RQ17-1

Development of Higher Fidelity, Parallelized, and Multidisciplinary Aircraft Design Suite

1. **Research Title:** Development of Higher Fidelity, Parallelized, and Multidisciplinary Aircraft Design Suite
2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Aerospace or Mechanical Engineering / Computer Science / Systems Engineering (MS level)
4. **Objectives:** To develop an aircraft design environment using higher fidelity models than traditional aircraft conceptual design tool fidelity levels. The design suite will be centered on the Computational Aircraft Prototype Syntheses (CAPS) and the Service Oriented Computational EnviRonment (SORCER) technologies developed within the Multidisciplinary Sciences and Technology Center (MSTC). The design environment will natively support selected open-source analysis and design software that can be parallelized and coupled together in a multidisciplinary fashion to properly account for all physics necessary to design revolutionary air vehicles. In addition to natively supporting selected open-source software tools, the environment will be extensible so that any user may implement their own required software, commercial or home-grown, into the multidisciplinary design process. Finally, this design environment will be computationally competitive with existing conceptual design tools to support short design time frames typically imposed on the conceptual design phase.
5. **Description:** Many aerospace vehicles envisioned for the future are departing from the look and functionality of vehicles developed in the past. Future fighters, transports, and unmanned air vehicles (UAV's) are being driven by more stringent requirements such as lower cost, higher fuel efficiency, increased survivability, and greater power and cooling. These requirements are frequently conflicting, causing the design space to shrink when traditional conceptual design tools are applied. Therefore more exact prediction of the air vehicle physics earlier in the conceptual design process is required. Not only must the prediction of disciplinary physics improve, the multidisciplinary couplings across the air vehicle must be accounted for and captured by the design tools used. It is these multidisciplinary couplings that may be the key to close a future design when exploited during the design process.

   Geometry is the beginning of any analysis, but unfortunately almost every analysis requires different geometry. The CAPS program has developed geometry software that can unify the disparate disciplines with all their different fidelity levels to a single representation of the air vehicle being designed; eliminating the small errors between different disciplinary geometry representations. Additionally bringing higher fidelity earlier in the design process requires the use of the increasing computational power to meet the conceptual design time constraints. The open-source SORCER software capitalizes on the modern multi-core computer architectures, and will allow distributed computation on any available network.
6. **Research Classification/Restrictions:** None.
7. **Eligible Research Institutions:** Indicate to what organizations this topic should be provided.

   [✖] **DAGSI** (Wright State University, AFIT, Ohio State University, University of Dayton, Miami University, Ohio University, University of Cincinnati).