1. **Research Title:** Two-phase flow thermal systems study for UAS aircraft applications.

2. **Individual Sponsor:**
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3. **Academic Area/Field and Education Level:** Aerospace Engineering / Mechanical Engineering / Chemical Engineer / Fluid Mechanics (MS or Ph.D. level)

4. **Objectives:** Research refrigeration systems that can be miniaturized and incorporated into electronic packaging systems for UAS. Model and Simulate small-scale refrigeration to determine which ones are suitable for incorporation in aircraft electronics packaging. Design, develop, model, test, and characterize the performance of these systems.

5. **Description:** Currently, aircraft thermal and power systems account for up to 30% of the size and weight budgets of a UAV. However, new requirements continue increasing the thermal loads imposed on these military aircraft. The continued increase in thermal loads has led to the use of unconventional thermal architectures. Two-phase flow systems introduce boiling effects instead of relying on fluid velocity to improve heat transfer. Also, two phase flow systems allow the cooling of highly integrated power electronics using two-phase heat transfer vaporization inside a cold plate and heat rejection at temperatures higher than ambient temperature. Further, two-phase systems can provide high heat flux and more uniform temperatures profiles along a fluid cold plate, providing thermal and packaging advantages for designers. This work will explore refrigeration systems architectures that can be miniaturized and incorporated into electronic packaging systems for UAS. Additionally, model and Simulate of these refrigeration architectures will be needed to determine which ones are suitable for incorporation in UAS electronics packaging.

6. **Research Classification/Restrictions:** Open to U.S. citizens only. Some aspects of this research may include ITAR restrictions.

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

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