An aerodynamics-focused innovation solicitation from NASA. It's designed to promote high-confidence predictions in aerodynamics, which are essential for high-confidence development and assessment of new concepts. This solicitation is open to small businesses and is focused on aerodynamics-related research and development. The challenge of flight, at its core, is the understanding, prediction, and control of fluid flow around complex geometries. Aerodynamic prediction is critical for the development of subsonic, supersonic, and hypersonic vehicles, influencing how these vehicles are designed, loaded, and how they impact the environment. This solicitation seeks innovative physics-based models and novel aerodynamic concepts, with a particular focus on flow control, applicable in part or over the entire speed regime from subsonic through hypersonic flight.
- Turbulence models capturing the physics of separation onset at Reynolds numbers relevant to flight, where relevant to flight is dependent on a targeted vehicle class and mission profile;

- Boundary-layer transition models suitable for direct integration with state-of-the-art flow solvers;

- Active flow control concepts targeted at separation control and/or viscous drag reduction with an emphasis on the development of novel, practical, lightweight, low-energy actuators;

- Innovative aerodynamic concepts targeted at vehicle efficiency or control;

- Physics-based models for simultaneous low boom/low drag prediction and design;

- Aerodynamic concepts enabling simultaneous low boom and low drag objectives;

- Innovative methods to validate both flow models and aerodynamic concepts with an emphasis on aft-shock effects which are hindered by conventional wind tunnel model mounting approaches;

- Accurate aerodynamic analysis and multidisciplinary design tools for multi-body flexible structures in the atmospheres of planets and moons including the Earth, Mars, and Titan;

- Advanced flow control technologies to alleviate off-design performance penalties for reusable hypersonic vehicles.