The Lyndon B. Johnson Space Center (JSC) has been a critical element of the United State’s human space flight program for over 50 years. It is the home to NASA’s Mission Control Center, the astronaut corps, and many major programs and projects including the Space Shuttle Program, International Space Station Program, and the Orion-MPCV (Multi-Purpose Crew Vehicle) Project. As part of JSC’s Engineering Directorate, the Applied Aeroscience and Computational Fluid Dynamics Branch is charted to provide aerosciences support to all human spacecraft designs and missions for all phases of flight, including ascent, exo-atmospheric, and entry.

This presentation will review past and current aeroscience applications and how NASA works to apply a balanced philosophy that leverages ground testing, computational modeling and simulation, and flight testing, to develop, verify, and validate related tools and products. The speaker will address associated aspects of aerodynamics, aerothermodynamics, rarefied gas dynamics, and decelerator systems, involving spacecraft vehicle design and analysis, and operational mission support.

From these examples some of NASA leading aerosciences challenges will be identified. These challenges will be used to provide foundational motivation for the development of specific advanced modeling and simulation capabilities, and will also be used to highlight how development activities are increasingly becoming more aligned with flight projects. NASA’s efforts to apply principles of innovation and inclusion towards improving its ability to support the myriad of vehicle design and operational challenges will also be briefly reviewed.