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A STUDY OF THE EVOLUTION OF FLIGHT CONTROLLERS SINCE THE BEGINNING OF  
SPACEFLIGHT: WHAT DEFINES AN IDEAL FLIGHT CONTROLLER?

**Abstract**

The roles and responsibilities of flight controllers have indeed intensified alongside the complexity of the missions. Tasks evolved from achieving basic orbital flight and ensuring astronaut survival to sustaining LEO flight, training astronauts on the ground and in flight, deploying scientific experiments and payloads, integrating with other visiting vehicles, controlling robotic arms, and interfacing with other spacecraft components. Naturally, the emergence of modern commercial and private space companies is changing the operational paradigms and landscape of mission control.

There has been a clear shift from manual hand calculations and rigidity that once allowed minimal in-flight adjustments to automated spacecraft monitoring and software systems. Controllers who formerly operated from limited telemetry information from the capsule on the ground now have a constant stream of data to monitor the vehicle and the crew and have high-resolution videos. Instead of coordinating in small teams in one location, today's controllers operate and receive real-time guidance and support from multiple teams and locations across the globe through international partnerships.

With the decommissioning of the ISS, upcoming Artemis missions, and an overall industry shift towards supporting human spaceflight efforts towards deep space in addition to LEO ventures, flight controllers will once again evolve to remain at the forefront of space exploration to guide us to new frontiers.

This paper attempts to categorize the key parameters and skill sets required for the next generation of flight controllers. The selection criteria, such as flight controller training, GNC experience, flight simulator training, and physical skills, will also be studied. This paper will also compare the mission control teams in public and private agencies and the impact of the demands of modern crewed and uncrewed missions. The expected outcomes of the data collection of this study will attempt to define the profile of ideal flight controllers. Lastly, this paper aims to answer the question: what skill sets will the next generation of flight controllers across private and commercial spaceflight companies and agencies need to succeed?