

Firsts in Space and Space Medicine

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The year 1965 (50 years ago) was a truly historical year in space medicine, as the U.S. manned spaceflight effort was in its peak year with regards to budget and personnel. The 1965 NASA budget was \$5.1 billion (\$38.5 billion in 2014 dollars and 4.3% of the federal budget). Compare this to the 2014 NASA budget of \$17.4 billion and less than 0.5% of the federal budget. NASA employed a total of 411,000 people (41,000 in house) as compared to 79,000 (19,000 in house) today.

The Gemini Program made great progress in 1965. Following the three-orbit *Gemini III* flight of Grissom and Young in March, flight durations were progressively extended with a 4-d (*Gemini IV* with McDivitt and White), 8-d (*Gemini V* with Cooper and Conrad), and then a 14-d flight (*Gemini VII* with Borman and Lovell). There was great concern about deconditioning and resistive exercises using bungee cords were performed on all of the long-duration missions. There was also concern about orthostatic hypotension on landing, which had been experienced by Cooper on his last *Mercury* 34-h spaceflight. The orthostatic hypotension on landing was predicted to be especially significant as the *Gemini* astronauts landed in the water upright and not supine. Medical tests and nutritional studies were conducted on all flights and the final conclusion was that no medical problems were found to prevent long-duration (14-d) flights.

The *Gemini* Program had many dramatic moments, such as the first U.S. extravehicular activity (EVA) by Edward White, the launch pad abort of *Gemini VI*, and the rendezvous of *Gemini VI* with *Gemini VII* 3 d later. When the *Agena* target vehicle for *Gemini VI* was lost during launch in October, NASA management made a bold decision in changing the mission of *Gemini VI* to rendezvous with *Gemini VII* in December. Many engineering firsts were accomplished in the *Gemini* Program in 1965. The first maneuverable spaceflight (*Gemini III*), the first controlled precision re-entry (*Gemini VI*), first live telecast of a recovery using the Intelsat 1 (Early Bird) communications satellite (*Gemini VI*), first use of Mission Control in Houston (*Gemini IV*), first use of a hand-held maneuvering unit during EVA (*Gemini IV*), first time that astronauts removed their space suits in flight (*Gemini VII*), and the first use of fuel cells for spacecraft power supply (*Gemini V*). My favorite first achievement was the first normal food eaten in space (a stolen sandwich by John Young on *Gemini III*).

During the Aerospace Medical Association meeting in New York City on April 26-29, two panels were presented, "Progress Report on Project *Gemini*" (moderated by Dr. Charles Berry) and "Life Support for Manned Spaceflight" (moderated by Dr. Stanley White). At the Space Medicine Branch meeting, Charles A. Berry, M.D., was elected President, the guest Speaker was Dr. George E. Mueller (Associate Administrator of NASA), and Hans Georg Clamann, M.D., received the Hubertus Strughold Award.

The Soviets were successful in performing the first EVA (Alexi Leonov on *Voskhod II* on March 18). His 12-min EVA was threatened when he had difficulty re-entering the spacecraft through the airlock due to his suit being overly inflated. Leonov

vented air from his spacesuit to climb back into the capsule (the spacesuit had two pressure settings—5.89 psi and 3.97 psi). The reentry was complicated by the orbital module not separating from the descent module, malfunction of the automatic landing system, and an offset center of gravity which resulted in a reentry of over 10 G and an overshoot of over 2000 km. The spacecraft landed in the Ural Mountains of Siberia in deep snow and was not found until the next day by recovery forces on skis.

The *Ranger 8* and *Ranger 9* lunar impact missions were flown, paving the way for the *Surveyor* unmanned lunar landing missions and in preparation for the hoped for *Apollo* manned lunar landing flights. Three unmanned *Saturn I* launches were successful, the first successful *Atlas Centaur* was launched, and the first nuclear powered spacecraft (SNAP) was launched.

The perception that manned spaceflight was eventually headed for a long-duration Mars mission in the intermediate future can be demonstrated by the articles published in the *Journal of Aerospace Medicine* in 1965. There are several articles on water reclamation and regeneration, long exposure to enclosed atmospheres, physiological effects of living in a slow rotating room, exercise during 4 wk of bed rest, and acceleration tolerance after prolonged bed rest. At that time, Mars was thought to have lichen-like vegetation which underwent seasonal variation and, although water was not abundant, it was still present, especially in the polar regions. On July 14, the *Mariner IV* spacecraft made its closest approach to Mars (6118 mi or 9800 km) on its flyby mission. The data collected radically changed the perception of Mars. Extensive cratering found on the 22 photographs that were taken indicated that weather and water erosion had been minimal for several billion years and that the planet was geologically inactive. The lack of a magnetosphere meant that the surface was not protected from solar radiation. The atmosphere was calculated to be only 4.1–7.0 mbar by radio occultation. This was a tenth of the predicted result and meant that water could not exist in liquid or even solid form. The polar caps, therefore, were composed of CO₂ dry ice and not water ice. It also indicated that the atmosphere was almost all CO₂ and without water vapor or nitrogen. The conclusion was that Mars was Moon-like and not Earth-like. Prior to *Mariner IV* there was wildly speculative talk of a manned Mars mission by 1980; now enthusiasm for the manned exploration of Mars radically decreased.

As the Vietnam War intensified, the NASA budget continued to decline from its peak, never to return, and 1965 became the peak year for resources allocated for human involvement in the exploration of space.

From Paris, TX.

This feature is coordinated and edited by Walter Dalitsch III, M.D., M.P.H. It is not peer-reviewed. The AsMA History and Archives Committee sponsors the Focus as a forum to introduce and discuss a variety of topics involving all aspects of aerospace medicine history. Please send your submissions and comments via email to: walt3@dalitsch.com.

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