Paper ID: 80364
student

57th IAA HISTORY OF ASTRONAUTICS SYMPOSIUM (E4)
Scientific and Technical Histories (2)

Author: Mr. Michal Slomiany
Rzeszow University of Technology, Poland, m.slomiany@outlook.com

Mr. Kamil Ziolkowski
Rzeszow University of Technology, Poland, ziolko.kamil@gmail.com

HISTORY OF ANALOG SIMULATIONS IN PROJECT MERCURY

Abstract

Project Mercury was a pioneering endeavor during which the first human space flights were carried out. Despite earlier tests with animals, which confirmed that living organisms could survive space flight and perform simple tasks, the human reaction to rocket flight and the space environment remained unknown.

The challenges faced by the engineers and scientists planning the flight were primarily the stages of launch and maneuvering in orbit. Despite their impressive performance, human response to the immediate g-force once the rocket's engines ignited, was impossible to replicate on hypersonic aircraft. The effect of weightlessness on the ability to maintain spatial orientation and control the spacecraft was also an unexplored issue.

NASA embarked on a comprehensive program to design and build simulators to ensure that astronauts were best prepared for the tasks ahead. On the verge of emerging digital computers, the analog simulators developed for Project Mercury were the pinnacle of analog simulation technology. The advanced and sophisticated systems present an exciting engineering approach to simulate a wide range of flight conditions with limited resources, pushing analog devices to their limits.

Thanks to the availability of original NASA materials and the recollections of those involved in the Project, a comprehensive analysis was made of the challenges scientists faced, how they were solved, and the effectiveness of the solutions during the orbital flights. In addition to an in-depth technical description of analog flight simulators, the focus is also on human factors issues. Reports compiled in preparation for flights and summarizing the results of missions provide a glimpse into astronauts' reactions to spaceflight. Eyewitness recollections of the program expand the scientific descriptions with the personal feelings of the involved astronauts and engineers.

The technologies developed during Project Mercury laid the groundwork for training astronauts in subsequent space programs. The simulation program has proven to be a critical part of mission preparation as it significantly reduces the risk of flight failure. During the Gemini and Apollo programs, simulator training accounted for an increasing portion of the time spent preparing astronauts for flight.

The now-forgotten technology of analog machines is a reminder of the extraordinary potential of human creativity that enabled the first steps in developing human-crewed space flight. The paper is a unique, comprehensive overview of the Project Mercury simulation program, allowing insight into various aspects of the developed technologies.