STATEMENT OF OBJECTIVES (SOO)

Collaborations for Innovative Research on Aircraft Structure (CIRAS) Two-Step Open BAA with CALLS

I. Background

The Aerospace Vehicles Division (RQV), Aerospace Systems Directorate (RQ), Air Force Research Laboratory (AFRL), is soliciting research in aircraft structural design, analysis, and experimentation, specifically in the following areas:

1. Innovative structural concepts including, but limited to, multi-functional structure, and morphing structure;
2. Methods for generating and validating realistic load/environment spectra combining maneuver loads, dynamic loads, and environmental factors (temperature, humidity, chemical, etc.);
3. Advanced design, modeling and simulation methods to design, optimize, and subsequently predict the performance of aircraft structure;
4. Methods for validating structural design, models, and simulations.

The goal of this research is to pioneer transformative aircraft structural technologies and develop the aerospace structures research and development workforce experitise for government and industry. The research will provide the warfighters with a decisive advantage and to strengthen the availability of research and development (R&D) workforce expertise that will continue developing transformative technologies within the government and industry.

II. Description of Effort

Technical topics of interest include fundamental research in the public domain concerning the following research areas, including but not limited to, the following subtopics:

1. ***Innovative structural concepts for reducing weight and/or improving performance***;
    a. Embedding antennas, sensors, batteries, capacitors, or computers into load-bearing structure;
    b. Structures that change shape to effect control of aircraft maneuvers, aeroelastic response, flutter, etc.;
    c. Improved structural joining concepts;
    d. Impact of advanced materials and manufacturing methods such as hierarchically structured materials.

2. ***Generation of realistic load and environmental spectra***;
    a. Methods that consider maneuver, dynamic, and aeroelastic loads into a single load spectrum over the life of an aircraft;
    b. Creation of environmental spectra that describe thermal and chemical conditions and can be time sequenced with mechanical load spectra.

3. ***Advanced structural design and analysis methods;***
    a. Design structure that efficiently satisfies multiple requirements and optimizes the structure;

b. Model complex structure responses to mechanical and environmental loading, including the service life of an aircraft;
    i. Aeroelastic and dynamic responses;
    ii. Quasi-static and cyclic progressive damage, fail safe damage arrest, and impact damage in composite structures;
    iii. Fatigue crack initiation and growth, fail safe damage arrest, and buckling in metallic structure;
    iv. Effects of coefficient of thermal expansion mismatch on hybrid composite/metal structure.

4. ***Advanced techniques for experimental validation of structural models and simulations;***
    a. Quantitative correlation of full field measurements with the results from structural models;
    b. Quantification of uncertainty in experimental data and model results, and the impact on validation;
    c. Innovative testing and measurement techniques.

III. Deliverables

See Contract Data Requirements List (CDRLs), Attachment 2 of the Broad Agency Announcement (BAA) for possible delivery items. The attached CDRL document is an example for planning purposes and each resulting award shall have its own tailored CDRL package.

IV. OPSEC

Operations Security (OPSEC) must be an integral part of our daily activities. As we maintain security on our future technologies that are vital to national interest, we must recognize and prepare for the threat poised against our technology. Department of Defense policies mandate a high degree of security throughout the acquisition process. However, heightened security awareness and threat-based countermeasures are particularly essential during the research and development phase when our technology is most vulnerable to espionage, sabotage, or exploitation. It is the obligation of each employee or persons involved on this agreement to be constantly aware of and strictly adhere to security requirements designed to protect sensitive unclassified and other information and resources produced by acquisition, research and development, and technological security efforts outlined in this SOO. The recipient shall ensure employees receive training and follow appropriate Operations Security (OPSEC) measures during the performance of the agreement.