

LOVELACE WR, SCHWICHTENBERG AH, LUFT UC, SECREST RR. *Selection and Maintenance Program for Astronauts for the National Aeronautics and Space Administration. Aerosp Med* 1962; 33: 667-684.

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This paper describes the now legendary process for medical selection of the first group of astronauts, the Mercury Seven. The initial aeromedical selection team consisted of Drs. Stanley White, William Augerson, and Robert Voas, together with representatives from the NASA Space Task Group and the NASA Special Committee on Life Sciences. It had been decided at the White House level that only male military test pilots would be used. The candidates were required to have at least 1,500 flying hours, a maximum age of 39 years, and a maximum height of 5 foot 11 inches, the latter based on the preliminary design of the Mercury capsule. In January 1959, the selection committee reviewed records of all military test pilots on active duty and selected more than 500 for further consideration, then reduced the list to 110 men.

On February 2, 1959, 69 candidates (the first two of three arbitrary groups) reported to Washington under special military orders for Phase I of the selection process. They attended briefings and had a technical interview. This initial medical screening included a psychiatric evaluation by two Air Force psychiatrists, Drs. Ruff and Levy, a detailed review of their medical records, and an interview by the flight surgeon, Dr. Augerson, and a battery of written psychiatric tests by Dr. Voas.

There were 31 pilots chosen for Phase II to be carried out at the Lovelace Clinic, Albuquerque, NM. Initial planning favored selection of a facility to perform the medical examinations in the Washington area, with top consideration being given to three Federal institutions: The National Institutes of Health, the Army's Walter Reed Medical Center, and the Bethesda Naval Hospital. Factors in the choice of the Lovelace Clinic were the work it was doing for the USAF Air Research and Development Command on selection techniques for the USAF "Man-in-Space Soonest" program, that it was a civilian facility, and that it had recently completed development of machine cards for recording all medical related information. The comprehensive program of examination and evaluation to determine the physical, mental, and social status of the candidates was under the direction of Dr. Schwichtenberg. During 1 week, each candidate was evaluated for aviation history, medical history (Dr. Schwichtenberg), physical examination, laboratory tests, radiographic examinations, and physical competence tests (Dr. Luft). The physical examinations were made by an internist and flight surgeon, Dr. Secrest. The candidates were also examined by an ophthalmologist, an otolaryngologist, a cardiologist, a neurologist, and fi-

nally a flight surgeon, either Dr. W. R. Lovelace II or Dr. A. McKinnon, Jr.

All of the candidates then reported for Selection Phases III and IV at the Air Force Research and Development Command (later the Air Force Systems Command) in Dayton, OH, February 16-March 27, 1959. Phase III evaluated the candidates' tolerances to various stresses, including exercise, heat, cold, orthostasis, acceleration, vibration, noise, disequilibrium, and isolation. Phase IV included further psychiatric evaluation and psychological testing to evaluate personality, motivation, intelligence, and special aptitudes.

A final selection meeting took place at NASA's Langley Research Center in Hamilton, VA, and included medical and technical representatives from NASA, the USAF Aerospace Medical Laboratory, and the Lovelace Foundation. The 7 selected astronauts (the original goal had been 12, which was then reduced to a goal of 6) were chosen on April 2, 1959, as a result of physical, psychological, and stress tolerance abilities and because of their individual technical experience. Of interest, they had an average of 3300 flying hours and the following characteristics (average of the entire group): Body fat, 11.2%; peak O₂ consumption, 2.6 L · min⁻¹; cholesterol, 238 mg · 100 ml⁻¹; and an Intelligence Quotient of 135. Five of the final seven had a greater than 15 db hearing loss in the upper range.

The authors of this paper noted that the medical maintenance phase of the astronaut program should emphasize constant and continued medical monitoring and observation of morale and motivation. Periodic intensive medical, physiological, and psychological reevaluations should also be performed.

This initial selection process was certainly ground breaking, especially when one considers that the NASA infrastructure was in early development and that the requirements for selection standards which are now present were then completely non-existent. The decision to utilize a non-military and non-governmental facility to perform the majority of the medical screening to insure that there was no impact on the military careers of the candidates was also unique. The goal of Project Mercury was to investigate whether man could survive spaceflight, and the physiology was completely unknown at the time. Therefore, the emphasis on testing physiological tolerance to various stress factors was very appropriate. After the success of Project Mercury, these were eliminated from the selection process. Interestingly, the Soviet program followed a similar process, but physiological tolerance testing continues to this day in the Russian medical selection and flight certification requirements.

In 1960, Lovelace privately funded a testing project to see how 13 accomplished female pilots would compare

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to the astronaut candidates. The women underwent much of the same medical, physiological, and psychological testing. The "Mercury 13" were not military test pilots and did not have engineering degrees; they were not a part of the NASA astronaut selection program and

never actually met as a group. Although their supporters appealed to President Kennedy and Congress to include women in the astronaut corps, NASA did not select any female astronaut candidates until the 1978 class of Space Shuttle astronauts.