

Douglas WK. Preparation of the Astronaut. *Aerosp Med* 1963; 34:232-5.

In this paper, Dr. William K. Douglas described the medical preparations for the first orbital flight by a U.S. astronaut, John Glenn, on February 20, 1962. The paper described Glenn's physiological training, his exercise program, and efforts to protect him from infectious diseases by minimizing his contact with the general population. Special emphasis was placed on giving Glenn a low-residue diet for three days pre-launch as there was no capability on the Mercury spacecraft to handle defecation. Consideration was given to sleep-shifting him, but that was determined to be impractical; instead, he was allowed plenty of rest during the days leading up to launch.

Several days before the flight, Glenn underwent a series of neurovestibular tests. Two days before launch, medical testing and physical examinations were conducted by specialists in neurology, psychiatry, aviation medicine, radiology, and ophthalmology. Preparations on launch day itself required more than eight hours and included additional examinations by the flight surgeon, a cardiovascular internist and a psychiatrist; the paper described their findings in great detail. Sensors were applied to transmit EKG, respiration, blood pressure, and rectal temperature, following which Glenn donned his pressure suit, transferred from Hangar S to the launch pad and entered the spacecraft, where the suit was purged with 100% O₂. The flight surgeon then inspected the capsule's interior, the hatch was closed and the spacecraft was purged with oxygen. The paper ends with the words, "The gantry was withdrawn, the countdown proceeded to zero, and the spacecraft was launched." The rest is history.

It is interesting to compare the procedures in 1962 with those today. Pre-launch preparations now involve an extensive medical examination and laboratory testing 10 days before launch (L-10) with only a brief medical examination on L-2. Today only the flight surgeons are involved in the examinations and appropriate sleep-shifting is a routine practice. Preventing exposure to infectious diseases remains important. Purging the capsule with oxygen was abolished after a launch-pad fire took the lives of the three Apollo 1 astronauts.

Background

The author of this Classic, William K. (Bill) Douglas, was a pioneer of Space Medicine. He was detailed for duty as the personal physician for the astronauts in early 1959 when he held the rank of Lieutenant Colonel as a Flight Surgeon in the U.S. Air Force. He played a key role in medical support of the first four Mercury flights and felt that the flight surgeon "Should do everything that his pilots are required to do in so far as he is able to physically and intellectually. I have also consistently refused to divulge personal anecdotes because my doctor-patient relationship with the astronauts has never ended. It is your job to support that pilot and keep him in the air, keep him well, safe, sound, and secure" (Unpublished autobiography given to Dr. G. W. Hoffer for the Society of NASA Flight Surgeons in 1989). With that in mind, Douglas went through the physical examinations at the Lovelace Clinic at the same time as the astronaut candidates. He attended their classes and tried out every training device and procedure in their program, including the human centrifuge, high-performance jet aircraft, the Multi Axis Spin Test Inertial Facility, water egress training, and the famous Slow Rotating Room at Pensacola. Douglas was closely involved in evaluating the effectiveness of the newly developed biosensors at a time when instrumentation for remote read-out was primitive, unproven, and unreliable; the astronauts resisted being used as test subjects and the biomedical community was skeptical that these flights were worth the risk. Douglas advocated the insertion of a window in the Mercury spacecraft and also development of a system for rapid hatch opening and egress in case of emergency.

Apparently neither John Glenn nor the other seven Mercury astronauts knew that Douglas and other flight surgeons themselves tried out the various centrifuge runs, environmental control systems, and suit arrangements before the astronauts did (Raum, E., "John Glenn", Heinemann Publishers, 2005). Douglas did not pretend to be an astronaut, but wanted to understand first hand the effects of the preparations and simulations.

Of historical note, following his retirement, Douglas was present when the Space Shuttle (STS-95) returned a much older John Glenn from his mission on October 29, 1998; Douglas became ill while returning from that trip and died two weeks later.

Commentary by William Augerson, M.D.

This paper is a nice reflection of Bill's simple, straightforward approach to life and astronaut support. There was no need for him to dwell on what an enormous effort was expended in developing the procedures which he so nicely summarized in this classic paper. In addition to the earlier sub-orbital flight efforts where pre-launch preparations were developed, Bill was involved in hundreds of dress rehearsals and mini-preparation procedures related to centrifuge training runs, other flight simulations, and suit training.

I would like to think that I also helped Bill to get full-scale dress-rehearsals established as a necessary part of very complex operations, although the many sensible operational types already understood this concept. At the Bikini atomic bomb test in 1946 we had dress rehearsals of the air-drop and underwater tests, both of which revealed potentially fatal shortcomings that were corrected before the actual tests. In Project Mercury, we generally learned a lot from dress rehearsals, and realized sometimes that "ordinary" equipment such as elevators could provide unexpected problems for operations.

We did not then have the technology in hand to regulate multi-gas mixtures, so we were stuck with 100% oxygen for suit and capsule. The Mercury cabin pressure was a trade-off between the desire for the lowest pressure possible, to lighten spacecraft structure and promote glove mobility, and the desire to avoid decompression sickness (DCS) during a long flight at reduced pressure. We drew considerably on the experience of the 8th Air Force in Europe operating at similarly low barometric pressures. We chose 5 psi instead of a lower 3.5 psi to substantially reduce the DCS risk, which was further addressed by oxygen purging. We worked very hard to reduce combustibles in the craft, and perhaps we were lucky.

Dr. Stan White deserves great credit for realizing that there needed to be a "dedicated" personal physician for the astronauts, one who was uncoupled from any project responsibility. In retrospect, the USAF could not have done better than Bill Douglas in providing a dedicated advocate and sensible physician for our first astronauts. I spent a lot of time with Bill, and although we did not always see things the same way, the chance to work with him was one of the better parts of my time assigned to NASA. I am glad this "look back" gives some historical recognition of Bill's contributions.

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