

## **Doctor Berry Honored With Gemini V Astronauts *Gives Briefing at National Academy of Sciences***

The continued success of the Gemini Program and in particular the recent GT 5 flight has been a matter of great interest to the whole nation and certainly to the Aerospace Medical Association. With such a great number of our members so deeply involved in the entire space effort, with not only our physicians, but our life scientists, bioenvironmental engineers, and our

throughout the entire day, the aerospace medical specialist was honored in numerous ways. At the White House President Johnson pinned the medals to the lapels of the three while their wives and children watched. Each was presented with a framed certificate of the commendation. The astronauts' certificates stated, "... for outstanding contributions to the technology of manned space flight," and Dr. Berry's, "... for outstanding contribution to space medicine through direction and personal participation in the medical planning and control of the Gemini manned space flights."

Following the White House ceremonies, the astronauts and Dr. Berry, accompanied by the Vice President of the United States, Hubert H. Humphrey, who is Chairman

L. Gordon Cooper, Jr., Gemini 5 Command Pilot; Charles Conrad, Jr., Gemini 5 Pilot; and Charles A. Berry. Also seated on the rostrum were Dr. Robert C. Seamans, Jr., Associate Administrator, NASA, and Dr. Edward C. Welsh, Executive Director of the National Aeronautics and Space Council, both Honorary Members of the Association.

### **Vice President Opens Gemini V Review**

Dr. Seitz of the Academy opened the session with a brief history of the nation's space program and all the participating groups. The Academy's role in this activity has been played by the Space Science



President Lyndon B. Johnson presents Dr. Berry the National Aeronautics and Space Administration's Exceptional Service Plaque bearing the citation accompanying his Medal.

corporate members in the aerospace industries, it is little wonder that the Association itself has a sense of deep pride and gratification.

On Tuesday, September 14, the two astronauts of the Gemini 5 flight, accompanied by their physician, Dr. Charles A. Berry, were awarded the National Aeronautics and Space Administration Exceptional Service Medal at special ceremonies held at the White House. Previous space-flight pilots have received this special commendation at similar ceremonies, but the recognition of Dr. Berry has forcefully brought the specialty of aerospace medicine to the attention of the public and the general press.

The presentation of the NASA Commendation to Dr. Berry, as well as to the astronauts, was particularly significant of the importance given to his role as Director of Medical Programs at NASA's Manned Spaceflight Center in Houston, and

Vice President Hubert H. Humphrey (far rt.) escorts the Gemini V astronauts L. Gordon Cooper, Jr., Charles Conrad, Jr., and Dr. Charles A. Berry, Gemini Chief Medical Officer, after leaving Capitol Hill where the astronauts were presented to the House and Senate in separate ceremonies.



of the National Aeronautics and Space Council, were driven to the National Academy of Sciences building where a large crowd of invited guests, top-ranking members of the various scientific committees, and members of the press were gathered to attend a briefing or "Gemini 5 Review" in the Academy auditorium.

Participants in the Review presentation were Vice President Humphrey; James E. Webb, Administrator, National Aeronautics and Space Administration (NASA); Dr. Hugh L. Dryden, Deputy Administrator, NASA; Dr. Frederick Seitz, President, National Academy of Sciences; Dr. Harry Hess, President of the Space Sciences Board of National Academy of Sciences;

Board. Dr. Seitz then introduced the Vice President of the United States, who in his usual dynamic style welcomed the astronauts, Dr. Berry and their families, calling each by name.

In paying special tribute to those in science and industry, workers, craftsmen in plants and industries, scientists and engineers from the great universities and industrial establishments, to the Defense Department, and to the men and women of NASA, whose work made such a great space adventure possible, Mr. Humphrey stated, "Particular attention, of course, has been given to science and engineering and I should like to add in the presence of Dr. Berry, to medicine. I believe that the

breakthroughs in medicine and the knowledge of the human body of the reactions of human organs in space exploration will be worth the cost of this program alone. In fact, I believe the benefit to education alone is sufficient to justify much of the cost of our national space program. And those who are engaged in this program, whether they are orbiting the earth in the most modern of space equipment, or working diligently in the laboratory without attention or notice, are contributing to the world's library of scientific knowledge. I would emphasize that such contributions alone might well be sufficient to justify once again the total cost of our national space program."

The Vice President then called on Mr. Webb, the NASA Administrator, who introduced the astronauts and Dr. Berry, before calling on Mr. Hess to present the scientific portion of the briefing. Mr. Webb paid particular tribute to the Space Science Board, which Mr. Hess chairs, as having been of extreme value in the success we have had in the space field. In his introduction of the spacemen, Mr. Webb said, "We have been engaged in looking into the region out beyond the earth's atmosphere and taking scientific measurements. We have had to do a great deal of engineering in order to accomplish this and these two men, as well as Dr. Berry, are here today, not only as outstanding engineers, outstanding test pilots, outstanding astronauts, our most experienced in all of those fields, but also as our most experienced scientific observers in outer space."

### Astronauts Cooper and Conrad Report at Academy Briefing

Command Pilot Gordon Cooper, gave a brief résumé of the basic objectives of the flight which was "to conduct an eight-day flight, to adequately test if man can survive in a healthy condition, that the systems will work, that the manned spacecraft combination can do this eight-day period in space, which incidentally is the approximate time of the minimum time lunar mission, and all of these properly and successfully." The brief presentations by both astronauts, who showed the slide photographs of the earth's surface, stressed the geologic and oceanographic observations which were made. In discussing the seventeen scientific experiments attempted, Mr. Cooper again talked of the ability to see and observe, as well as photograph, so much detail. He was asked during the question period about his "vision in comparison with vision on his first flight," and humorously said, "Well, my eyes are as good as they were—and this time I have a witness."

Charles Conrad, Jr., the Pilot, also discussed some of the experiments performed and the visual acuity tests, and in showing more of the slides, pointed out such things as volcanic areas in Mexico, which were unknown before some of these observations were made. Mr. Conrad expressed his praise and appreciation about the environmental control system, which, he said,

performed in a most outstanding manner for eight days. We probably had the nicest, freshest air that anybody could want to breathe, and we had an unusual first in the space business; most environmental control systems had been loaded down and pilot after pilot came back saying they were too warm. We fought this out at McDonnell, had little changes made, and it turned out we were too cold. We were the first ones to shut down the cabin heat exchanger and run everything as hot as we could. We were just right. The thing that most surprised us on opening the hatch was that we couldn't tell the difference between inside and out, and that is a monumental job for that small system."



CONGRESSMEN APPLAUD GEMINI V ASTRONAUTS J. Gordon Cooper, Jr., and Charles Conrad, Jr., after they address the House of Representatives.

In this brief space we will not attempt to cover all the scientific and technical data which was presented. Most of the material which the two astronauts presented, including the very excellent slides of photographs taken on the mission, have been reproduced in various national magazines and newspapers. The entire medical data which Dr. Berry presented, as well as much more still being studied and evaluated, will be published in complete detail in NASA publications; however, we are presenting some of the charts and graphs which give valuable medical data on the pilots during their eight-day flight.

Dr. Berry's review of the medical data acquired during the eight days was excellently presented with the accompanying graphs and charts shown on slides. A great deal of scientific information was released at this time, and it was all received with enthusiasm and interest. Specific medical questions were asked at the close of the formal briefing by several physicians, among which were questions from Dr. Don Flickinger, one of the Aerospace Medical Association's past presidents, who had played a large part in the early planning stages of manned space flight. Dr. Kennard, Executive Vice President of the Association and Managing Editor of *Aerospace Medicine*, also participated in the questioning period.

Following the briefing at the National Academy, the three spacemen were taken by motorcade before thousands of watching Washingtonians down the broad streets to the Nation's Capitol where they were presented by the Vice President to both Houses of Congress. The festivities continued throughout the day and for Dr. Berry, culminated in a reception given by Dr. Flickinger where more than one hundred distinguished scientists and physicians from the Armed Services, NASA, and the National Academy greeted him. Among the guests were a great many members of the Aerospace Medical Association, Dr. Berry's colleagues and friends, who have worked closely with him in the past.

### President Sends Dr. Berry With GT-5 Astronauts to Athens

It is most gratifying that President Johnson felt that the successful Gemini 5 mission was of such scientific importance that he authorized both astronauts and Dr. Berry to attend the International Astronautical Federation meeting in Athens where they presented their reports to the international scientific community.

As Vice President Humphrey stated, "I want to stress our space program's potential as an arm of our foreign policy, of our international relations, and particularly of our peace policy, because this Government has but one objective in the world: a just, honorable and enduring peace. Everything that we do publicly or privately must be and should be and is directed towards the achievement of that goal. I believe that high among the benefits which these distinguished astronauts, administrators and scientists are contributing to their country, is our sturdy and steady movement toward world peace."

The astronauts and Dr. Berry were also authorized to visit some seven countries where our tracking stations are located to express our nation's appreciation for the international cooperation our space programs have received.

## Collection of Medical and Physiological Data During GT-5

The photographs and charts shown here are presented only to illustrate how physiological data and medical information was obtained during the entire course of the space flight as the spacecraft passed over each tracking station in the worldwide network. This information was transmitted instantaneously to the mission operations control center, immediately observed by the flight medical officer, and recorded for analysis during the flight and post flight.

Figure 1 shows the biosensors, the voice microphone, and, at the bottom, the box-like signal conditioners. The sensors provide for two leads to the electrocardiogram, blood pressure, respiration, and body temperature. Figure 2 shows the sensors as they are placed on the chest with the signal conditioners around the waist. This system worked very, very well, and at no time was any data lost.

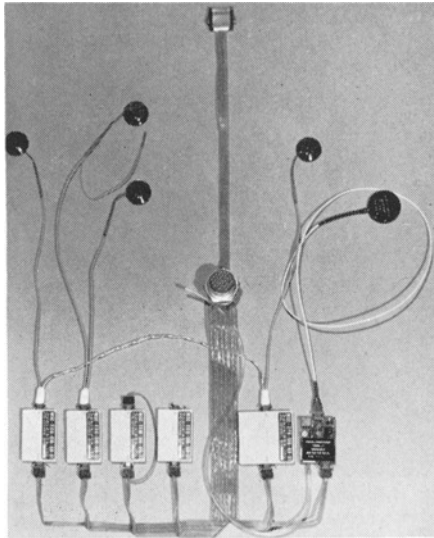


Fig. 1. Biosensors, microphone and signal conditioners (at bottom).

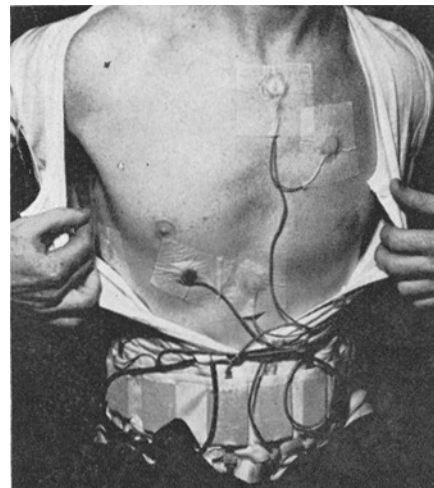


Fig. 2. Biosensors on chest, signal conditioners around waist.

The results of some of this data is shown in Figure 3 which is an actual trace received during the 111th revolution and, though late in the flight, the data was as good as in early recordings. The information includes data from the two leads of the EKG, respirations, and blood pressures on both Command Pilot and Pilot. Records of these data will be submitted to computer analysis to provide a final, post-flight, detailed report.

Figure 4 gives graphic presentations of some of the physiological data, plotted in four-hour intervals, on the Command Pilot for the entire 8-day GT-5 mission. The data shown here includes body temperature, mean heart rates in beats per minute, mean respiration rate per minute, and some sleep periods.

Figure 5 shows a graph of the pre- and post-exercise blood pressures on each of the astronauts. These are computed by

taking daily averages of all readings made on each day.

The graphs shown in Figure 6 give a record of data from the tilt table studies made on the Command Pilot, both pre-flight and immediately post-flight. Previous scientific articles in this journal have described tilt table studies in great detail. These tilt table responses are a simple means of demonstrating the cardiovascular responses of the Command Pilot to space flight conditions of weightlessness, inactivity, and stress. Each period of time on the tilt table, the whole 25 minutes, the sensors are applied in the same manner as during flights. For simplification, the graph shows responses only from one baseline pre-flight tilt made on August 17, and the first three post-flight tilts made at landing, plus 2.5 hours, plus eleven hours, and plus 30 hours respectively. The final three post-flight tilts made at 47 hours, 72 hours, and 106 hours, are not recorded here, but showed that blood pressures were back within normal limits. Pulse pressures and heart rates approached normal but showed some minor variations.

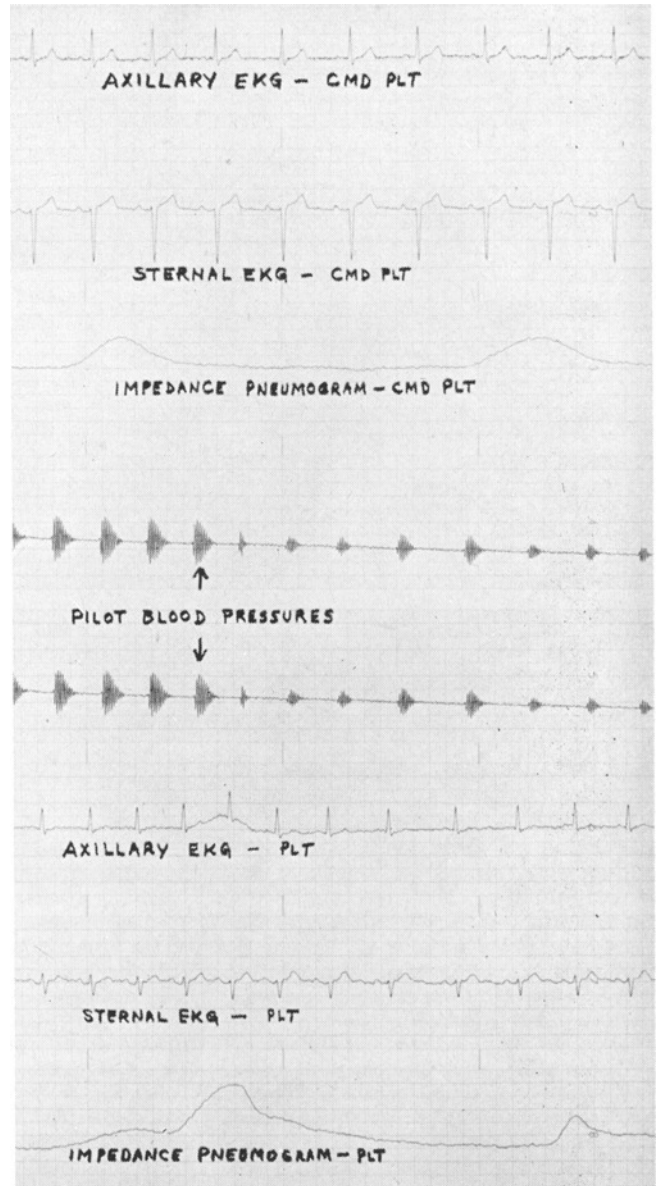


Fig. 3. Tracing made during 111th revolution showing two EKG leads, respirations and blood pressures on command pilot and pilot (at bottom).

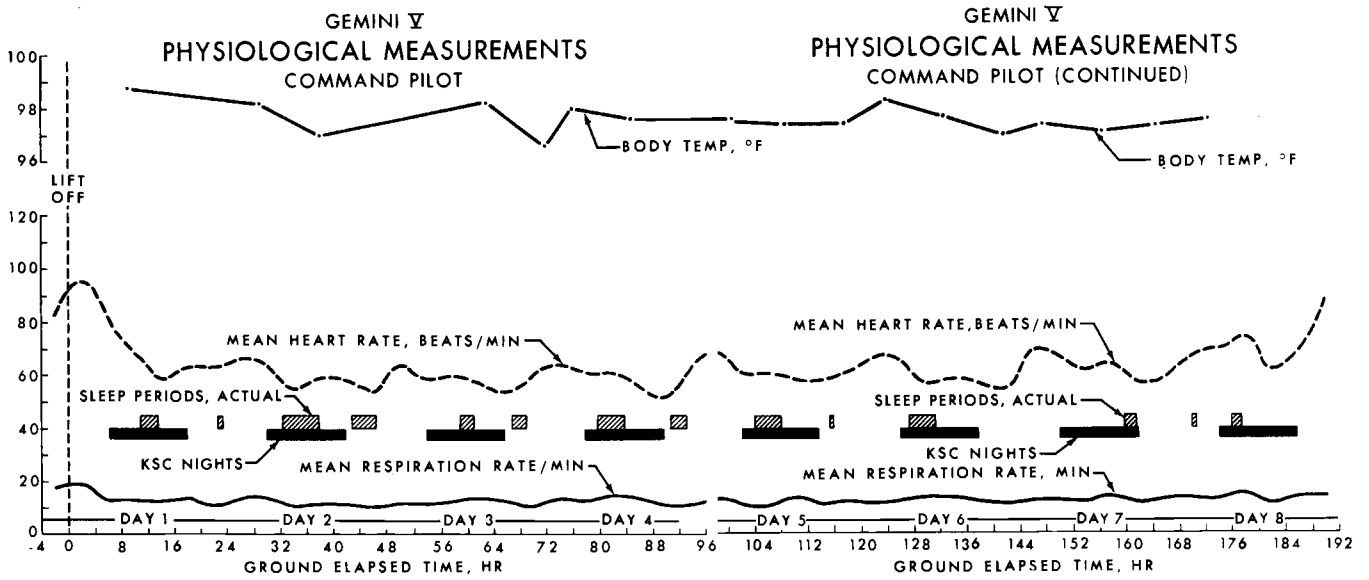


Fig. 4. Geographic presentation of physiologic data on command pilot of GT-5.

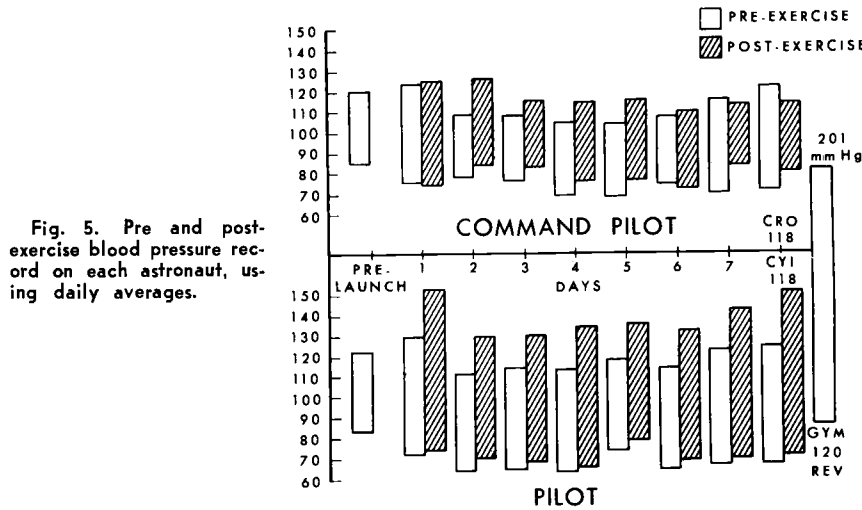


Fig. 5. Pre and post-exercise blood pressure record on each astronaut, using daily averages.

Blood pressure readings showed that there was no great change after exercise throughout the duration of the mission. The first blood pressures taken during the parachute recovery phase, which in a way resembled a tilt table action as the chute placed the astronauts first in a lying position, then in a sitting up position, demonstrated that the condition of orthostatic hypotension was indeed present. Blood pressures were quite low, with increased heart rates.

Dr. Berry reported that the use of blood pressure cuffs on the GT-5 Co-pilot apparently did not have any major effect on his condition, although Conrad's cardiovascular system did return to normal quicker than did Cooper's, who did not wear cuffs. This may have been due to individual differences, Dr. Berry said.

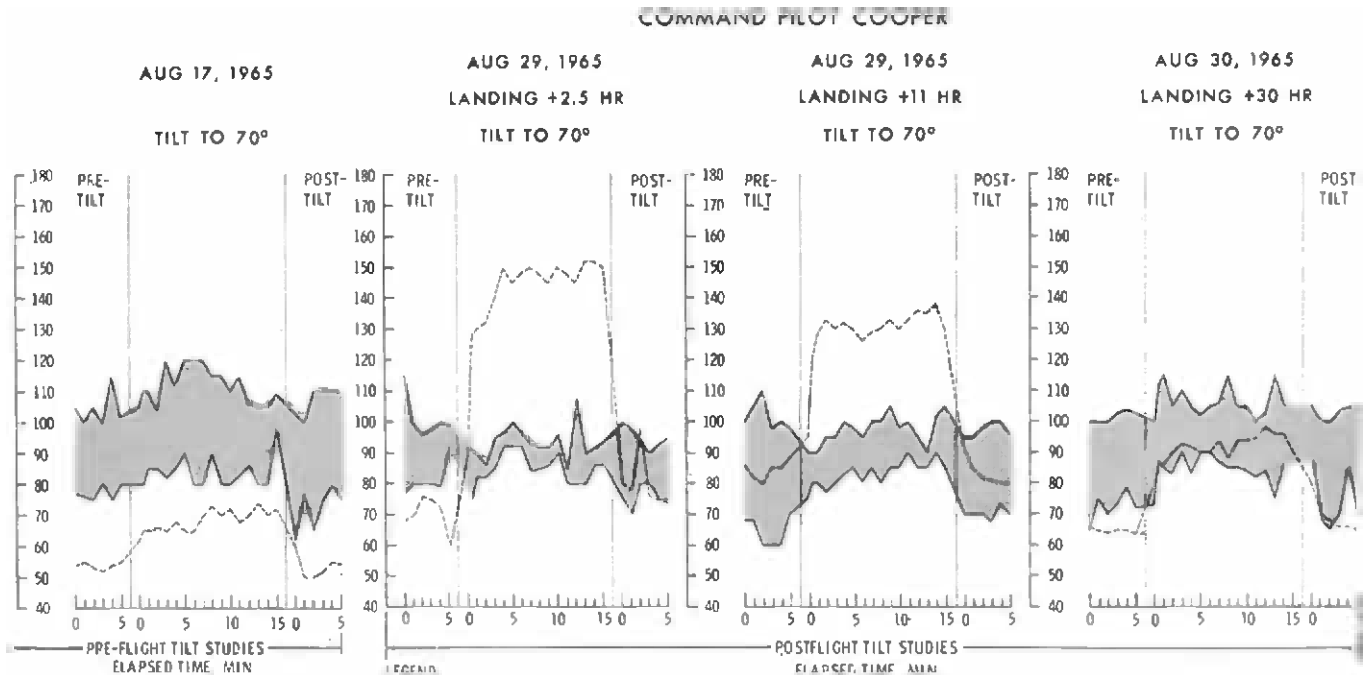


Fig. 6. Tilt table studies. Broken line—heart rate; solid line—blood pressure; darkened area represents pulse pressure.

## Aerospace Physicians Observe Medical Operations in Mission Control Center

The Gemini series has included a significant number of medical experiments and studies. The GT-5 mission was heavily weighted with medical programs to study the effects on man of prolonged exposure in space flight. During the last 60 to 72 hours of GT-5, when fuel cells were weak

Dr. William J. Kennard, Executive Vice President, Aerospace Medical Association, watches with Dr. Berry at the flight surgeon's console on the 6th and 7th days of the Gemini V eight-day flight.



Dr. Neal E. Baxter (r), President of the Aerospace Medical Association, sits at flight surgeon's console in the Mission Control Center during GT V as Dr. Charles A. Berry, Gemini flight surgeon, explains console procedures.



and power limited, the major remaining experiment was to continue obtaining medical and physiological data so as to evaluate man's capabilities in prolonged space flight, with the specific goal of an eight-day lunar mission.

In view of the great emphasis on medical programs, the Administrator of NASA authorized Dr. Berry to invite a number of physicians and aerospace medical specialists to visit and observe the medical operations.

### *A Message from Dr. Berry*

It is indeed an honor to address the members of our Association and the Space Medicine Branch at the invitation of our President, Neal Baxter.

The past few weeks have been momentous ones for all those interested in aerospace medicine and in medicine itself. Our primary concern is man and his ability to perform effectively as an essential part of the spacecraft.

The manned spaceflight missions have been programmed in such a manner that man is exposed to and tested by increasing periods of time in the spaceflight environment. This program satisfies one of the primary goals of the Gemini series, the study of man's response to long duration flight in space. Only a few short months ago the first of these long exposures — 4 days — was successfully completed in Gemini IV. We have now seen the equally successful completion of an eight-day stay in space by astronauts Cooper and Conrad in Gemini V. The overall significance of this accomplishment is tremendous.

The results indicate man is capable of adapting to this difficult environment and then readapting to our earth environment after eight days of weightlessness. We have seen such data on man for the first time in the world and take justifiable pride in being on the forefront of this new frontier. We want to share this information with all the world for we feel it should be of benefit to all mankind.

Some of the interesting findings have been reported in our country to the National Academy of Sciences in Washington on 14 September and since then at the Athens, Greece, meeting of the International Astronautical Federation.

We have seen the heart rate increase with launch, descend toward the reflight normal over the next 36-48 hours, and then stabilize at a new lower level until a few hours before retrofire. No ECG changes of significance have been recorded. The tilt-table responses have shown little change from those observed following the four-day flight. We have noted some decrease in blood volume post-flight, mainly accounted for by decreases in red cell mass. We have learned much about such mundane activities as eating, sleeping and handling body wastes. It appears that man is ready and able to undertake the lunar mission.

The Exceptional Service Medal presented to me by the President on 14 September was accepted as recognition of all those thousands in medical and paramedical fields who have done so much to achieve our present position in manned spaceflight. Since this presentation we have covered some 27,000 miles and seven countries and discussed these flight results with many levels of people in those various countries, and, at Athens, with our counterparts from the Soviet Union. All are interested and stimulated by what we are learning about man and his abilities. The information and techniques learned should benefit all of medicine and therefore the citizens of any country on the globe.

The Aerospace Medical Association and the Space Medicine Branch have been important stimulators of these developments and we all look toward extending man's accomplishments further.

*Charles A. Berry, M.D.  
Chief of Center Medical Programs  
NASA, MSC, Houston, Texas*

Thus during the actual eight days of space flight, several of the physicians invited were privileged to visit in the Mission Control Room of the Manned Spacecraft Center. Because of their interest and work in the aeromedical field, several of the Aerospace Medical Association's officers and members were among those privileged few. Dr. Neal E. Baxter, President, and Dr. William J. Kennard, Executive Vice President, each spent a day in the Control Room. Representing the American Medical

Association's Department of Occupational Medicine, Dr. Jan Tillisch, of the Mayo Clinic, who is a past-president of the Association, was also present. Dr. George J. Kidera, Chairman of the AMA's Aerospace Medicine Committee, was unable to accept the invitation due to conflicts in his busy schedule.

All were so impressed with the magnitude of the operation and were in complete accord that the experience was one of the most gratifying ever experienced. In a

newspaper interview in the Bloomington, Indiana, paper, President Baxter said, "It's the most fantastic experience I've ever had in my life." "It's tremendous, dramatic—I'm almost speechless." Dr. Kennard shared these sentiments, and reported that what impressed him most was the complete organization, calm acceptance of any crises that arose because of the sure knowledge of all the facts concerning the systems, the pilots, and the equipment. Even in the midst of the all-important decision making involving the number of orbits, and the failure of the "cryos" power cells, calm assurance prevailed, and the humorous quips between the personnel at the Mission Control Center and the voyaging astronauts, interspersed with all the scientific and technical communications, continued throughout the entire time.

Dr. Jan H. Tillisch, Department of Medicine at Mayo Clinic, with Dr. Berry at the flight surgeon's console during fourth day of Gemini V flight, while Dr. Berry talks with another flight controller.



## Ground Control and Communications: Key Elements in Manned Space Flights



MISSION OPERATIONS CONTROL ROOM in Mission Control Center, Houston, Texas, during Gemini V space flight. MCC is a huge global network of tracking and communications stations providing centralized control for Gemini missions.



GROUP CONFERENCE ON FUEL CELL PROBLEM early in GT-5 Space Flight is held around flight director's console in MCC. At left is Astronaut McDivitt, spacecraft communicator. Christopher C. Kraft, Jr. (hand on chin), chief flight director, is flanked by flight directors Eugene F. Kranz, (left) and John D. Hodge (fist under chin).

Astronaut James A. McDivitt (r), spacecraft communicator at his console with Astronaut David R. Scott, who is scheduled for EVA program during Gemini VII.

### News of Members Solicited

The Washington Staff will be grateful to members of the Association who may be kind enough to forward information suitable for the "News of Members" column. Honors or awards, election to office of professional or scientific societies, books, monographs, or articles published in other journals, promotions, vocation or avocational events or achievements, changes in duty, changes in affiliation—all these are grist to our mill—and of interest to your friends and associates. Please send all such items to Aerospace Medical Association, Washington National Airport, Washington D. C. 20001