

1. **Research Title:** Study of DEW thermal performance under aircraft mission profile conditions
2. **Individual Sponsor:**

Dr. Abdeel J. Roman, AFRL/RQQM
AFRL/RQQ
1950 Fifth St bldg. 18
WPAFB, OH 45433
Abdeel.roman@us.af.mil

3. **Academic Area/Field and Education Level**
Aerospace Engineering / Mechanical Engineering/ Electrical Engineer (MS or PhD level)
4. **Objectives:** Research the effects that aircraft maneuvers can cause to a DEW when using a two-phase pump loop for cooling. Exploring the performance of a DEW operating at mission profile conditions. This study will also consider transient behavior of a DEW in response to aircraft maneuvers.
5. **Description:** The increase in aircraft electronic requirements and the need for higher power devices has led to the integration of multiple aircraft thermal technologies in order to develop a capable system. Future aircraft thermal management architecture may consist of an air cycle machine combined with a vapor cycle system, and a polyalphaolephin (PAO) loop with a two-phase flow pump loop all integrated. These integrated thermal architectures can provide the thermal requirements required by the subsystem components and still fulfill the additional thermal requirements needed for the integration of a DEW. The integration of a DEW into an aircraft creates the demand for a thermal management system that can provide highly efficient heat transport and dissipation techniques. Further, the integration of a DEW into an aircraft will require additional areas of consideration. Conditions that simulate full and partial operation of an aircraft should need to be contemplated. Therefore, the need for further exploring the performance of DEW operating at partially simulated aircraft conditions is necessary to predict the behavior of these systems. Current research explores the effects that aircraft maneuvers can cause to a DEW when using a two-phase pump loop for cooling. Additionally, transient behavior will be study to understand the performance of a DEW operating at aircraft mission profile conditions.
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).

PA Approval: 88ABW-2020-0057