1. **Research Title:** Goal-oriented adaptive methods for air vehicle design

2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Aerospace or Mechanical Engineering / Computational Physics and Numerical Analysis (BA/BS, MS or Ph.D. level).

4. **Objectives:** To develop goal-oriented adaptive analysis methods for transient, coupled-physics phenomena and assess their application within processes for air vehicle design.

5. **Description:** The ability to quickly evaluate an air vehicle design realization during optimization is critical for the effectiveness of the design process overall. High-fidelity computational, coupled-physics analyses are an important tool for evaluating design objectives, but their relatively high cost can limit or prevent their early and widespread application in air vehicle design optimization. Goal-oriented adaptive methods seek to significantly reduce analysis time by reducing problem complexity while preserving predictive quality for outputs-of-interest (e.g. goals for design optimization). Goal-oriented adaptive methods that are of interest under this topic include mesh adaptation, h-p-r adaptation, space-time adaptive methods as well as supporting technologies such as error estimation. Of particular interest, is the extension of such methodologies to include transient (time-marching and time-spectral) phenomena with multidisciplinary couplings. Research areas under this topic may include:

   a. Error estimation and adaptivity for transient, multidisciplinary processes.

   b. Error estimation and adaptivity for internal flows with impacts from inflow / outflow boundary conditions.

   c. Methods for formalizing the optimal application of goal-oriented adaptive methods within design optimization. (what level of accuracy should one seek to achieve for a given design realization?)

6. **Research Classification/Restrictions:** Unclassified

7. **Eligible Research Institutions:** All DAGSI Universities.
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