PRIVILEGED

Report by Dr. Charles A. Berry on Apollo 15
Meeting of Committee on Space Medicine, September 17, 1971

The Apollo 15 crew was in excellent physical condition at the time of launch. Their oxygen uptake preflight was above the mean of previous crew members, and Scott's was the highest ever: He was in the best shape of any astronauts flown. They were also the best hydrated in flight and ate the best; there was little weight loss. Even though the total duration of the mission and the EVA time were longer than in previous Apollo flights, the lunar rover was expected to decrease the workload on the crew.

Irwin had a vestibular response after becoming weightless. He felt giddy if he moved his head. He took care not to move his head rapidly and did not get nauseated, but he felt that without such precautions he would have. This effect disappeared on the lunar surface and did not recur on the return leg of the flight. It started again on return to earth, persisted for 5 days, and included the sensation of 20° head-down tilt when he was lying down (whether face up or down or on his side). No previous astronauts have reported this sensation.

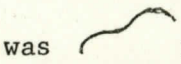
Irwin occasionally has premature ventricular contractions. Typically for him, one showed up about 20 min prior to launch. He had more frequent PVCs during excursions on the lunar surface, but they were still singles. Some of the workloads on the surface were very high, especially core drilling, first driving of the rover, and getting in and out of the lunar module in the face of difficulties in opening the hatch fully. Irwin's heart rate went up to 190 as he was trying to re-enter the LM after the first EVA. After this, mission control called for more rest periods.

After departure from the lunar surface and rendezvous with the command module, the surface crew transferred all the gear and samples from the LM to the CM, a long and arduous task; they worked all the way home. During equipment transfer, they began to make mistakes; the spacesuit integrity tests had to be repeated several times. Personnel at mission control were also very fatigued and could not always establish just what the crew were doing. Ground control feared the hatch was not entirely closed, and debated whether an additional orbit should be made to allow time to check it out. As the crew were finally ready to jettison the LM, suddenly Irwin's heart rate rose to 140, dropped back to 70, and he went into a "true" bigeminal rhythm. There were 10 to 14 pairs at 3-, then 4-sec intervals; his EKG then returned to normal. Irwin was not aware of any of this, he told Berry after the flight; he said he was so overcome with fatigue that he had to go to sleep, and remembers thinking at the time how inappropriate it was. Berry believes he lost consciousness. The other crew members were too busy with flight maneuvers to notice anything and simply let him sleep.

All contact with the crew is through the "capcomm" at mission control, passed by the flight commander, and is on an open line (in real time) to the press center, with transcripts sent worldwide. Thus Berry and his colleagues faced the dilemma of how to alert the crew to the danger without making it public. They finally decided to ask all the crew members to take seconal; the crew, being very busy and not understanding the reason for the request, refused. They did agree to keep Irwin hooked up to the medical monitoring apparatus until the next morning. (This was the first flight in which all crew members were not monitored all the time; rather, each was monitored one-third of the time.) Berry states very forcefully that the "open line to the world" policy followed since the first U.S. manned flights will not be tolerable in future missions; means for private communication with the crew for such emergencies must be available.

During the night, Irwin exhibited some more premature auricular and ventricular contractions, some in pairs. They gradually went away.

On the last day, during his final hour of sleep, Scott began to throw PACs fast; they stopped, then started again. His heart rate went down to 28 during sleep. There was no sign of blocks on the tracings. A half hour after he rose, the same PACs appeared in a long series, with bradycardia (heart rate in the 40s and low 50s); his EKG then returned to normal. Scott has never shown PACs before.

On return, everyone saw the crew walk across the carrier deck; they seemed well and alert. Nevertheless, it took them longer to recover to preflight levels than any previous crew. Usually it takes 48 h to attain preflight levels on the bicycle ergometer test; the lunar surface crew required 9-13 days and showed, moreover, an abnormal response: the curve was  rather than  . Irwin showed a paradoxical response, with heart rate decreasing as work increased, and he became unresponsive after a while. Response to lower body negative pressure also took longer to return to normal in the case of the lunar surface crew (9-13 days); the CM pilot who had remained in lunar orbit returned to normal in 6 days. These results were a complete reversal from Apollo 14. Berry believes that if the CM had landed upside down in the ocean, Irwin could not have gotten out.

Total body potassium was measured using K^{42} total exchangeable potassium because in previous flights the K loss was out of proportion to the protein loss. The surface crew lost 15% of their exchangeable potassium, the CM pilot, 10%. If the latter is the cost of adapting to zero gravity, what additional effects caused the greater loss with the surface crew, Berry asks. He believes the arrhythmias are generally explainable by the K loss.

Some procedural changes have been instituted for Apollo 16, namely, EVAs to last no more than 4 h, and insistence on adequate sleep.