| SBIR 06.2 PHASE I - AWARD DETAILS | |
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| **ORGANIZATION** | AMRDEC (M) |
| **TOPIC NUMBER** | A06-016 |
| **CONTRACT NUMBER** | |
| **YEAR OF AWARD** | |
| **AWARD START DATE** | |
| **AWARD COMPLETION DATE** | |
| **PROPOSAL NUMBER** | A062-016-1342 |
| **TITLE** | Missile Flight Weather Encounter Software for System Requirements Development |
| **PROJECT MANAGER** | William F. Adler<br>(805) 692-2341<br>wadler@sysci.org |
| **COMPANY** | Aquila Laboratory, LLC<br>5385 Hollister Avenue, MB205<br>Santa Barbara CA 93111-2389<br><br>Minority Owned: No<br>Woman Owned: No<br>Veteran Owned: No<br>Number of Employees: 1 |
| **KEYWORDS** | hydrometeors, aerospace vehicles, missile trajectories, meteorology, microphysical processes, cloud-resolving model |
| **ABSTRACT** | If flight through real weather environments is to be realized, there are two very important problem areas that have to be addressed: the true nature of the weather environments of interest has to be understood and characterized, and the metrics established for these environments have to reflect to a reasonable extent the significant features of these environments. Both of these problem areas are in desperate need of re-examination which is the goal for the proposed work. When the hydrometeor environments are considered from what is known from meteorology, it quickly becomes evident that the prevailing focus on rain requirements raises questions about the relevance of such requirements. Knowledge of the details of hydrometeor environments is increasing with advanced meteorological measurement techniques. Computational methods based on current meteorological results and field measurements will be used to establish the types and characteristics of the hydrometeors an aerospace vehicle will encounter along a particular flight trajectory through adverse weather. These are important calculations because they indicate the specific hydrometeors that have to be considered in qualification testing and in establishing performance estimates. How well this can be accomplished determines the fidelity of subsequent computational models: hydrometeor/aerodynamic interactions and material damage. |

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| **BENEFITS** | This research addresses a critical issue that concerns the Tri-services and aerospace companies involved with aerospace vehicles that have to operate in adverse weather conditions. Specifically, the components on these vehicles (such as, infrared sensor windows, radomes, shrouds, thermal protection systems, and heat shields) whose function can be compromised by encounters with the hydrometers associated with adverse weather. Due to the increasingly challenging mission specifications for missiles and reusable launch vehicles, the preferred materials for the primary functions that have to be satisfied are not always sufficiently resistant to the hydrometeor impacts the aerospace vehicle may encounter when deployed. Since the performance of the material of choice in a flight environment may be inadequate or possibly unacceptable, it is necessary to realistically characterize the operational environments to develop qualification tests before a system is placed in service. Substantial sums are spent to verify a component satisfies rain erosion requirements, but the current qualification procedures offer very little assurance of what will happen to a qualified component when it is flown through real-world hydrometeor environments. This is critical for system integrators, because lack of characterization of the actual hydrometeor environments encountered in flight means that vehicle components may be over-designed or under-designed. At the present time there is no effective way to make this determination. The analysis software to be provided is based on current understanding and characterization of the hydrometeors present for a spectrum of weather conditions at sites world wide. The ability to run simulations for missile launch points and trajectories for a specific weather event will provide system integrators and component developers with more accurate and realistic performance evaluations of their products. Realistic weather definitions are significant in themselves, but when they are coupled with other ongoing work they will provide credible predictions of overall performance early in the development and acquisition phases of a system development program. This capability will remove the high level of uncertainty that currently exists. It is anticipated the resulting products will be widely accepted and used in these markets due to their importance. |