I Any change in fan operation?

A No. No apparent change in fan operation.

74. I Well, I guess there wasn't any noticeable overpressure in your suit. Your suit never tried to pressurize?

A No, it never tried to pressurize after we once made the pressure check on the gantry.

75. I How about negative pressure in your suit? Was there ever any?

A Yes, I'm not sure it's particular to my suit, but I've always had just a little tendency for the material around the neck to come in against my neck when I inhale, so I'm sure we're operating at the ragged edge of 2 inches of pressure differential right there at the suit outlet. It never really choked off the flow, but you could always feel it coming in.

76. I Did this bother you any?

A No. I think we've got to live with this system unless we drastically change the suit pressure regulator to provide a positive pressure inside the suit with respect to the cabin all the time.

77. I Could you hear the demand regulator?

A No.

78. I Could you hear the oxygen flow through the helmet exhaust hose?

A Yes.

79. I Was it annoying?

A No. It was very comforting.

80. I It doesn't interfere with communications or your ability to concentrate?

A I don't think it did. I understand that the voice came through fairly well throughout most of the flight. As far as I was concerned it didn't bother me.

81. I You never did use the emergency oxygen?

A Never did. It came on, of course, when the inlet snorkel opened up. I don't remember noticing any sizable change in the cooling flow. I don't remember being uncomfortably warm any time after the emergency flow-rate came on while I was in the capsule. I always felt comfortable. Once I disconnected the suit and was charging around getting into the sling, into the helicopter, and going back to the ship. I was pretty steamed up by the time I finally got down and got the suit off. But while I was in the capsule I felt comfortable at all times.

82. I After you were in the helicopter, did you have a way of ventilating the suit there?

A I did. I could have unzipped it which would have been enough. But we were so close to the ship that I chose not to.

83. I I see. But no one carried a portable ventilator out to you?

A No, but I was in good shape. I took my helmet off before I came out of the capsule, and I could have unzipped the suit if I had wanted to at that point.

84. I Would it be worthwhile in the future flights to carry one of these portable ventilating units?

A I don't think so. If you get uncomfortably warm you can unzip the suit and take your gloves and helmet off. If you get in trouble at that point, the crewman can help you take the whole rig off right then and there.

85. I Were you aware of any of the biosensors? Why?

A No, once you get them on you're not aware of them.

86. I How about this cannon plug on your right thigh? Did that get in the way or bother you?

A It didn't bother me at all.

87. I Then you do not have any suggestions for modifications or changes?

A Only that the stuff used to apply the sensors is apparently giving some people skin trouble. I've got a small infection on my chest as a result of the application of this stuff. Bert North and Gus have had the same problem. I don't know whether it's in the rubber cement that they're using or whether it's the chemical compound, but it is giving us a little problem.

88. I Did you notice whether the clock stopped at any time during the flight?

A No, I didn't. I thought ahead of time that I was going to watch that little rascal, and I also had in my mind that the clock I was going to use was the aircraft clock which I punched at lift-off. We found that the counter of capsules 5 and 7 did actually stop. I didn't really look at it at all. It may have stopped, but I wasn't aware of it.

89. I In other words, you didn't refer to the digital counter?

A No.

I We had a tentative report yesterday that it did not stop during exit, but that it did stop for awhile during reentry.

90. I Did the roll, pitch, and yaw position indicators function properly at all times? In other words, was there any gyro tumbling, did any of the hands go to full deflection at any time?

A The rate indicators, as far as I am concerned, functioned properly all the time. The attitude indicators functioned properly for as long as I watched them. Of course, I watched them up through positioning for reentry. At this time, I controlled rate and once the .05g relay latched in - roll started on the ASCS. Then I paid no further attention to the attitude indicators as such.

91. I So you probably wouldn't have noticed if the gyros had tumbled. They probably did inasmuch as the capsule was rolling after that.

A Well, this is a point that is different between the trainer and Capsule 7. The attitude indicators cut off at .05g in the trainer but stay active in Capsule 7 all the way to 10 K. Even though you know they are active on the way down, you don't look at them, and on manual control on reentry you're always looking at rates and not paying any attention to the attitudes. That's why I didn't specifically notice them. Other than that, whenever I needed them, they performed properly.

92. I Let's get to the reaction control system now. Do you have any comments on this system in addition to those you've already made?

A Well, let's see. I discussed, I think, the fact that, on occasion, I was aware of the noise of the jets primarily when the high-thrust jets were working. On other occasions, I wasn't aware of it at all and I noticed the reaction of the capsule by the visual cue of the scope or from the instruments. This indicates to me that if you're in a high-thrust level, you can hear it inside and if you're in a low-thrust level, you can't. The internal noise is just about the same at your ears as the other external noise. I didn't have any problem at all with the stick forces. There was plenty of adrenalin working and any time I wanted to move the stick, even though I was obviously bumping into the parachute with my right hand, I didn't have any trouble. I didn't always move it in the right direction but any time I wanted to move it, it moved fine.

93. I I guess this question is more applicable to an orbital mission where you're worried about an hour and a half rather than a couple of minutes.

A I do comment about the microswitches. I think, particularly down at the Cape, they're aware of what problems we have with respect to ringing in the microswitches of the fly-by-wire and friction of manual system. I was going to try to work the control handle on the way out, to find out whether or not varying load factors had anything to do with friction in the system, but unfortunately I didn't. The first time I tried it at zero-g it was free with no additional friction that I could notice. Here again, because of the microswitches, I had a tendency to overcontrol on fly-by-wire. Manual, I didn't seem to have much trouble. I didn't always control the right way but when I did what I wanted to do, I didn't have any trouble doing it.

94. I Did you notice overshooting, then, when you were on fly-by-wire? The point that Chambers is making is that if you were on both manual and fly-by-wire you should not have overshoot.

A Well, I wouldn't say this was true because when you displace the control stick from center, you don't always get the low thrust (the one or six pound thrusters) but sometimes you get the high and before you want it. Whether or not I was in manual and fly-by-wire simultaneously, I still got more rate than I wanted and I think this is primarily a function of microswitch position rather than the addition of manual proportional.

95. I I understood the switches were not set up according to design.

A They were set up the best they could do and we decided to take it as it was.

96. I Do you think your difficulty was due to an incorrect setting of these switches or do you think it's just the basic system of having a low thrust and then a much higher thrust?

A I think it's probably the basic system, but I think it's something we shouldn't change around now since my complaint is a low order complaint. I'd much prefer to using it as a backup system for the manual control using the automatic jets than I would to cross-connect the manual and the automatic, for example. So this is a low order notation and I think we ought to try to get the microswitches as close to specs as we can and just accept it that way.

97. I One other thing along the same line. You, of course, had quite a bit more experience training with manual proportional than with the fly-by-wire control system. How much of this difference of ease of control do you think could have been made up through more equal training on the two?

A Well, it might be better if you tried a little more fly-by-wire. You could be better prepared.

98. I What I'm really trying to find out here is for future planning. As far as ease of the man using a control system, would you say it was easier to use a proportional system than the fly-by-wire system, or does the fact that you do better on the proportional system stem mainly from the amount of practice you've had with it?

A Well, you've got to describe the requirement first. If you're talking about maintaining an attitude using small rates, then the manual is easier, and practice on the fly-by-wire would be a prerequisite here. If you're talking about preparing for reentry and holding position during retro when you're calling for the much larger stick deflections and rates, then it doesn't make a bit of difference, I don't think. Because you're pulsing the stick, (at least I am) to take care of a rate and the fact that you're getting full manual or full automatic thrust as a result of the high-thrust microswitches being depressed wouldn't make any difference. I think it would be more profitable to practice using fly-by-wire for retrofire control although I didn't use fly-by-wire for controlling retros since there isn't much difference when you're calling for large rates. And so you don't notice the difference as much in this situation as you do when you have to have fine control.

99. I Except for the time when you were looking out the periscope identifying things, during which time you weren't doing much maneuvering, you did use the instruments almost entirely during the flight. Did you remember any time when you were controlling using the periscope as a reference?

A Not primarily, no.

100. I You occasionally glanced down at it, but it was never your primary reference?

A I wasn't using it for a reference.

I It just gave you a cue to the fact that you were moving, but you weren't trying to get a position on it.

101. I Was there any leakage in the coolant tank of the circuit?

A Didn't notice any.

102. I How about the periscope reticle light? Was this adequate, or did you notice?

A Never needed it. There was plenty of light inside and outside all the time.

103. I What was the relative noise level in audio? Would you say it was low and how would you describe it?

A Well, I don't know how to describe it really.

104. I Did it bother you?

A No. As I said before, the noisiest part of the flight was when they stuck the hose in the door and purged the cabin. I think the noise probably does mask a lot of these other little noise signals that you were asking about, but the fact that they are masked doesn't disturb you because you have other cues as to what is going on.

105. I Did you hear a 400-cycle or an 800-cycle tone? Was this prevalent? Or was it just one noise?

A It's the tone coming from feedback somewhere in the system. There was a very high tone. It was pretty far up in the audible range. What the frequency of it was, I don't know. This was apparent in the headset and not over RF because I turned the volumes up and down on the command, HF and UHF receivers when the capsule IM transmitters were on and I thought well, maybe it's feeding across into RF on one of these sets but it was not. It was coming directly into the headset from somewhere. It was of such a nature that it wasn't disturbing on the flight, but it had been fairly high in some cases on the pad and I'm not sure we know exactly where it's coming from.

106. I Was RF interference noticeable?

A Do you mean from some area?

I Well, I think they were probably referring to this reentry bit. Deke, maybe you can tell us.

107. I Well, from about T-135 minutes on, there shouldn't have been any RF. We had some at T-80 and from there, there wasn't any until recovery. So I think you could say there wasn't any RF interference during the flight phase of the mission.

A The only extraneous noise I noticed was general background noise on UHF which you take care of by adjusting the volume so that it just

blends into the inverter noise of the capsule. There was one spurious call of unknown origin and also the background noise built up during reentry. That's all. On the command receiver, when there is a command carrier on, the background noise is cut down. You can hear the background just dropping out when the carrier comes on.

Blank from 565 to 617 (This in Shepard's writing).

108. I Can I digress here a minute? It's along the same line. Don't I remember that Capsule 7 was accepted communications-wise as suitable only for a ballistic flight?

A Yes.

109. I Do you still feel this way about it in view of the fact that we have this special capsule test going on in St. Louis on Capsule 6 (I guess) or do you feel it would be satisfactory for an orbital flight?

A Well, as far as I'm concerned, it's satisfactory for a ballistic flight because we've had good communications back and forth from Tel 3 direct through GBI and through the relay airplane. I don't know whether we receive HF or not. I understand that somebody received the capsule and we just made one short HF check.

110. I I got the word yesterday that they heard you on the Pacific Missile Range on HF. I know that you went to HF. The only time you went to HF was that in flight?

A In flight. Just prior to .05g. Also after 1.0K, you're actually modulating whichever radio you select on your transmit switch and I kept it on UHF.

111. I So you didn't use recovery HF?

A No.

112. I Deke, in Tel 3, didn't UHF transmission break up pretty regularly?

Deke: No.

113. I Not broken at all?

Deke: We lost signal right after he came off the high g pulse. We didn't switch to GBI hard line. As soon as we lost signal we called down to GBI to find out why he hadn't switched us to hard line and at that time he switched us. He was loud and clear from that time on down to mainchute. Then we lost him again.

114. I During powered flight was it solid with no breaks at all?

Deke: Yes.

A We had this trouble with Gus once before, in one of the '106's. I don't know which one he was flying. The antenna is fairly directional.

115. Deke: I wouldn't feel that 7 was satisfactory as an orbital capsule, at least on UHF reserve. This was horrible.

A No, we never got the reserve UHF to work very well. We took it the way it was. To specifically answer your question, man, after a lot of talk. I think we ought to continue to try to improve the communications system from the standpoint of the interference noise. As you know, some of the onboard recordings haven't been good, not very good at all. I think the fact that the onboard recorder is affected more from the background noise and vibration than the helmet, is probably the reason that this capsule sounded better with somebody in it. So I think we should still continue to try to find out where all this cross talk is coming from inside the capsule. It will be to our advantage in the orbital case, I'm sure.

116. I While we're on RF I've only heard you mention one setting you used. I think you mentioned you started with volume setting 7.

A I used five primarily around the pad area, and then I went to 7 for the flight. I thought I'd have to go all the way, but as I mentioned, I didn't.

117. I Did you stay at 7 generally then throughout the flight?

A Yes.

118. I How about this question about reaching the controls? We heard you report that you were a little afraid to make the change on the filter on the periscope and you had difficulty turning the yaw handle on the manual controller.

A That was not a function of reaching, it was a function of bumping into the parachute.

119. I Yes. Now, were there any other controls that you had difficulty in getting to?

A Well, I think the parachute also makes it difficult for you to reach the voice-operated relay sensitivity knob. We set that before flight, but if it becomes too sensitive and is not working, you can always take

the little cocktail shaker stick (the swizzle stick that we have) and reach over the top of the parachute and switch it off. The fact that we couldn't reach it didn't give us any trouble. I had no difficulty in reaching anything else that I can think of right now.

120. I When did you open the manual shutoff valve? Remember, you were going to keep that closed so you could exercise the stick during powered flight. You said you forgot to do that exercise.

A We lifted off with the manual valve pulled out and off. The three ASCS handles were in. After capsule separation we put the manual valve in at that time and pulled out pitch, yaw, and roll ASCS handles successively. I made no change then until after retros were fired, at which time I went to fly-by-wire and pushed the three ASCS handles in. I thought I pulled the manual out at that time. Maybe I didn't. Then I went back to manual again after .05g, after roll rate had already started. Then went back and pushed all the handles in and left them in so the peroxide would dump.

121. I Were any fuse switches changed to the alternate switch positions during the flight?

A No.

122. I Did you observe any structural deformations or hear any noises that could have been caused by structural deformations?

A I sure didn't notice any. I don't remember hearing anything or noticing anything at all. I think there may have been some there, but this is a general comment. I think, with respect to noise cues of that sort, unless it's a spurious one you don't necessarily notice it because your attention is elsewhere. Also, you have this ambient noise level which tends to blot out small sound cues.

123. I Did you notice any response of the capsule as a result of arm movements? Or of your own body movements?

A I didn't notice any.

124. I Was there too much standardized talk procedure to perform?

A No! With respect to the RF I think we had just about what was needed. In this particular flight we described all sequences of events and got their confirmations back from the ground. The voice procedures, our procedures for check-offs prior to lift-off were very limited and satisfactory. Voice procedures after landing in the recovery area I thought were good. Surely from the standpoint of this flight I think

this was just about right. Trying to look to the orbital flight, I think we're probably in just as good shape there. I think with practice we can go over a quick status report that would satisfy everybody's requirements as we pass over a station. I think we're going to be all right. As it stands now, on yesterday's flight I had no real feeling that I wanted to talk only to the onboard recorder, that is that I would like to have given a lot of information off the air. But I think on an orbital flight the only way we can do it now, is to turn the transmit switch to the off position and speak into the recorder. Whether this is going to be satisfactory or not, I don't know. We'll have to talk this over. I think it probably is because there are going to be times during an orbital flight when you will want to put information on the tape to jar your memory later on, and not want to use up power to transmit. I think this is the way we will have to work it.

125. I Would you have preferred a more impromptu procedure for reporting your flight impressions during the flight?

A No. I think the people on the ground have to know pretty much what you are going to say and you have to stick pretty much to a standardized format. It can vary some, but it's got to be something people are familiar with, otherwise you'll waste an awful lot of time.

126. I On an orbital flight where you have a lot more time would you prefer to have a bigger proportion of it to yourself? I mean for you not to be forced to make reports very often?

A No. I think it is important to make reports. To me, anyway, it is important because it forces me to read or cross-check the panel and maybe I haven't done it recently. It is important also to the people on the ground to reassure them that the T/M is correct. So I think we've got to live with voice reports and I think that for efficiency they should be of a standard reporting form. I think when we get some of our controllers working together in the orbital flight case with the equipment we have back at Langley and at the Cape, we can get these reports in a standard form. This is going to fulfill that requirement.

127. I Would you have liked to be informed about how the booster and the ASIS were performing in real time?

A Well, I got everything I needed to know. I think all I need to know is the fact that the trajectory is OK. Well, since you can't do anything about the booster except get away from it, the only thing you want to know is that trajectory is or is not within nominal limits. I don't think you really need any more information. That's all I needed yesterday. The fact that it was looking good was reassuring enough to me, to enable me to look at what I needed to know right inside. Now, you're

going to talk about controlling the booster, obviously you've got to have more. If it's just a question of seeing it and believing it and the fact that it's good or not is plenty.

128. I Would you like to know from the ground what the capsule attitude is?

A I'm not sure I understand the question.

129. I In short, were you able to assess properly the operation of all the capsule systems by reference to the onboard instrumentation? Or even shorter, was the instrumentation adequate, the onboard presented to you, as far as you were concerned?

A Well, let me reinterpret the question for you the way I look at it. I don't think you need to know the proper operation of all the capsule systems prior to an Atlas flight. There are some systems, the malfunction of which would cause an abort. You decide these by looking at ground rules, before you go. Insofar as the abort criteria for the Redstone flight, we had no problem at all really. Insofar as the abort criteria for the Atlas flight, I think we are still talking essentially about a couple of systems. We're talking about the peroxide quantity and we're talking about the oxygen quantity, talking about electrical systems, primarily the isolated battery and the main bus. My answer to that question is definitely "yes". As for anything else that would malfunction, after insertion in the orbital case, the backup is plenty to take care of one orbit, so I think there is no need to provide additional instrumentation to enable us to decide go-no-go for the orbital case. I'm thinking now about Capsule 7 and it didn't have enough instrumentation primarily with respect to the oxygen as you know. There was no way to determine what is happening to the main bottle quantity until it is gone. That is not good enough for an orbital case, but for the spec capsules of course, we have gauges and transducers on both bottles. So I think we're OK here.

130. I So nothing new arose as a result of the flight with regard to the instrumentation itself? The instruments not only were there but they were adequate, you could read them and so on?

A There is a little "sound" here which I think all of us are aware of, but maybe you people are not since you haven't worked too closely with us at the Cape. But the peroxide quantity, for example, when it should be reading zero, it is reading 70% or 65%. So if you're going to be in a capsule you've got to know these idiosyncrasies and place little marks on the dials for reminders if you need them.

131. I This is being corrected. This should be the last capsule you fly that will be this way.

A Well, in that case it's still a good comment. Before you're going to fly a capsule you ought to spend some time at the Cape with it, because of these little things that crop up. If you know about them you can cope with them. That's a long answer to the question which should be "yes."

132. I Would you like to know when all major capsule events have happened from the ground?

A The way we have been doing is using the capsule as the primary originating source and within a few seconds after a sequence is supposed to have happened, he describes if it has or has not happened with the action he is or is not taking. If he doesn't do this, as in the case of when I was trying to figure out what to do in the case of retro-jettison, Deke came in and said he had the signal on the ground. So it's got to be a two-way contact here and use the capsule as the basic originating reference with a confirmation from the ground. It's adequate and we didn't have any trouble.

133. Deke: Basically, information comes from the capsule to the ground with ground as a backup.

A Even in the case of the use of a manual override, for example, in a sequenced event, it's interesting to know at that time that you've used it, but it's unnecessary. All you have to know on the ground is that the event has occurred and in the proper sequence.

134. I Were you adequately briefed on all phases of the mission?

A Yes, I certainly was. I don't know of any complaints at all in that respect. As a matter of fact, I was more than adequately briefed. Everything was handled very nicely.

135. I Were you at all in doubt about our recommendation that you go to standby inverter before lift-off?

A It was a little surprising and I wanted to think about it a few minutes. The fact that you essentially had the same line of thinking that I did was certainly reassuring. I felt happy about it.

136. I We were a little leery of Purser recommending it because it was a change from our established procedure.

A I think we are maybe a little more flexible here than we think we are because we practice some of the failures on the Procedures Trainer. What I was afraid to accept was loss of fans buss, but I decided I didn't need the lights and could go to emergency flow to take care of the loss of fans.

137. I Is the present debriefing adequate in your opinion?

A Yes. I think after we finish up today, I've given you just about all I can without referring to some other outside source. All this information has been primarily from memory, and if we want to get any more, we've got to have some other cues.

SECTION D

ASTRONAUT DEBRIEFING

AT LANGLEY, JUNE 21, 1961

ASSESSMENT OF PREFLIGHT TRAINING PROGRAM

This is Shepard using the Astronaut Debriefing Form, page 21.

1. Were you sufficiently trained for the mission? Explain.

A The answer is yes, I was sufficiently trained for the mission. As a matter of fact, because of the inherent slippage in the flight program, I feel that all seven of us were sufficiently trained several months prior to the fifth of May. This answer I would like to qualify further by saying that the training actually produced a feeling of self-confidence as well as the physical skills necessary to control the vehicle.

2. Has your flight experience pointed up any areas where you felt you had no training and needed it?

A The answer to that is no, the flight uncovered no unexpected areas. Here again, I think we were over-trained rather than under-trained. The physiological sensations I was well equipped to handle. The control of the capsule I was well equipped to handle. Of course, there were no unusually large rates developed during the flight, so with regard to this orientation I can make no concrete comment. However, the general answer to that is I found no time during the flight did I run into anything unexpected as a result of having prepared for it using our training program.

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? Orbital task? Retrofire task?

A I find that, with respect first to the ALFA Trainer, in the case of using the periscope for attitude control, the moments under the actual flight conditions compared to the ALFA Trainer were just about identical. The reaction of the capsule on the manual control system, general attitude control, were very close to those observed on the ALFA Trainer. This comment applies also to the orbital task insofar as I was able to investigate it and the retrofire task. The dynamic response of the

Enclosure 7

ALFA Trainer with respect to a manual input is almost identical to that experienced in Capsule No. 7. As a result, I feel the ALFA Trainer is very worthwhile in developing the skills necessary for control on the periscope and I'm sure in the next flight, when we have a window for control, we will find it to be equally valuable. With respect to the Procedures Trainer, in comparison with Capsule No. 7, I don't think that it was as worthwhile as it will be on later capsules, primarily because the arrangement of the instrument panel, the knobs and levers, in the Procedures Trainer differs from Capsule 7, which of course is an early production capsule. I feel, however, that the procedures developed in meeting emergencies, in using manual override, and general observation are indeed valuable, and I think that for later capsules, 9 and subsequent, we will find that the Procedures Trainer is one of our most valuable aids in preflight training programs. It is also valuable in training flight crews with ground control crews, specifically those at the Mercury Control Center. Voice procedures, talking the same language, investigating emergencies under simulated conditions using the Tel 3 crew and the Procedures Trainer at the Cape are going to provide us with a great deal of valuable training. The third item under Question 3, with respect to the Centrifuge, the Centrifuge does not prepare one too well for the manual control task. The Centrifuge primarily excels in preparing one for acceleration. So therefore, with respect to the orbital case and the retrofire task, I don't feel the Centrifuge is valuable, primarily because in these cases the changes in acceleration levels are not disturbing. There is, of course, no change in acceleration level in orbit, and the slight change in acceleration during the retrofire case is not upsetting at all. I do feel that the Centrifuge is valuable as a training aid during periods of launch and reentry. There is, of course, no control task during launch, only the functions of breathing and reporting. However, the control task during reentry is directly related to the Centrifuge, and I think we'll find it valuable for future training programs on this basis.

4. How would you compare the control characteristics of the actual capsule with the control characteristics of the various trainers? For example, maximum effectiveness, cross-coupling, lag in response, and tail-off?

A The maximum effectiveness of the control jets I think is best practiced on the ALFA Trainer. There is, of course, some correlation between maximum effectiveness of control on the Procedures Trainer in the actual flight case, but I think the ALFA Trainer here is more valuable because you are able to observe movement in the horizon as well as movement on the instruments. In no case did I have to use maximum thrust for other than short durations of time, so I don't think I really fully investigated the maximum effectiveness of control jets during the flight of Capsule 7. With respect to cross-coupling, here

again the ALFA Trainer, with the installed instruments, is a valuable aid, because cross-coupling is, of course, most noticeable upon the instruments. I'm speaking here of cross-coupling between the gyros rather than any inertial cross-coupling of the capsule itself. Insofar as lag in response is concerned, this is really not too noticeable. Let me combine the last two items, lag in response and tail-off. I think these are not too noticeable in the actual flight case because primarily you're controlling for a specific attitude or a specific rate and the hand controller is moved until the attitude or rate is obtained. Any over-control as a function of tail-off is not distinguishable as such. In other words, there is a tendency to over-control possibly as a result of the human input and this may or may not mask the lag in the response or the tail-off, so I think that any errors that you have here between human input, jet lag, and tail-off, are all combined into one error as evidenced by the visual cue, whether it be instruments or periscope or horizon. So therefore I don't feel that these are any problem and I don't feel that we have to use any specific training device in preparing for these items.

5. Which Mercury trainers could have been omitted without loss in your state of readiness in this flight?

A This is kind of a tough one to answer because I think all the training devices and phases we experienced were valuable. I would say that the Centrifuge, the Procedures Trainer, and the ALFA Trainer should not be omitted. All of these are valuable training aids. Some of the disorientation devices that we used may be eliminated in future training programs as they are primarily a confidence-building device. Some of the training aids which we used in egress training, desert survival, and general survival, and so on should not be omitted, because here again is their ability to build confidence as well as prepare one for the actual flight case. I would say at this point that the training program has been a good one. We can cut down our emphasis on such things as disorientation, and our emphasis on such things as weightlessness because I don't really feel these physiological symptoms are going to be any real problem. So let's say generally that at this point let's not omit any, but let's look at the training program with a view to reducing some of the time we spent on disorientation devices, etc.

6. Do you have any suggestions relative to retiming of the training program? For example, were you rusty in any particular control task?

A No. I have no suggestions relative to retiming. I think that we should make the Centrifuge training, of course, as close to the flight itself as possible. The fact that we have a Procedures Trainer at the Cape is helpful because the last month or so should certainly be spent at the Cape, primarily from the standpoint of following actual capsule tests. So therefore I would say that any major change in retiming of the training program is not required.

7. When were you the most anxious?

A I would say that was when they put the hatch on, and I don't know how you overcome this. I think the fact the pilot, for example, participates in the RF checks with the gantry out, in which case he is all suited up, strapped in, the hatch has been put on, the gantry removed was a help, but I don't know how you get over the anxiety of the flight itself. This is an individual problem I think and not a function of the training phase.

8. How did the noise and vibration experienced in the capsule compare with that experienced in the Centrifuge training program?

A Here a specific comment is that there is no correlation between any of the noise and vibrations on the Centrifuge and that experienced in the flight case. The noise levels of the booster, the noise levels of the retrorockets and so on are apparent but they are not disturbing. Now the reason for this is the onboard noise of the recorders, cameras, gyros, inverters is such that, unless it is a very loud noise from the outside, it's hardly apparent on the inside with helmet attenuation and so on. We might continue providing a tape input on the Centrifuge, but I don't think the noise level really is a problem. I confine my remarks here to the Redstone and not to the Atlas. With respect to the vibration, I don't think the Centrifuge is capable of producing vibration as experienced in the flight. The only vibration that was disturbing was that which occurred around max q, and this is not a serious problem; I was able to read the instruments all right at this time, although my head was bouncing somewhere around 12 to 15 cps. The vibration in the Centrifuge is of a jerky type, computer input of course, and there is no real correlation here between the two.

9. Were any physiological effects experienced during the mission accelerations that were not experienced on the Centrifuge accelerations or vice versa? (Angular acceleration, etc.?)

A The answer to that is essentially no. There was no angular acceleration, as I mentioned before, that led to disorientation and, as a matter of fact, the accelerations of the Centrifuge during retrofiring were far more jerky and upsetting than that occurring during the flight. This general comment also applies to the simulated acceleration of the Centrifuge at drogue and main chute. These operations during the flight are very smooth whereas the inputs during the Centrifuge training program were rather jerky. So I would say that for these particular maneuvers, retrofire, main chute, and drogue chute, the Centrifuge is of no value on a dynamic basis and we should use it only for the powered phase and the reentry phase of acceleration.

10. Was the acceleration produced during the retrofire task in the October Centrifuge program a help or a hindrance in preparing you for the actual retrofire task?

A I've covered that before. The answer is it was a hindrance. The Centrifuge is far more abrupt and jerky than the actual flight case.

11. What sound effects do you wish we had had on the Procedures Trainer?

A Here again, the onboard noise is such that any external sounds are all subdued in the Redstone flight and I don't think we need to go to any particular effort to reproduce any sound on the Procedures Trainer.

12. Was the periscope display in Procedures Trainer No. 1 valuable or not?

A The answer is it was of very little value. I would very much prefer using the periscope display in the ALFA Trainer in preparing for the actual flight case.

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

A The answer is yes. I think that in the training program one should specifically over-train. By that I mean create more failures than could possibly occur in an actual flight. I think that in meeting failures and emergencies such as this, the normal procedures pretty much take care of themselves.

14. Was an area of training overlooked on the Procedures Trainer?

A At this point let's cover the error on the Procedures Trainer. The Procedures Trainer at the Cape incorporated approximately an additional 30 seconds between peak g and the altimeter schedule. The fact that we had an extra 30 seconds on the Procedures Trainer was disturbing to me for a moment when I discovered that I was at a much lower altitude after the reentry g bleedoff than I'd expected to be. I think we should be more careful in the future to check our time schedules on the Redstone flight versus the Procedures Trainer to be sure we have a closer correlation. Other than that there was no area of training that was overlooked on the Procedures Trainer.

15. 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?

A If the Procedures Trainer is working properly, the answer is no. There was some difference between what I had on the Procedures Trainer at the Cape and the actual flight case, but in the case of Trainer No. II it was not working properly.

16. In what particular way did the response of the H_2O_2 jets differ from the response of the controls of the ALFA trainer?

A In no particular way did the response differ. I found that the flight of No. 7 was indeed very close to the control responses exhibited by the ALFA Trainer.

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

A Again, the answer is very close. The moments and reactions as set up on the ALFA Trainer now are very close to the actual flight case.

18. Was the periscope display training on the ALFA Trainer valuable in preparing you to fly the capsule using the actual periscope display?

A Yes, it was. Primarily here from the standpoint of general land observation. The flight in No. 7 was too short to really pick up some of the finer points of periscope control but there is no question about the fact that the periscope display on the ALFA Trainer is a valuable aid.

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

A This is not applicable to No. 7. Capsule 7 had no horizon display.

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

A The answer is, I think it would be desirable but there are so many things to do during the weeks preceding the flight with respect to capsule checkup, which I think are more important, I don't think it is worthwhile moving the ALFA Trainer or providing one at the Cape. For future flights if we have a Trainer of this sort, then I would suggest the possibility of having one set up down there.

21. Do you think you could have controlled the capsule satisfactorily if you only had had training on fixed-base trainers such as the EEAC and the Procedures Trainer? (Orbital stabilization? Retrofire? Reentry?)

A I don't think so. I think that the ALFA Trainer has a very definite place in the training program and the Procedures Trainer in itself is not enough.

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

A Here, the weightless flying is valuable as a confidence-building maneuver. I don't think that we have to fly it to the extent that we did. I think that maybe one or two flights in the back seat of an F-100 and one or two flights in a KC-135 and a Convair are certainly plenty. Weightlessness, as exhibited on a Redstone profile, provides no problem at all.

23. How important was your training in the MASTIF Trainer relative to this flight?

A It's difficult to answer since no rates were developed that caused disorientation. I think that we can include it, possibly, in future training programs, but it is certainly not an important training aid.

24. Do you feel you had sufficient training in the MASTIF Trainer?

A More than sufficient training on the MASTIF. Maybe we can cut this down a little bit.

25. Should more or less emphasis have been placed on environmental training? If so, in what way? (Procedures Trainer training or Surgeon's Capsule training?)

A I think less emphasis should be placed on environmental training with respect to the Surgeon's Capsule. The actual chamber run using flight articles at the Cape is more than enough training for the flight case. Of course, additional training in the environmental system is available using flight articles during the various checkouts that occur prior to launch at the Cape.

26. Should we have had an ALFA Trainer powered by the actual H_2O_2 control systems?

A No, I don't think this is necessary. I think the air jets as we have them set up now are satisfactory.

27. Was the training you received on the transparent gimbal capsule of any value? If yes, why?

A Yes. The answer here is of primarily observing the cross-coupling effects between the gyros and in observing any trouble areas which we can avoid by astute preplanned capsule maneuvers.

A No. I think we should learn to recognize terrain under clear conditions and we'll just have to accept whatever degradation occurs during case of a cloud cover. I think that photographs of actual cloud coverage should be observed so that we have an idea ahead of time what to expect in this area.

34. In your opinion, do the incorrect lg cues that exist on the ALFA Trainer negate all positive training value of an ALFA-type Trainer?

A No. I don't think so. I think we can work with this lg cue that we have here because of the general value of the Trainer itself.

35. Was there any comparison between the noise of the H₂O₂ jets and the noise of the air jets on the ALFA Trainer? Control jets? Retrorocket jets?

A The outside noise of the jets during the actual flight case are not noticeable unless you have full thrust. Here again, it just barely gets above the general noise level inside the capsule. The retrorocket jets can be heard but they are not upsetting.

36. On future manned space projects, how much (if any) effort should be expended on trying to develop a "zero g" simulator?

A I think no effort should be expended. I think that the airplanes that we have now that give us zero g for short periods of time will develop enough confidence in one's ability under weightless conditions and that any insidious physiological effects of weightlessness will have to be investigated under actual flight conditions.

37. Do you feel there is any future for submersion simulations for weightlessness training?

A Here again, the answer is no. Weightlessness is not a real problem. We only have to investigate in future space flights what it's effects are for long periods of time. I might add as a personal note here that I don't think we have any problem at all. I think that circulation can be controlled by movements, I think that exercises can be provided just to the general movements required during the flight, plus maybe a few associated movements to give us enough muscular activity so we're not going to have any real problem at all.

28. If any maneuvers were made in two or three axes simultaneously how did the attitude display compare to the display on: Procedures Trainer I, Procedures Trainer II, Centrifuge, Indicator Mockup Capsule, ALFA Trainer?
- A The only maneuvers that were made on two or three axes simultaneously were made during retrofire case, and here again the ALFA Trainer is the most important during these maneuvers. The Procedures Trainers do provide a little input. The Centrifuge is not too valuable here. The indicator mockup capsule is not too valuable here.
29. Were any Mercury trainers detrimental to your state of readiness?
- A The answer is no, except as otherwise noted, because there are some cases where I was confused by the Procedures Trainer being off on its schedule.
30. If in retrospect you could pick just one Mercury trainer to help you train, which one would you pick? If two, which? If three, which?
- A The answer here is the Procedures Trainer. If two, I would say the Procedures Trainer and the Centrifuge. If three, Procedures Trainer, Centrifuge, and ALFA.
31. Should the Procedures Trainers have been mounted on a Centrifuge? In your opinion, is this worth ten million dollars?
- A The answer to both is no. The Centrifuge is valuable, but we want to keep it as simple as possible, and it certainly is not worth combining the Procedures Trainer with the Centrifuge with the resultant cost and complexity.
32. Was the star field simulation on Procedures Trainer I useful in any way? What cabin lighting did you use and could you see the stars at any time during the flight?
- A The answer here is an incomplete one. The star field simulation, of course, was not applicable since I was not on the dark side. I used full cabin lighting at all times and I could see no stars during the flight primarily because of the reflection of the sun on the edge of the porthole, as well as general light level inside the capsule, with dark adaption and so on, being too high. I think for orbital flights on the dark side the star field simulation may be valuable, so we should continue to include it.
33. Should we have included a cloud cover on the ALFA Trainer or Ground Recognition Trainer visual display?

SECTION VI - SUMMARY QUESTIONS

38. Is this a safe operation at the present time?

A Yes.

Should more unmanned flights be made before any more manned flights are made?

A No. I would hope that as soon as we get confidence in the Atlas booster we can go manned. I should hope that any Apollo flights that we make of a booster-development nature can also be manned.

39. What capsule systems need improvement the most?

A I think that we're in pretty good shape here actually. I think that we have to continue to provide for the integrity of the peroxide system. However, since No. 7 differs from some of the later capsules with respect to its systems I think that we should get additional comment on this after we've had more flights. The improvements needed in the electrical system in the environmental control system certainly were not apparent on the short Redstone flight. I think we're dealing in terms primarily of usage data so I can't make any appropriate comments with any of the systems at this time.

Is the capsule ready for orbital missions?

A With respect to capsules 9 and subsequent, yes.

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

A The improvements here I think we can investigate only as we come to the orbital flights. I found no flight control procedures that were deficient. I think minor changes in some voice reporting, minor changes in some of the ground control reporting procedures - these can be taken care of from flight to flight as we gain more experience.

41. 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?

A The answer is no. I felt that I was certainly properly trained for this flight, as I have indicated before.

42. How do you feel about your ability to perform during longer periods of weightlessness? Are we ready for 4 1/2 hours of zero g?

A As I have answered before, I am confident that we can perform very nicely under longer periods of weightlessness, and we certainly are ready for a three-orbital case, with respect to zero g.

43. What was the most difficult part of the mission?

A My most difficult part was the period between the visual observation out the porthole and just after .05g when the .05g relay latched in before I was ready for it. I had intended, of course, to be on full manual control at this time. I was behind schedule primarily because we had planned to do so much during the flight that I just got a few seconds behind. I was able to catch up to a degree, but I never felt as though I was in complete control of the reentry situation as a result of not being quite ready for it.

44. What is your advice to the Astronaut who will fly the next Mercury capsule?

A This has been pretty well covered in our group and with the Tel 3 people. We plan to do a little bit less during the next Redstone flight than we did during mine, thereby allowing more time for observation of specific items, a little more time to get ready for the next action which is to occur during the flight.

45. Is there anything further you wish to say?

A The answer is that I would like to indicate at this time that I had a very enjoyable trip. I think that the training program was indeed satisfactory. I think that we're proceeding along the right lines in this area, and that I have enough strength left for an orbital flight. I hope I have the opportunity to make one.