



**Program Announcement
Hispanic Serving Institutions
Research and Infrastructure Development Program**

U.S. Army Research Laboratory (ARL)
Army High Performance Computing Research Center

1.0 Overview

The U.S. Army Research Laboratory (ARL) announces the Army High Performance Computing Research Center (AHPCRC) Consortium (“Consortium”) *Hispanic Research and Infrastructure Development Program*, under a Cooperative Agreement (W911NF-07-2-0027). The AHPCRC was formed to exploit emerging computing and computational science capabilities with the purpose of better understanding and addressing some of the most complex challenges in defense-related sciences and engineering. High Performance Technologies, Inc. (HPTi) manages the infrastructure and administration component of the Consortium. As such, HPTi is the manager for this procurement and will manage this call for proposals and make awards to qualified Hispanic Serving Institutions (HSI) based on the technical evaluations and final approval of the ARL. HPTi is the sole point of contact related to this RFP and universities may only contact HPTi directly during the pre-award stage and post-award stage for any communication associated with this program.

The purpose of this program is to support the institutional and infrastructure needs and to aid in the development of the next generation of Hispanic computational scientists and engineers by funding student research experience and computational infrastructure support. The overarching goals of these programs are to:

- Improve the educational opportunities for Hispanic students,
- Increase participation in computational science / computer science programs and related curricula,
- Increase the resource pool of well-trained scientists and engineers that utilize computer based modeling and simulation techniques.

2.0 Contract Outline

2.1 Contract Type

The AHPCRC intends to make multiple awards to HSIs based on the requirements herein on a cost reimbursable, not-to-exceed ceiling basis. The period of performance is one year from the date of award. The number and size of awards will vary depending upon the scope of the programs proposed but will range between \$75,000 and \$150,000 per award. It is anticipated that only one award will be issued to any single institution.

2.2 Pricing

Costs shall include all labor, support contracts, equipment, administration fees, and taxes. Technical requirements are divided into the two areas described below. Universities are encouraged (but not required) to bid on both areas based on the requirements outlined in Section 3.

2.3 Eligibility

Proposals may only be submitted by **Hispanic Serving Institutions** as defined by Title V as a non-profit institution that has at least 25% Hispanic full-time

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equivalent (FTE) enrollment. Proposing schools need not be research institutions, but they should have accredited computational science / computer science and/or engineering programs and a history of graduating students in these fields. Community colleges or junior colleges responding to this announcement should demonstrate or establish a program in which the graduates will continue computational science / computer science and/or engineering studies toward the baccalaureate degree.

Proposing schools must submit a compliant proposal to be eligible and only one proposal may be submitted per institution. See Section 5 for detailed proposal instructions.

3.0 Technical Requirements

This section describes the requirements for the types of Hispanic educational programs that will be given priority. Acceptable proposals must comply with the requirements described in this section, the reporting and invoicing requirements in Section 4, and the Proposal Instructions in Section 5. A template for the technical proposal is provided in Appendix A and a sample technical proposal is included in Appendix B.

3.1 Computational Sciences and Engineering Student Research Proposals

Research proposals will be considered for funding. This research should be computational science / computer science or computational engineering research (i.e. mathematics, engineering, chemistry, biology, physics, computer science, or other scientific discipline where a significant portion of the research involves using computers to model the scientific principals being studied). Higher priority will be given to those proposals with explicit (named/identified) student participants. Each proposal should include the names of the principal investigator and student investigators, a description of the planned research objectives including methodologies to be used or developed. The proposal should also include a description of the role that the students will have in the research and the anticipated benefits of student participation.

Each proposal should include the names of the principal investigator and student investigators, a description of the planned research objectives including methodologies to be used or developed, and scientific merit of the research. The proposal should also include a description of the role that the students will have in the research and the anticipated benefits of student participation.

Student participants must:

- Be Hispanic citizens of the United States, nationals of the United States, or aliens lawfully admitted to the United States for permanent residence
- Be enrolled full-time at a Hispanic Serving Institution, and be pursuing a degree in computational science / computer science or engineering programs
- Demonstrate academic talent or potential

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Awarded universities must comply with reporting and invoicing requirements outlined in Section 4. Awarded universities must execute the research as proposed.

3.2 Hispanic Serving Institution Advanced Computing Infrastructure Labs

To support the development of HSI advanced computational infrastructure needs, the AHPCRC intends to support the establishment of new advanced computation laboratories or expansion of existing computational laboratories at eligible HSI institutions. The intent of this requirement is, at a minimum, to establish a computational research laboratory where students will have an opportunity to learn directly how to administer, maintain, and utilize multi-processor computer systems and associated peripherals in a research environment. Each responding university should describe the technology that they wish to acquire, how it establishes or enhances the computational capabilities of the institution, scientific merit, and how it will be used increase the pool of well-trained scientists and engineers that utilize computer based modeling and simulation. All proposals for this area must include a description of the proposed procurement methodology and supporting quotes from the vendors they intend to procure the technology from.

For example, a university could propose a request for a computational laboratory with a Linux cluster with quad-core, quad-socket nodes, high speed interconnect fabric, and associated software to use as a platform for computational science or computer science research, modeling and simulation. Or, if the responding university has already established an advanced computational laboratory and is interested in expanding the capabilities of their existing resources, they could propose a request for equipment that offers students an opportunity to work with cutting edge computational technologies such as: 1) General Purpose Graphics Processing Units (GPGPU), vector co-processor boards, or Field Programmable Gate Array (FPGA) units and supporting hardware utilized for computational research and applications development, 2) Cell workstation development platforms used to enable research in utilizing Cell processors for application development, or 3) Visualization equipment used to expand the capabilities of existing advanced computing resources for modeling and simulation.

Each responding university should describe the technology that they wish to acquire, how it establishes or enhances the advanced computational capabilities of the institution, and how it will be used increase the pool of well-trained students that utilize computer based modeling and simulation. All proposals for this area must include a description of the proposed procurement methodology and supporting quotes from the vendors they intend to procure the technology from.

Awarded universities must comply with reporting and invoicing requirements outlined in Section 4.

4.0 Reporting and Invoicing Requirements

4.1 Program Plan

Each university will provide a report within 60 days of award that summarizes the students participating in the program, their academic profile, the objectives for the program, any events, and other statistical student profile information (male/female ratio, states represented, etc).

This report will also include a budget plan broken down by month of the planned costs for each month of the program. This will be provided at the level of detail to address the cost elements required in the initial proposal.

4.2 Quarterly Status and Financial Report

Universities will submit a quarterly status report regarding progress of their program, This report will provide details on the performance of the program, execution of the proposed plan, and explain any deviations from the proposed plan.

This quarterly report will also address performance to the monthly budget and actual cost reporting following a prescribed format provided by HPTi after award.

4.3 Final Report

At the completion of the program, a final summary report will be due within 30-days of completion of the program. The final report should include assessment and evaluation feedback on the program from the students as well as the institution.

4.4 Invoicing

Invoices will be submitted quarterly and by the 10th of month following the quarter close. Standard Form 270 should be used as the invoice cover sheet with supporting details provided using the cost category outlined in Section 5.1

A final invoice will be submitted within 45 calendar days of the completion of the performance period and will indicate a notation that “This voucher is the final voucher for this contract. No further vouchers will be submitted for this contract.”

5.0 Proposal Instructions

Each proposal must include two required files, the Price Proposal, and the Technical Proposal. Each should include Summary and Supporting Details using the following instructions. A template for the Technical Proposal is provided in Appendix A and a sample technical proposal is provided in Appendix B.

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5.1 Pricing

Universities are required to provide detailed price proposals in accordance with the following guidelines:

- Pricing must be expressed in terms of a cost budget that includes all needed funds including labor, administrative costs and student support costs. Specific costs categories that need to be addressed include:
 - Personnel: Indicate the projected salary and wages for all program personnel. Compensation must meet a fair and reasonable assessment.
 - Fringe Benefits: Fringe benefits should be based on actual known costs or an established formula. Fringe benefits on overtime hours are limited to FICA, Workman's Compensation, and Unemployment Compensation.
 - Travel and Living: Provide the total travel budget, based on projected travel expenses for project personnel.
 - Equipment: Provide the total projected cost of non-expendable items that need to be purchased. Non-expendable equipment is tangible property having a useful life of more than two years. (Note: Organization's own capitalization policy and threshold amount for classification of equipment may be used.) Expendable items should be included either in the "Supplies" category or in the "Other" category. Rented or leased equipment costs should be listed in the "Contractual" category.
 - Supplies: Provide the total projected cost of supplies (e.g., office supplies, postage, books, copying paper, and other expendable items.) Organization's own capitalization policy and threshold amount for classification of supplies may be used. Generally, supplies include any materials that are expendable or consumed during the course of the project.
 - Contractual: Provide a total projected cost of any consultants or contracts for additional support under this program.
 - Total Estimated Cost: The total dollar value for all categories.
 - Cost Rationale: A brief narrative that explains the key assumptions and methods used for cost estimations.
- Ensure allocations are defensible, particularly staffing, travel and living, and equipment. All proposals for the advanced computing infrastructure requirement (Section 3.2) must include supporting quotes from the vendors they intend to procure the technology from.
- Costs should be itemized according to the above cost categories. The use of travel, housing, facilities, and supplies included in the costs should be clearly described as part of the supporting technical proposal.
- Proposals shall remain valid for 180 days from the date of submission.
- Payment terms: Invoices will be paid when government reimbursement is made to the Consortium.

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- Please submit price proposals in Excel 2003 (.xls) format and price proposal rationale in Adobe Acrobat (.pdf) format. Please use the following naming conventions for the electronic files, inserting offering institution name and date of submission in the noted area:
 - AHPCRC_HSI_RIDP-Price_UNIVERSITY NAME_SUBMISSION DATE.xls
 - AHPCRC_HSI_RIDP-Price_UNIVERSITY NAME_SUBMISSION DATE.pdf

5.2 Technical

In addition to responding to the required technical specifications, universities are required to adhere to the following guidelines:

- Technical Proposals shall not exceed more than 10 pages in length for each requirement being responded to (i.e., 3.1 and/or 3.2). If all are proposed, the total technical volume shall not exceed 20 pages in length. This page limit does not include the pricing volume or and participant curriculum vitae.
- Proposals shall remain valid for 180 days from the date of submission.
- Deviations from the required technical requirements outlined above are permitted. However, all deviations must be duly noted and fully justified in order to comply with proposal specifications. Determination of compliance with the technical requirements will be made by ARL.
- Use the template in Appendix A as the format for the technical proposal.
- Please submit technical proposals in Adobe Acrobat (.pdf) format. Please use the following naming convention for the electronic file, inserting offering institution name and date of submission in the noted area:
AHPCRC_HSI_RIDP-Technical_UNIVERSITY NAME_SUBMISSION DATE.PDF

6.0 Evaluation Process and Criteria

Proposals will be submitted to and evaluated by the ARL based on a “best value” / merit-based determination of the student research or advanced computing infrastructure program proposed in accordance with the requirements outlined in this RFP. Overall, quality of the student research / advanced computing infrastructure program proposed as well as integration of advanced computing, computer based modeling and simulation are paramount. In addition, there will be an evaluation of the proposed costs for reasonableness relative to overall funding requested.

Quality of the computational sciences and engineering research proposals will be determined using the following criteria:

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1. Scientific merit: Evaluation of this factor will concentrate on the overall scientific and technical merit, creativity and innovation, of the proposed research in light of the state-of-the-art of current related technologies.
2. Impact of requested funding on the growth of computational science and/or engineering programs and how it will result in an increased resource pool of well-trained scientists and engineers that utilize computer based modeling and simulation.
3. Impact on students and number of students who will benefit from the funding.
4. Qualifications of faculty and university staff to support and manage the proposed program. Demonstration of past performance will be reviewed in assessing this.

The first criterion is most important. Criteria 2-4 are equally important but less important than number 1.

Quality of the advanced computing infrastructure proposals will be determined using the following criteria:

1. Impact of requested funding on the growth of computational science/computer science and/or engineering programs and how it will result in an increased resource pool of well-trained scientists and engineers that utilize computer based modeling and simulation is most important.
2. The degree to which the requested equipment will interface with or upgrade other educational programs and the impact relative to current capabilities.
3. Impact on students and number of students who will benefit from the funding.
4. Qualifications of faculty and university staff to support and manage the proposed program, including the use and maintenance of any proposed equipment. Demonstration of past performance, and facilities plans will be reviewed in assessing this.

The first criterion is most important. Criteria 2-4 are equally important but less important than number 1.

The ARL, with Consortium support, reserves the right to eliminate universities who do not submit compliant proposals upon initial evaluation. The ARL, with Consortium support, also reserves the right to enter into initial discussions with universities prior to final award; however, awards may be made based upon initial or final proposals updated based on these discussions.

6.1 Award Process

Notification of award will be made to the submitting institution by HPTi's contracts office, upon selection and approval by the ARL. HPTi will make subcontract awards based on ARL evaluations. Institutions whose proposals are declined will be advised as promptly as possible. A summary debrief of your proposal evaluation will be provided upon request.

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The proposals awarded are subject to the terms and conditions of the AHPCRC consortium agreement and will be included in the negotiated subcontracts. The parties agree to negotiate a subcontract in good faith on a timely basis. Draft subcontracts will be provided prior to proposal submission. Subcontractor understands that there are mandatory terms and conditions that must be flowed down to all subcontractors.

7.0 Schedule

- Questions should be submitted by 3:00PM EST October 5, 2009.
- Letters of intent are requested by 3:00PM EST October 29, 2009.
- Proposal responses are due by 3:00PM EDT November 27, 2009 according to the aforementioned specifications.

During the pre-award phase, questions, letters of intent, and proposals shall be sent to:

Bob Lyke
Subcontracts Manager
blyke@hpti.com
703-707-2726

An HPTi post-award point of contact will be provided with the award notifications.

Appendix A: Technical Proposal Template

Format: Technical Proposals should not exceed 10 pages in length for each requirement being responded to (i.e., 3.1 and/or 3.2). If both are proposed, the total technical volume should not exceed 20 pages in length. Pages should provide for 1” margins, 12 point Times New Roman font type, 1.5 line spacing. The proposal should include the following sections:

Section 1: Title Page / Executive Summary (not included in above page count)

- Title: AHPCRC Research and Infrastructure Development Program
- Organization Identifier: Provide the name and address of your institution and the primary point of contact.
- Total Budget: Provide the total dollar amount of your proposal, as detailed in the price proposal summary page.
- Executive Summary: In 350 words or less, describe the proposed program plan, management approaches, implementation, anticipated results and/or performance objectives of the program. *NOTE: Information contained in this Executive Summary supports an important component of the Army proposal review process; failure to provide this in a clear and concise manner may unfavorably impact the results of this review.*

This proposal has been submitted

Section 2: Institution Eligibility (Limit to 1 page - not included in above page count)

- Demonstrate compliance with eligibility requirements outlined in Section 2.3.

Section 3: Technical Narrative (page count guidelines included)

Technical Narrative should not exceed more than 10 pages in length for each requirement being responded to (i.e., 3.1 and/or 3.2). If both are proposed, the total technical volume should not exceed 20 pages in length. Pages should provide for 1” margins, 12 point Times New Roman font type, 1.5 line spacing.

- Concisely describe the methods, plans, and approaches that will be used to meet the requirements outlines in Section 3 and 4 of this document.
- Demonstrate the capabilities and capacities to deliver these student research, and/or advanced computing infrastructure requirements of this program within the period of performance and within budget.
- Provide a brief staffing and facilities plan that is realistic, fiscally responsible, and attainable.

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- For the student research requirements (3.1), clearly address the selection criteria that will be used for identifying student researchers and how their successful performance will be supported.
- For the advanced computing infrastructure labs (3.2), clearly address the facilities available for the equipment, how its use will be incorporated into student academic programs (as opposed to research programs), and the plans to support the use and maintenance of the equipment.

Appendix B: Technical Proposal Example

Please note that this sample is provided as a convenience for proposers. It does not imply that the technical content of this sample or a similar project would or would not be funded under this RFP.

Section 1: AHPCRC Research and Infrastructure Development Program

I. M. Researcher

Mycollege University

1 Rural Road

Inatown, MT 99999

Total Budget: \$85,457 For budget details, please see the attached cost proposal.

Executive Summary:

Mycollege University is proposing a research plan that will allow three undergraduate students in our Mechanical Engineering Department complete research in Computational Fluid Dynamics related to flapping wing motion. This research is applicable to micro-aerial vehicles on the scale of the size of a small bird or large insect. This research will consist of creating a wing model using CAD software, then simulating the various wing motions using the AERO code developed at Consortium University. Faculty support will be provided to the students by Professor I. M. Researcher whose previous experience with the AERO code will allow him to guide the students to successful completion of their research. Computational resources will be provided by funding Mycollege University's partner proposal for a Linux cluster system to support these efforts, or through a proposal to the DoD HPCMP program for time on their computer systems.

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Institutional Endorsement:

Mycollege University is pleased to submit this proposal in the form of a cost-reimbursement contract for which the expenses are described in the enclosed cost proposal. Mycollege University is a public nonprofit U.S. institution of higher education. It is classified as an HSI under Title V of the Higher Education Act and is a member of the Hispanic Association of Colleges and Universities. Thank you for your consideration of this proposal and if you require any additional information, please contact me at the number below.

Signed _____

Grant A. Dmini

Mycollege University Contracts and Grants Administrator

(999) 555-2222

Section 2: Institution Eligibility (Limit to 1 page - not included in above page count)

My college University is designated as an Hispanic Serving Institution under Title V of the Higher Education Act. Mycollege University is a member of the Hispanic Association of Colleges and Universities and as of the 2008-2009 school year the student population of the University was 2131 students and 59% of those students are of Hispanic ethnicity.

Section 3: Technical Narrative

Flapping and Twisting Aeroelastic Wings for Propulsion

PI: I. M. Researcher

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Technical Objectives: This effort is aimed at using computational technologies to determine whether it is better to flap a wing in pure plunge, pitch, or twist motion or to use combined motions in order to provide additional thrust, and to determine the optimal amplitudes and frequencies of the flapping and twisting motions. This project will provide support for one faculty member (summer support) and three undergraduates to support work on their senior research thesis projects.

Research Issues: At larger sizes, the best aerodynamic efficiency has been attained by fixed wing vehicles with a separate propulsion system. This may still be true at the size of small UAVs such as the WASP, developed by AeroVironment, which is a flying wing with a span of 13 inches and a separate propeller. MAVs are generally regarded as vehicles with wingspan of six inches or less, and flight speeds of 36 – 72 km/h. At the very low Reynolds number (3,000 – 100,000) typical of MAVs, there is a serious degradation of the aerodynamic characteristics such as L/D of a fixed wing. A separate propeller would suffer an even greater degradation. Thus, it appears that as the scale is reduced below a span of six inches, scaling effects will favor integrated lift and propulsion via flapping wing flight. Then, the research issues become to figure out whether it is better to flap a wing in pure plunge, pitch, or twist motion or to use combined motions, and to determine the optimal amplitudes and frequencies of the flapping and twisting motions.

Related Research: The kinematic variables governing the maneuvering of insects include the stroke amplitude, stroke frequency, wing twist, mean flapping angle, and the variation of the angle of attack during the up- and down-stroke. These variables are combined to generate enough lift for hovering, produce lift and thrust for turning, and alter the total thrust produced by the flapping motion of the wings for accelerating. The primary mechanisms by which insects generate lift and thrust is believed to be related to the control of the vortices shed from the leading edge of the wings. The unsteady motion of the wings is also believed to be the primary source of the aerodynamic forces produced by insects. Both experimental and computational studies have been performed to investigate the aerodynamic characteristics of flapping wings. Experimental efforts have

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considered realistic wings with sharp leading and trailing edges that simulate flat-plate cambered wings. Most computational studies were based on two-dimensional models of benign wing shapes that are rounded near the leading and trailing edges. Both types of studies have relied on various combinations of the kinematic variables mentioned above to predict the vertical and horizontal forces that can be generated by wing motions. The few three-dimensional flapping wing simulations that have been reported in the literature are low-fidelity in the sense that either the twist of the wing was assumed to be constant, and/or the wing was assumed to be rigid, and/or the flow was assumed to be laminar. The cross-section of the wing was typically assumed to be an airfoil. The simulated Reynolds number varied between one thousand and ten thousand. The motion of the wing was assumed to be a combination of sinusoidal pitching and plunging with the two differing by a phase angle. This combination was also observed experimentally for insects in flight.

Technical Approach: It was shown in Jones & Platzer (2002) that a combined pitch/plunge oscillation is more efficient than a pure plunge oscillation, provided the pitch oscillation leads the plunge oscillation with a phase angle of about 90 degrees. A pure plunge oscillation produces higher thrust than a combined pitch/plunge oscillation, but at a lower efficiency. A pure pitch oscillation will produce thrust only if the airfoil oscillates at rather high frequencies, and the efficiency will be quite low. Furthermore, thrust can be increased by either increasing the flapping amplitude or the frequency. However, Jones & Platzer (2002) have proved that it is more efficient to increase the amplitude rather than the frequency, provided the flow remains attached to the airfoil. To further investigate these important issues and exploit the potential of structural flexibility for maximizing propulsive efficiency, the parameterized MAV configurations will be considered using a single actuator at each wing root for generating the flapping motion and each of the following three possibilities for generating the twisting motion: (1) Distributed actuators on the wings, (2) one (torsion) actuator at the tip of each wing complemented with suitable aeroelastic tailoring of both wings, and (3) one external flapping actuator and relying on the aerodynamic loads and aeroelastic tailoring of both wings. In each case, multidisciplinary analysis and optimization will be performed to generate the aeroelastic tailoring, maximize the propulsive efficiency, and highlight the

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pros and cons of the above three scenarios. First, students will create wing models using CAD software. Then, using the AERO software developed at Collaboration University, each student will calculate the effects of one of the forms of wing motion. This software can address aeroelastic effects in the presence of the geometric nonlinearities implied by large flapping and twisting motions. These simulations will be run on the cluster proposed under Section 3.2 of this solicitation. If this proposal is funded and the equipment proposal is not funded, resources will be requested from the DoD HPCMP to run the simulations. The results will then be compared with previously conducted experiments on mechanical hummingbird models, axisymmetric vortex ring-sphere interactions, and flapping plate models.

Deliverables: Each student will prepare a research paper written for their senior thesis reporting the results of their findings. The reports will contain their computational results and a comparison to experimental results.

References:

(Technical references for this work should be cited)

Student Support: Students will be mentored through the research process by Dr. I. M. Researcher. His postdoctoral experience at Consortium University gives him the background required to assist the students with how to run the AERO code, and assist them with interpreting the results of their computations. Dr. Researcher is requesting summer support in order to work with the students full-time in this effort during the summer months.