A Vision of the NASA Aerosciences Discipline Under the Agency's New Operating Model

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NASA has adopted a new operating model that employs Discipline and System Capability Leadership Teams to define and manage technical and business capabilities required to execute the Agency's mission. These teams provide bottom-up input to Agency decisions involving workforce and infrastructure capacity. An Aerosciences Capability Leadership Team has been formed and an initial assessment of the discipline was conducted in 2014 with four key recommendations focusing on enhancing the Agency's test and analysis capability. Since this initial assessment the Aerosciences Capability Leadership Team has helped define and implement a new funding model for Agency-critical wind tunnel facilities, making them more accessible to research and smaller programs and projects. Implemented in 2017, the funding model has already substantially increased facility utilization and the wind tunnels are fully subscribed for the first time in over a decade. The team has recently defined a series of tests and accompanying Computational Fluid Dynamics (CFD) studies that, for the first time, are specifically aimed at answering the question of whether CFD can be used as a surrogate for wind tunnel testing in a specific speed regime. NASA is hoping to use data from this study, and potentially others like it, to make better-informed decisions on future wind tunnel facility divestment/investment and CFD development requirements. A Strategic Vector for the future of the Aerosciences Discipline has also been established, which sets ambitious goals to further the development of our test and analysis capability, aiming for a physics-based integrated-system simulation capability in the next 40 years. Development of such a capability requires moving CFD past its presently predominant role as a computational wind tunnel toward its more productive utilization as a time-accurate simulator that can be confidently applied across the full range of aerodynamic and aerothermodynamic flight conditions required by the Agency's present and future missions. This means future CFD methods will have to move away from the local time-stepping steady attached flow analyses routinely employed today to efficient time accurate simulations capable of predicting attached and separated flows, accelerating and maneuvering vehicles, mechanical and propulsive active controls, and deforming geometries. This presentation will touch on each of these topics and discuss some of the current and emerging initiatives that will help enable this vision.