BROAD AGENCY ANNOUNCEMENT (BAA)

1. Agency Name

United States Air Force Academy (USAFA)

Colorado Springs, CO

2. Funding Opportunity Number

USAFA–BAA-2009-1

3. Funding Opportunity Title

Research Interests of the United States Air Force Academy

4. Types of Instruments Awarded

Research and Development contracts, grants and cooperative agreements

5. Announcement Type

This is the initial announcement.

6. Catalog of Federal Domestic Assistance (CFDA) Numbers

12.800

7. Due Dates

This announcement remains open until superseded. Proposals are reviewed and evaluated as they are received. Proposals may be submitted at any time. Calls may be placed against this BAA and specific information related to due dates will be provided in each Call. The Calls may also include specific terms which apply to the Call such as further technical details, cut-off date for proposal submission and any pertinent clauses such as available GFP or specific Organizational Conflict of Interest requirements. Proposals or White Papers can be submitted at any time or in response to Calls. Late bid and proposal provisions (IAW FAR 52.215-1(c) (3)) will apply to this BAA.

8. Additional Overview

USAFAs Dean of Faculty (DF) is announcing to business and academia the intent to solicit proposals for basic and applied research through this BAA. This strategy provides USAFA DF an acquisition tool with the flexibility to solicit proposals and make awards to develop technologies to meet present and future Air Force research needs as technology issues are identified. USAFA invites proposals for research in many broad areas. These areas are described in detail in Section I, Funding Opportunity Description.

USAFA is seeking unclassified, fundamental research white papers and proposals do not contain proprietary information. Requests for White Papers/proposals are transmitted via Calls are published separately from the BAA at various times during the open period of the BAA (note: the first Call may be published with the BAA).

It is also anticipated awards will be made in the form of grants, cooperative agreements or contracts. USAFA reserves the right to select and fund for award all, some, or none of the proposals in response to this announcement. All awards are contingent upon the availability of funding for the program areas identified. Unless specifically indicated in a Call, cost sharing is permitted but not required. This announcement will remain open until replaced by a successor BAA or cancelled. Proposals may be submitted at any time.

Awards based on responses to this BAA are considered to be the result of full and open competition. Small businesses are encouraged to propose on all of the solicitations. The NAICS code, unless otherwise stated in the BAA amendments shall be: 541711, Research and Development in Biotechnology and 541712, Research and Development in the Physical, Engineering and Life Sciences (except Biotechnology). The size standard for both NAICS codes is 500 employees. Proposals submitted shall be in accordance with this BAA and its appropriate amendment(s).

Interested offerors should be alert for any BAA amendments call for proposals, permit extensions to the proposal submission dates, or otherwise change the requirements of this BAA or its subsequent amendments. Amendments to this BAA will be posted to the FedBizOpps and/or Grants.gov website and published when they occur. Interested parties are encouraged to periodically check these websites for updates and amendments.

USAFA will not issue paper copies of this announcement. The costs of white papers and/or complete proposals in response to this BAA are not considered an allowable direct charge to any award resulting from this BAA or any other award. Technical and cost proposals, or any other material, submitted in response to this BAA will not be returned.

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I. Funding Opportunity Description

The Air Force Academy invests in an active research program for three main reasons. First and foremost, research significantly enhances the cadet learning experience. Our research is done by, for and with cadets who work alongside fellow cadets and faculty mentors. Research provides cadets with rich independent learning opportunities as they tackle ill-defined problems and are challenged to apply their knowledge and abilities.

Secondly, our research program provides opportunities for essential faculty development. Research broadens and deepens the experience base of the faculty. This infuses current, relevant, state-of-the-art and cutting-edge applications and examples into the curriculum. This also helps our faculty remain current in their respective fields.

Third, at USAFA we strive to conduct research to enhance the ability of the Air Force to perform its mission. There are currently ongoing research projects spanning topics as diverse as super cooled cesium atoms, cyber security, spatial disorientation and homeland defense.

This BAA is located at FedBizOpps.gov and Grants.gov website. Research areas of interest to the Air Force Academy's Technical Program Managers are described in detail in the Sub areas below.

a. Research Centers

1. Aeronautics (Aeronautics Research Center)

The Aeronautics Research Center performs a range of aeronautical research tasks in support of Air Force, DoD, NASA, other government and commercial sponsors. Making use of the extensive experimental facilities housed in the USAFA

Department of Aeronautics, the Center pursues a range of aeronautic and propulsion research efforts, with equal emphasis on basic and applied research. The research program in this center is geared toward providing all undergraduates with a rich, relevant research experience while answering critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research tasks, but must seek to incorporate student participation in their projects, typically two to four students per semester. Substantial effort in this center is directed toward the solution of multi-disciplinary problems may require skills beyond classical aeronautics disciplines, including plasma and laser physics, automatic controls and applied mathematics. The ARC, in partnership with the USAFA Modeling and Simulation Center, is a leader in the complementary employment of experiment and simulation to solve complex fluid, aerodynamic and control problems.

Current research strengths include several complementary thrusts. Closed loop flow control efforts focus on aero-optic and energy extraction, with extensive effort in the development of automatic control algorithms and techniques, experimental flow control methodologies and CFD simulations. Plasma actuator development continues in collaboration with the USAFA Physics Department, investigating basic phenomenology while investigating high-leverage applications for the devices. Heat pipe investigations seek improved performance of high power lasers. Well-developed force and moment measurement capabilities are employed in the investigation of numerous air vehicle modifications as well as development of new designs. Operating engines, including an F-109 turbofan and several internal combustion engines are used for fuels and flow quality investigations. Researchers are encouraged to propose topics in these areas and other allied aeronautics subjects.

Currently available facilities, instrumentation and research efforts can be found at http://www.usafa.edu/df/dfan/research_centers/aero_research_center.cfm.

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2. Aeronautics (Modeling and Simulation Research Center)

The Modeling and Simulation Research Center (M&SRC) is a multi-disciplinary center which shares a dual mission of providing high performance computing resources to USAF Academy cadets and research and teaching personnel, as well as conducting modeling and simulation research tasks in support of Air Force, DoD, NASA, other government and commercial sponsors. Making use of distributed/shared memory computing systems and a dedicated research network, the Center pursues a range of computational research efforts, with equal emphasis on basic and applied research. The research program in this center is geared toward providing undergraduates with scientific computing experience supported by the DoD High Performance Computing Modernization Program and projects answer critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research tasks, but must seek to incorporate cadet participation in their projects, typically two to four cadets per semester.

The M&SRC, in partnership with the USAFA Aeronautics Research Center, is a leader in the complementary employment of experiment and simulation to solve complex fluid, aerodynamic and control problems. Current fluid/aerodynamic research efforts include: 1) closed loop flow control focused on aero-optic and energy extraction, 2) plasma actuator development, in collaboration with the USAFA

Physics Department, 3) Chemical, Oxygen, Iodine Laser operation optimization, 4) fluid-structure interaction as applied to aero-elasticity and cargo airdrop operations, 5) massively-separated flow aerodynamics, including turbulence modeling and 6) electrostatic force enhancement of aerosol processes. The M&SRC, in partnership with the USAFA Center of Innovation, is also a leader in the complementary employment of web 2.0/3.0 experiment and simulation on "intelligent networks" including the Flexible Distributed Control/Coordination (FDC) process. FDC has the desired effect of changing and improving decision making within a Command and Control (C2) hierarchy adding a collaborative element to the decision making process and it may also be able to align social networking to achieve desired effects. This is a complementary thrust with the Department of Homeland Security.

Currently available facilities, resources and research efforts can be found at http://www.usafa.edu/df/dfan/research_centers/modeling_and_simulation_center/modeling_and_simulation.cfm

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3. Astronautics (Space Systems Research Center)

The Space Systems Research Center performs a wide range of activities involving the design, assembly, integration, test, launch and flight of small satellites and sounding rockets to conduct research for the Air Force and the Department of Defense. This unique program blends science, technology and organizational skills like none other at the Air Force Academy. The Center is currently analyzing the spacecraft and payload telemetry of FalconSAT-3, briefing real FalconSAT-6 payloads to the Air Force and DOD Space Experiment Review Boards, finishing the

construction of FalconSAT-5 and performing vibration/Thermal Vacuum/CGMOI testing at Kirtland AFB NM, Hall-Effect Thruster characterization at Edwards, launch vehicle integration at Kodiak Island AK. These activities will be completed by February 2010. The Center is also preparing for a FalconSAT-6 conceptual design review by May 2010. The center also is conducting research on sounding rockets. Our recent FalconLAUNCH-7 obtained an apogee altitude of 354,000 ft! Other research areas are nanosatellites (CUBESAT class) and space education. Designing a satellite is a complex, multi-disciplinary undertaking requiring expertise across a number of technical disciplines.

The Space Systems Research Center has openings in the following areas:

- Electrical engineer, FalconSAT program.
- Mechanical technician, fabrication and design support, FalconSAT and FalconLAUNCH programs.
- Satellite engineer, FalconSAT and FalconLAUNCH programs.
- Space operator, FalconSAT program.
- Computer Aided Design (CAD) modeler, FalconSAT program.
- Avionics Chief Engineer, FalconSAT and FalconLAUNCH programs.
- Software Engineer, FalconSAT program.
- Space operations Chief Engineer, FalconSAT and FalconLAUNCH programs.

Currently available facilities, instrumentation and research efforts can be found at http://www.usafa.edu/df/dfas/Research/research.cfm?catname=dfas

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4. Bioenergy (Environmental Research Center)

The Environmental Research Center's (ERC) primary mission is to support the Air Force Office of Scientific Research (AFOSR) basic research program though faculty and cadet research efforts. The United States Air Force Academy (USAFA) has a long-term vision to establish a multi-year alternative energy program of planning, research and infrastructure investment starting in 2009. The vision involves a mix of research and alternative energy production facilities in solar electric, biofuels, waste-to-methane and other multiple conservation efforts. Given the recent high interest in the use of microalgae in alternative fuels production, our Environmental Research Center (ERC) within the Department of Biology is starting up a Biofuels research program. To this end we are seeking research partnerships in developing the photosynthetic, growth and biomass properties of certain microalgae for the purposes of optimizing algal oils production.

Ultimately, our goal is to have these oils converted to liquid transportation fuels. Research efforts will focus on strain selection/cultivation to improve the overall yield of oils in microalgal mass cultures, in concert with developing novel extraction processes to increase oil harvest yields. A proposed solution would include a commercial partner with experience in conducting and participating in R&D relating to the production of lipids in microalgae for conversion to biofuels. Ideally, this arrangement would include exceptional research scientists with backgrounds in applied algal biochemistry, physiology and lipid biosynthesis to investigate/integrate a variety of approaches to increase oil yields in microalgae. Researchers must provide leadership and guidance for a team of laboratory technicians and students, produce reports and other materials to disseminate research results, assist other partner scientists and have a good working knowledge of laboratory analytical equipment. Recognizing the need to develop renewable energy sources vital to this nation's security and defense, "the primary objectives are to understand and improve the facility of certain microorganisms to produce biofuels—specifically molecular hydrogen and algal lipids—for use in fuel cells and air breathing engines."

Because of our USAFA mission to prepare young men and women for leadership positions within the Air Force, cadet participation with researchers is expected as part of our independent study projects (499s) and cadet summer research program (visiting partner labs). Additionally, there is potential for cross disciplinary involvement from a number of academic departments aside from Biology such as Chemistry (biochemistry), Civil Engineering (facility production), Management (project analysis) and Aeronautics (fuel testing). Development of this research thrust may also result in potential collaboration opportunities with other academia, private companies and our Air Force Research Laboratories.

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5. Chemistry (Chemistry Research Center)

The Chemistry Research Center (CRC) engages in broad range of basic and applied research topics in support of the Air Force and DoD technology base. An essential feature of the projects chosen for study is the active participation of cadets who are chemistry, biochemistry and materials chemistry majors. The cadet research efforts are mentored and guided by Academy military and civilian faculty members, with significant collaboration by contractors and academic partners. The expertise, knowledge and creativity of scientists who are from outside of the Air Force Academy are an important part of the research efforts. The current topics of interest in the CRC are renewable energy materials and processes (e.g. hydrogen storage materials, ionic liquid thermal fluids and photoelectrochemical materials), energetic materials, chemical agent decontamination in ionic liquids, electrowetting of surfaces by ionic liquids, microbial adhesion on surfaces, polymer and

nanoparticle coatings on technologically important surfaces, organometallic chemistry of fulvenes.
Research may take place on site using the laboratories and analytical instrumentation located in the Department of Chemistry at the US Air Force Academy (USAFA). A short description of the chemistry research facilities and equipment is available at http://www.usafa.edu/df/dfc/research.cfm?catname=dfc

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6. Computer Science (Academy Center for Cyberspace Research)

The Academy Center for Cyberspace Research (ACCR) conducts research in a wide range of basic and applied areas within the field of Computer Science in support of the Air Force, DoD and other government and commercial sponsors. The primary mission of the center is to enhance cadet education through participation in and exposure to research projects in the domain of cyberspace. All cadets in the Computer Science major receive a research experience through independent studies, course projects and summer research opportunities. Current research focus areas for ACCR include cyberspace education and training, offensive and defensive cyber-warfare and information assurance. State of the art computing facilities are available to students and researchers for conducting studies in an isolated network environment running VM software for rapid reconfiguration and testing. Parallel architectures are also available for studies using neural networks and parallel algorithms. ACCR is especially interested in multi-disciplinary efforts apply underlying computer science principles and theory to complex problems and applications. For example, the application of concurrent coding theory to the development of jam resistant communications without requiring a

shared secret; ad hoc network routing algorithms for robust communication in autonomous vehicles; and the application of visualization principles to discover system vulnerabilities. Researchers are encouraged to propose topics in these areas as well as other cyberspace topics.

Currently available facilities, publications and research efforts can be found at http://www.usafa.edu/df/dfcs/accr/.

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7. Engineering Mechanics (Center for Aircraft Structural Life Extension)

The Center for Aircraft Structural Life Extension (CAStLE) performs a range of vehicle structural integrity research tasks in support of Air Force, DoD, DHS, NASA, other government, academic and commercial sponsors. Making use of the extensive experimental and computational facilities housed in the USAFA Department of Engineering Mechanics, CAStLE pursues a range of engineering mechanics, mechanical engineering, aerospace engineering, corrosion engineering and material science research efforts, with more emphasis on applied, advanced development and technology transition than basic research. The research program in this center is geared toward providing all undergraduates with a rich, relevant research experience while answering critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research tasks, but must seek to incorporate student participation in their projects, typically two to four students per semester. CAStLE in partnership with the USAFA Modeling and Simulation Center is a leader in the complementary employment of experiment and

simulation to solve complex static stability, static strength and fracture mechanics problems. Current research strengths include: high temperature materials development; advanced barrier coatings; static strength, corrosion and static stability design, test, analysis and methods development; computational structural and fracture mechanics; failure analysis, flight data acquisition system development, installation, maintenance and data analysis; structural risk analysis; and USAF Aircraft Structural Integrity Program. Researchers are encouraged to propose topics in these areas and other allied integrity subjects.

Currently available facilities, instrumentation and research efforts can be found at http://www.usafa.edu/df/dfem/castle/index.cfm

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8. Laser and Optical Physics (Laser & Optics Research Center)

The Laser and Optics Research Center performs a range of research tasks in support of the Air Force, Department of Defense, Department of Energy, National Science Foundation and other government and commercial sponsors. Making use of the extensive experimental facilities housed in the USAFA Department of Physics, the Center pursues a range of research efforts, with an emphasis on basic research. The research programs in this center are geared toward providing all undergraduates with a rich, relevant research experience while answering critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-

minded focus on research tasks, but must seek to incorporate student participation in their projects, typically two to four students per semester.

Current research areas of emphasis comprise five broad areas. In the Atomic physics area, precision measurements of atomic properties are a primary focus of investigation. These include measurements of atomic state lifetimes and branching ratios in alkalis such as cesium, sodium, potassium and rubidium along with alkaline-earth elements such as strontium which have atomic clock applications. Also the interaction of alkali atoms with inert gases is being studied for their collisional excitation transfer properties which are important to the operation of alkali lasers. This area is closely related to our second area of emphasis: the study of diode-pumped alkali lasers (DPAL). Key objectives of the DPAL research program are investigating their potential for scaling to high average power, investigating various amplifier and resonator configurations and improving the spectral and spatial output characteristics of high power semiconductor diode pump sources. Applications such as second harmonic generation and sum frequency generation are also part of this effort. Other gas lasers such as carbon monoxide lasers operating infrared wavelengths are also investigated.

Fiber laser research involves novel fiber designs including photonic crystal fibers and acoustically-engineered fibers for the suppression of non-linear effects in high-power fiber lasers, fiber components necessary for coherent beam combining, fiber laser and amplifier characterization, novel fiber manufacturing and processing methods, high-brightness, efficient, wavelength-stabilized pump sources, modeling and simulation of fiber lasers and amplifiers and fiber laser applications including but not limited to remote sensing, tracking, directed energy weapons and communications.

High-performance imaging research is focused on novel wavefront measurement and manipulation techniques including holographic wavefront sensing and

correction and photon sieve telescopes. Key objectives include developing and demonstrating imaging technology suitable for integration into rugged compact devices and aerospace platforms.

Nanomaterials research includes the application of novel materials structures for the manipulation of light including negative index materials, phonon-photon superlattices, tunable dielectrics, ferro-electric and ferro-magnetic oxides, surface plasmonics and black silicon for photo-detector and solar cell applications.

Researchers are encouraged to propose topics in these areas and other related subjects.

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9. Physics (Space Physics & Atmospheric Research Center)

The Space Physics and Atmospheric Research Center (SPARC) studies the natural environment from the troposphere to the Sun in support of Air Force, DoD, NASA, National Science Foundation and other government and commercial sponsors. Making use of the extensive experimental facilities housed in the USAFA Department of Physics, the SPARC pursues a range of efforts, with equal emphasis on basic and applied research. The research program in this center is geared toward providing all undergraduates with a rich, relevant research experience while answering critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research tasks, but must seek to incorporate student participation in their projects, typically two to four students per semester. Substantial

effort in this center is directed toward the solution of multi-disciplinary problems may require skills beyond classical physics disciplines, including plasma and laser physics, advanced miniaturization techniques, use of Microelectromechanical systems (MEMS), development of minitruized automated satellite constellations and advanced data mining techniques for large data systems. The SPARC in partnership with the USAFA Space Systems Research Center, is a leader in the development of miniaturized payloads for small satellites.

Current research strengths include several complementary thrusts. Space physics and space weather study the relationship of the space environment and the effects this environment have on mankind. Topics in space weather can range from experimental, such as developing new instrumentation to measure the space environment, to theoretical, such as developing assimilative models which can be used to predict the space environment into the future. Linked with space physics and space weather, the micro and nano satellite thrust develops aggressively miniaturized spacecraft for use in small in-expensive constellations devoted to exploiting the entire range of space activities of interest to sponsors. The applied physics thrust considers all applications of physics to the practical applications of technology to sponsors and in the past has included studies of plasma actuators, high speed spectroscopy in support of brief duration phenomena in the roposphere, mesosphere and the ionosphere, studies of the aurora and applications of weather modeling to highly dynamic small scale areas such as the Air Force Academy. Finally we support a wide range of basic research in astronomy and astrophysics in support of the Academy observatory.

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10. Center for Physics Education Research (CPER)

The Center for Physics Education Research (CPER) was founded in 1994 to build a USAFA center of gravity providing impetus, opportunities and tools for physics faculty nationwide as well as engage in and apply Scholarship of Teaching and Learning-like (SoTL) research activities within the Department of Physics. The CPER maintains extensive ties and collaborations with similar research programs nationwide.

The primary goals of the CPER are to:

- Engage in research initiatives quantify gains in student understanding and appreciation of physics. Efforts in this category leverage the random assignment of students within Core Physics sections to categorize and assess gains in performance of students within a single semester and across multiple semesters. In addition to analyzing performance on standardized assessments, there is considerable interest in analyzing student response patterns, developing assessment rubrics and understanding prior student knowledge.

- Develop and share tools for enhancing teaching and student learning in physics. Of particular interest is the development of pedagogical techniques and supporting tools for the Just-in-Time Teaching (JiTT) initiative, the signature CPER effort. This effort includes the extension of JiTT to develop student self explanations under a Worked Example model of instruction. Additional efforts would include development of tutorials (to include computer simulations) for both beginning and intermediate physics students.

- Maintain a connection between course and curriculum development (content, assessment methods, pedagogical approach) and physics education research. CPER is actively and intimately involved with several national level efforts to engage in collaborative education research and bring the research

results into the classrooms, both nationally and USAFA, as soon as warranted by the assessment results. Current research in this area includes Do-It-Yourself Modeling (DIY), examination of concept visualization techniques in eight disciplines ranging from Astronomy to Sociology and development of classroom lessons based on the group's prior work. These topics (and supporting grants) are in the NSF CCLI (Course, Curriculum and Laboratory Innovation) category.

- Proliferate lessons learned on a national level by disseminating research results through conference presentations, workshops and publications.

- In addition to disseminating results and lessons learned in Goals 1-3 on a national level, CPER personnel are also developing tutorials, annotating JiTT content for national distribution and authoring a first-ever undergraduate textbook in the Physics of Space Weather.

Researchers are encouraged to propose topics in these areas and other related subjects.

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11. Academy Center for Unmanned Aerial Systems Research (UAS)

The Academy Center for UAS Research educates our cadets as Air Force Unmanned Aerial Systems (UAS) Officers, develops premiere UAS research capabilities and faculty and provides world-class UAS research facilities, supporting a real-world experience for our cadets and producing needed research solutions for

our military partners and sponsors. The research in support of this Center focuses on providing autonomous, decentralized solutions of UAS may also incorporate the use of land and water assets. Researchers may expect access to premier facilities, including lightweight UAS vehicles with supporting Command and Control infrastructure and test and development equipment.

Current research areas strive to achieve the Center's goals. These include control systems algorithms to direct autonomous vehicles, robotic control and navigation, robust communication systems meet the challenges of unpredictable network topology changes, inexpensive sensor network designs incorporate fusion techniques for target identification and localization and event-driven, multithreaded software architectures. Researchers are encouraged to propose topics in these areas or in areas they feel will complement the Center's work.

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12. Center for Innovation (**COI**)

The USAFA Center of Innovation (**COI**) performs a wide range of cadet focused research and innovation tasks, projects and programs in support of DHS S&T, OSD, DoD, USSTRATCOM Global Innovation Security Center (GISC), AFRL and the JCS Strategic Multilayer Assessment Group. The **COI** also focuses on cadet research and innovations supports a Title III Section 313 DHS S&T program called "Technology Clearinghouse to Encourage and Support Innovative Solutions to Enhance Homeland Security." The innovation program places equal emphasis on

basic and applied research as well as prototyping and field testing novel technologies for use by warfighters and first responders. The **COI** focuses on creating novel linkages between old and new technologies can lead to game changing process innovations. The **COI** research program is geared toward providing all undergraduates with a rich, relevant research and innovation experience while answering critical needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research and innovation tasks, but must incorporate student participation in their projects, typically two to four students per semester. Substantial effort in this center is focused on how cadets would employ web 2.0/3.0 collaborative tools to enhance warfighters and first responders' ability to achieve desired effects. Specifically, the **COI** is interested in championing innovations in the cyber area blends the cadet's collaborative social networking skills with the state-of-the art networks, computational nodes, trusted enclaves and delayed tolerant networks.

The **COI**, in partnership with the USAFA Modeling and Simulation Center, is a leader in the complementary employment of web 2.0/3.0 experiment and simulation on "intelligent networks" to achieve a disruptive process innovation called Flexible Distributed Control/Coordination (FDC). FDC has the desired effect of changing and improving decision making within a Command and Control (C^2) hierarchy adding a collaborative element to the decision making process. It is believed FDC can achieve what is referred to as 3^{rd} to 6^{th} degree effects cannot be accomplished within a traditional hierarchical organization. FDC may also be able to align social networking to achieve desired effects. Prototyping an intelligent networking infrastructure facilitates collaboration, with more socialized networking constructs, we hope can ultimately achieve a FDC capability. The improvements come as a result of improved information flow between hierarchies and throughout the layers of a hierarchy, much the same way as human interactions are guided today.

Current research strengths include several complementary thrusts. Crowdsourcing in a DoD/DHS environment; Core Routing & Switching; ad hoc mobility; IP and digital communications; virtualization; media and content and network management. Immersive connected innovations interest include real-time ray tracing (3D water and 3D display); 3-D Internet and data visualization; Co-Processor Memory Sharing for Visual Computing; Confrontational Computing: Socializing Around Arguments on the Web; Human-Centric Vision of Consumer Applications; 2D Interconnect for Tera-scale Processors; Collaborative Visual Analytics in Virtual Worlds; Parallel Programming Tools: Enhancing Computer Vision; Bringing Mobility to Virtual Worlds; Everyday Sensing and Perception; Clone Cloud: Augmented Smartphone Applications Through Cloud Execution; Distributed Applications with Adaptable Security; Router Bricks: Enabling General-Purpose Network Infrastructure; Cloud Computing - near term platform approaches, security federation, enterprise collaboration and scalable data storage; internet-scale general-purpose information exchange service facilitates, controls and monitors the secure borderless delivery of messages among a wide range of internet-connected devices and enterprise applications; Collaborative Data Management - Automatic assignment of semantics to data. Researchers are encouraged to propose topics in these areas and other allied **COI** subjects.

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13. Electrical and Computer Engineering Research

The Department of Electrical and Computer Engineering (DFEC) conducts research into producing needed solutions for our military partners and sponsors while providing real-world engineering experience for our cadets and aiding in the

professional development of our faculty. Research in the areas of energy security and smart grid technology are sought to include concepts associated with effective demand management, integration of multiple generation sources and communication of energy events.

The DFEC research program currently includes investigations in the following areas:

- RF measurement and systems development,
- Micro-Electro-Mechanical Systems (MEMS) applications,
- circuit development,
- robotics and
- renewable energy.

Researchers may expect access to fully equipped facilities, including a state-of-the-art Anechoic Chamber and RF laboratory, MEMs design and test capabilities, various robotics platforms and test and development equipment as well as a printed circuit board prototyping support. Examples of existing research include improvised explosive device (IED) detection, radar cross section (RCS) analysis, MEMs-based antenna design, portable wind power generation and autonomous robot algorithms. Researchers are encouraged to propose topics in these areas or in areas they feel will complement the department's work.

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b. Research Institutes

1. Institute for Information Technology Applications

Warfighter's Edge (a Rapid Application Development team, under the Institute for Information Technology Applications)

The Warfighter's Edge team performs a myriad of cutting edge software development with research necessary for interaction with legacy software solutions. The team is primarily focused on the needs of unit level warfighters. Development projects range from interface development using plug in technologies to direct database calls to web service requests. The development team is geared toward interfaces with Air Force programs such as Portable Flight Planning System (PFPS) [and its 5.0 follow on], FalconView, Joint Mission Planning System (JMPS), Patriot Excalibur, TaskView, Theater Battle Management Core System (TBMCS) – Unit and force level and other common warfighter programs. Development is conducted with Team Foundation Server in the .NET programming language (C# or VB) with unit tests covering code. Agile development, specifically SCRUM is performed by the Warfighter's Edge Team.

Code is produced on the Defense Research and Engineering Network (DREN), is compliant with DoD regulations including Standard Technical Implementation Guides (STIGs), ASACoE certifications, AFNIC (EITDR) processes and requirements. Software is used on NIPR, SIPR and JWICS networks, therefore appropriate security clearances must be held. Research agreements with outside agencies is common and all code produced is the property of the US Air Force.

Strengths are a self-contained sustainment capability including subject matter experts on staff with real world operational aircrew, C&A and testing.

Overview of some products can be found at http://wedge.hpc.mil

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c. Other

1. Space Situational Awareness (Department of Physics)

Space Situational Awareness (SSA) research is performed by the Department of Physics (DFP) across a range of research tasks in support of the Air Force, DoD, NASA and other government and commercial sponsors. Making use of USAFA's extensive experimental facilities housed in several academic departments, DFP pursues a range of research efforts, with an emphasis on basic and applied research. The SSA-relevant research programs are geared toward providing all undergraduates with a rich, relevant research experience while answering critical research needs of our highly varied customer base. Researchers may expect extensive access to premier facilities, tremendous latitude of pursuits and single-minded focus on research tasks, but must seek to incorporate cadet participation in their projects, typically two to four cadets per semester.

Space situational awareness is the requisite current and predictive knowledge of the space environment and the operational environment upon which space operations depend as well as all factors, activities and events of friendly and adversary space forces across the spectrum of conflict. Current research areas of emphasis include space object characterization via resolvable and non-resolvable imaging using both passive and active optical and radar observations, improvements to satellite orbit determination and prediction (methodology, algorithms and processing), modeling of space surveillance sensors to enhance algorithm development and fusion of disparate data sources to maximize the situational awareness. USAFA currently

has a 41- and 61-centimeter telescope for SSA research along with access to high performance computing and small satellite experiments. Future capabilities and facilities will include a two-meter fast-tracking telescope, small remote/autonomous telescopes and radar receivers. This mini network of sensors will be tasked and used by cadets to maintain a small satellite catalog for SSA. Researchers are encouraged to propose topics in these areas and other related subjects.

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2. Department of Behavioral Sciences and Leadership

The Department of Behavioral Sciences and Leadership is involved in multiple basic and applied research efforts span the domains of human behavior. Specifically, we have expertise in areas such as human factors, leadership, sociology, social psychology, clinical psychology, social work, general psychology, biopsychology and cognition. The research program in the department is designed to leverage the expertise of the diverse faculty while at the same time provide undergraduates with relevant, applied experience in research through independent study projects, summer research programs and working alongside faculty on ongoing projects. This is accomplished through research conducted locally and also through numerous collaborations with other DoD agencies and academic institutions.

Current topics of interest range across the behavioral sciences and include:

- The examination of sleep to assess neuropsychological performance as a function of chronic partial sleep deprivation.

- Psychosocial resiliency among soldiers who have deployed during Operation Iraqi Freedom and Operation Enduring Freedom.
- The examination of leaders decision making and performance in complex socio-cultural and technological contexts. The goal is to enhance flexible and adaptive decision making and consequent behavior in military and interagency individuals and teams across the spectrum of current and potential military and civil-military (interagency and coalition) operations.

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d. Special Programs

1. STEM (Science, Technology, Engineering & Math)

The United States Air Force Academy faculty performs a variety of STEM outreach tasks in support of Air Force and Department of Defense goals to enhance the quality of K-12 science and mathematics education with the ultimate goal of encouraging greater numbers of US citizen high school graduates to pursue college degrees and careers in science, technology, engineering and mathematics.

Making use of the extensive experimental and classroom facilities housed in the USAF Academy in Colorado Springs, the Academy administers one of the largest undergraduate research programs in the United States, as ranked by the National Science Foundation's annual listing of federally funded research & development universities. See for example http://www.usafa.edu/df/data/researchReport-all_optimized.pdf The USAF Academy currently houses twelve active research centers and two Air Force research institutes as described at

http://www.usafa.edu/df/dfe/dfer/index.cfm?catname=research most of which have a STEM focus.

Further, the Academy pursues a broad range of teaching and learning research efforts, including research into the Scholarship of Teaching and Learning (SoTL) and a growing STEM outreach program. The program is geared toward providing all K-12 students in southern Colorado (loosely defined as south of the Palmer Divide) with a richer experience in science and mathematics by partnering with universities, K-12 school systems, non-profit foundations, professional societies and other entities in southern Colorado.

Researchers may expect seasonal (i.e., summer) access to premier classroom and laboratory facilities, tremendous latitude of pursuits and single-minded focus on STEM education but must seek to incorporate K-12 faculty and student participation in all their projects. Substantial effort will be directed toward

- Teacher training of K-12 educators, with emphasis on improved methods of organizing and providing coherent curriculum packages from national providers (e.g., NASA, American Institute of Aeronautics & Astronautics, American Chemical Society, Civil Air Patrol) to educators
- "Kindle the fire of curiosity" experiences for K-12 students and teachers during the normal school year and
- STEM summer camps at the Air Force Academy and across southern Colorado

Researchers are encouraged to submit science-based proposals in these and associated STEM outreach areas which develop and implement coordinated programs lend themselves to longitudinal studies of their efficacy.

Currently available facilities, instrumentation and research efforts can be found at http://www.usafa.edu/?catname=Dean%20of%20Faculty

Col Rob Fredell, Ph.D.
Chief Scientist and Director of Research
USAF Academy
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e. Conferences and Workshops

USAFA understands it is essential for the scientific community to maintain clear lines of communication for thorough and well-reasoned research to be accomplished. Support for conferences and workshops are an extremely valuable tool for USAFA. It allows our technical managers the opportunity to receive current information in their respective disciplines. It also allows USAFA the opportunity to inform the research community of the current thrust of USAFAs programs. Conferences and workshops constitute a key forum for research and technology interchange. USAFA accepts proposals from all recognized scientific, technical or professional organizations qualify for federal tax-exempt status. USAFAs financial support through appropriate financing vehicles for conferences and workshops is dependent on the availability of funds, Technical Program Manager's discretion and certain other restrictions including:

- USAFA support for a workshop or conference is not to be considered as an endorsement of any co-sponsoring organization, profit or non-profit.
- The subject matter of the conference or workshop is scientific, technical, or involves professional issues are relevant to USAFAs mission of managing the Air Force basic and applied research programs.
- The purpose of our support is to transfer federally developed technology to the private sector or to stimulate wider interest and inquiry into the relevant

scientific, technical, or professional issues relevant to USAFAs mission of managing the Air Force basic and applied research programs. Proposals for conference or workshop support should be submitted a minimum of six months prior to the date of the conference. Proposals should include the following:

f. Technical Information:

- Summary indicating the objective(s) of the conference/workshop
- Topic(s) to be covered and how they are relevant to USAFAs mission of managing the Air Force basic and applied research programs
- Title, location and date(s) of the conference/workshop
- Explanation of how the conference/workshop will relate to the research interests of USAFA
- Chairperson or principal investigator and his/her biographical information
- List of proposed participants and method (or copies) of announcement or invitation
- A note whether foreign nationals will be present

g. Evaluation Criteria For Conference Support:

Anticipated use of funds requested from USAFA proposals for conferences and workshops will be evaluated using the following criteria. All factors are of equal importance to each other:

- Technical merits of the proposed research and development
- Potential relationship of the proposed research and development to the Department of Defense
- The qualifications of the principal investigator(s) or conference chair(s)
- The realism and reasonableness of cost including proposed cost sharing and availability of funds

h. Cost Information (In addition to information required on SF 424 Research and Related (R & R) Budget forms):

- Total project costs by major cost elements
- Anticipated sources of conference/workshop income and amount from each source

If you have questions concerning the scientific aspects of a potential proposal to USAFA for conference or workshop support, please contact the Technical Program Manager listed in Section I of the BAA for particular scientific area.

II. Award Information

1. The Government anticipates the award of grants, cooperative agreements or contracts under this BAA. It is anticipated cumulative annual awards will not exceed fifty million dollars.
2. The amount of resources made available to this BAA will depend on the quality of the proposals received and the availability of funds.
3. Awards may start any time during the fiscal year.

III. Eligibility Information

All responsible, potential applicants from academia and industry are eligible to submit proposals. USAFA particularly encourages proposals from small businesses, historically black colleges and universities, minority institutions and minority researchers. However, no portion of this BAA is set aside for a specific group.

Proposals from Federal Agencies, including subcontracting/sub-recipient efforts will not be evaluated under this BAA. Federal agencies should contact the Technical Program Manager associated with technical area and listed in Section I of the BAA

to discuss funding through the internal Government procedures. Cost sharing is encouraged but not required.

IV. Application and Submission Information

1. **Address to Request Announcement Package –** This announcement may be accessed from the Internet at Grants.gov. See 'For Electronic Submission' below. A copy of this BAA is also posted on FedBizOpps.

2. **Marking of Proposals -** As previously stated, USAFA is seeking white papers and proposals do not contain proprietary information. If proprietary information is submitted, USAFA will make every effort to protect the confidentiality of the proposal and any evaluations. However, under the Freedom of Information Act (FOIA) requirements, such information (or portions thereof) may potentially be subject to release. If protection is desired for proprietary or confidential information, the proposer must mark the proposal with a protective legend found in FAR 52.215-1(e), Instructions to Offerors – Competitive Acquisition (Jan 2004), (modified to permit release to outside evaluators retained by USAFA). Since the Government anticipates the award of grants, cooperative agreements, or contracts, this statement is applicable to proposals for all three of these potential instruments.

3. **Content and Form of Application Submission** –
    a. **White Paper -** Before submitting a research proposal, you may wish to further explore proposal opportunities. You can do this by contacting the appropriate USAFA Technical Program Manager who can provide greater detail about a particular opportunity; the Technical Program Manager may then ask for a white paper. However, in your conversations with a Government official, be aware only warranted

contracting and grants officers are authorized to commit the Government.

If you prefer, or the Technical Program Manager requests, you may submit a White Paper, which should briefly describe the proposed research project's (1) objective, (2) general approach and (3) impact of Department of Defense (DoD) and civilian technology. The white paper may also contain any unique capabilities or experience you may have (e.g., collaborative research activities involving Air Force, DoD, or other Federal laboratory.) The Technical Program Manager may have additional guidelines regarding form and content of preliminary proposals. For additional information regarding White Papers and for ease of offerors and consistency, please see the AFRL BAA Guide for Industry at www.wpafb.af.mil/library/factsheets/factsheet.asp?id=6790.%20.

White Paper Format

- Paper Size – 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing – single or double spaced
- Font – Times New Roman, 10 or 12 point
- Copies – as discussed with the Technical Program Manager
- Content – as described above

b. **Full Proposals –** All proposals should be submitted electronically and must include the SF 424 (R & R) form from www.grants.gov/agencies/approved_standard_forms.jsp#2 as the cover page. Unnecessarily elaborate brochures, reprints or presentations beyond those sufficient to present a complete and effective proposal are not desired. To convert attachments into PDF format, Grants.gov

provides a list of PDF file converters at www.grants.gov/help/download_software.jsp

Full Proposal Format

- Paper Size
- 8.5 x 11 inch paper
- Margins – 1 inch
- Spacing – single or double spaced
- Font – Times New Roman, 10 or 12 point
- Page Limitation – None, although unnecessarily elaborate proposals are not desirable.
- Attachments – submit in **PDF** format (Adobe Portable Document Format)
- Content – as described below

1.) Advance Preparation For Electronic Submission - Electronic proposals must be submitted through Grants.gov. There are several one-time actions your organization must have completed before it will be able to submit applications through Grants.gov. Well before the submission deadline, you should verify the persons authorized to submit proposals for your organization have completed those actions. If not, it may take them up to 21 days to complete the actions before they will be able to submit applications.

The process your organization must complete includes obtaining a Dun and Bradstreet Data Universal Numbering System (DUNS) number, registering with the Central Contract Registry (CCR), registering with the credential provider and registering with Grants.gov. (Designating an E-Business Point of Contact (EBiz POC) and obtaining a special password called MPIN are important steps in the CCR registration

process.) Go to www.grants.gov/applicants/get_registered.jsp. Use the Grants.gov Organization Registration Checklist at www.grants.gov/section3/OrganizationRegCheck.pdf to guide you through the process. To submit a proposal through Grants.gov, applicants will need to download Adobe Reader. This small, free program will allow you to access, complete and submit applications electronically and securely. To download a free version of the software, visit the following web site: www.grants.gov/help/download_software.jsp. Consult Grants.gov to ensure you have the required version of Adobe Reader installed. Should you have questions relating to the registration process, system requirements, how an application form works, the submittal process or Adobe Reader forms, call Grants.gov at 1-800-518-4726 or support@grants.gov for updated information.

2.) Submitting the Application

a) **For Electronic Submission** – Application forms and instructions are available at Grants.gov. To access these materials, go to www.grants.gov, select “Apply for Grants” and then follow the instructions. In the Grants.gov search function, enter the funding opportunity number for this announcement (USAFA-BAA-2009-1). You can also search for the Catalog of Federal Domestic Assistance (CFDA) Number 12.800, Air Force Defense Research Sciences Program. On the Selected Grant Applications for Download page, click on 'download' under the heading 'Instructions and Applications' to download the application package.

All electronic submission requirements will be defined in each Call.

Note: All attachments to all forms must be submitted in PDF format (Adobe Portable Document Format). Grants.gov provides links to PDF file converters at this site: grants.gov/agencies/asoftware.jsp#3.

b) **SF 424 Research and Related Form (R & R)** - The SF 424 (R & R) form can be downloaded from www.grants.gov/agencies/approved_standard_forms.jsp#2 and must be used as the cover page for all electronic proposals. Complete all the required fields and the following instructions for the specified fields. Mandatory fields will have an asterisk marking the field and will appear yellow on most computers. In grants.gov, some field's will self populate based on the BAA selected. Please fill out the SF 424 first, as some fields on the SF 424 are used to auto populate fields in other forms. The completion of most fields is self-explanatory except for the following special instructions:

- **Field 2**: The Applicant Identifier may be left blank.

- **Field 3**: The Date Received by State and the State Application Identified are not applicable to research.

- **Field 7**: Complete as indicated. If Small Business is selected, please note if the organization is Woman-owned and/or Socially and Economically Disadvantaged. If the organization is a Minority Institution, select "Other" and under "Other (Specify)" note you are a Minority Institution (MI).

- **Field 9**: List USAFA as the reviewing agency. This field is pre-populated in grants.gov.

- **Field 17**: Choose 'No' and check 'Program is Not Covered By Executive Order 12372'.

- **Attachments: All attachments to all Grants.gov forms must be submitted in PDF format** (Adobe Portable Document Format). To convert attachments into PDF format, Grants.gov provides a list of PDF file converters at www.grants.gov/resources/download_software.jsp

c) Certification: All awards require some form of certification of compliance with national policy requirements.

For assistance awards, i.e., grants and cooperative agreements, proposers using the SF 424 (R & R) are providing the certification required by 32 CFR Part 28 regarding lobbying. (The full text of this certification may be found at www.wpafb.af.mil/shared/media/document/AFD-070817-127.pdf). If you have lobbying activities to disclose, you must complete the optional form **SF-LLL**, Standard Form – LLL, 'Disclosure of Lobbying Activities' in the downloaded PureEdge forms package.

d) **R & R Other Forms**: The following other forms must be used for all electronic proposals: R & R Senior/Key Person Profile form, R & R Project/Performance Site Locations form, R & R Other Project Information form and the R & R Budget form. The R & R Sub award Budget Attachment Form is required when sub awardees are involved in the effort. The SF-LLL form is required when applicants have lobbying activities to disclose. PDF copies of all forms may be obtained at the Grants.gov website.

e) **R & R Senior/Key Person Profile Form** – Complete the R & R Senior/Key Person Profile Form for those key persons who will be performing the research. The principal purpose and routine use of the requested information are for evaluation of the qualifications of those persons who will perform the proposed research. For the principal investigator and each of the senior staff, provide a short biographical sketch and a list of significant publications (vitae) and attach it to the R & R Senior/Key Person Profile Form.

f) **R & R Project/Performance Site Locations Form** – Complete all information as requested.

g) **R & R Other Project Information Form - Human Subject/Animal Use and Environmental Compliance.**

Human Subject Use. Each proposal must address human subject involvement in the research by addressing Field 1 and 1a of the R & R Other Project Information Form. If Field 1 indicates "Yes", the Air Force must receive a completed OMB No. 0990-0263 form before a contract, grant, or cooperative agreement may be awarded to support research involving the use of human subjects. Attach the document to the R & R Other Project Information Form. If using Grants.gov, a completed OMB No. 0990-0263 form shall be attached in field 11 of the R & R Other Project Information Form. The OMB No. 0990-0263 is available electronically at: www.hhs.gov/ohrp/humansubjects/assurance/OF310.rtf.

Refer any questions regarding human subjects to Gail Rosado of the Plans and Programs Directorate, Institutional Review Board (IRB) at gail.rosado@usafa.edu.

Animal Use. Each proposal must address animal use protocols by addressing Field 2 and 2a of the R & R Other Project Information Form. If selected for award, additional documentation in accordance with Air Force standards will be required. For ease of offerors and consistency, additional proposal guidance may be found at the following web site www.wpafb.af.mil/library/factsheets/factsheet.asp?id=9388.

Refer any questions regarding animal subjects to David Hale of the Department of Biology at david.hale@usafa.edu.

Environmental Compliance. Federal agencies making contract, grant or cooperative agreement awards and recipients of such awards must comply with various environmental requirements. The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. Sections 4321-4370 (a), requires agencies consider the environmental impact of "major Federal actions" prior to any final agency decision. With respect to those awards which constitute "major Federal actions," as defined in 40 CFR 1508.18, federal agencies may be required to comply with NEPA and prepare an environmental impact statement (EIS) even if the agency does no more than provide grant funds to the recipient. Questions regarding NEPA compliance should be referred to the applicable USAFA Technical Program Manager. Most research efforts funded by USAFA will, however, qualify for a categorical exclusion from the need to prepare an EIS. Air Force instructions/regulations provide

for a categorical exclusion for basic and applied scientific research usually confined to the laboratory, if the research complies with all other applicable safety, environmental and natural resource conservation laws. Each proposal shall address environmental impact by filling in fields 4a through 4d of the R & R Other Project Information Form. This information will be used by USAFA to make a determination if the proposed research effort qualifies for categorical exclusion.

Abstract - Include a concise (not to exceed 300 words) abstract describes the research objective, technical approaches, anticipated outcome and impact of the specific research. In the header of the abstract include the Technical Program Manager's name who should receive the proposal for consideration and evaluation. Attach the Abstract to the R & R Other Project Information form in field 6.

h) **R & R Other Project Information Form - Project Narrative Instructions**

Project Narrative – Describe clearly the research including the objective and approach to be performed keeping in mind the evaluation criteria listed in Section V of this announcement. Also briefly indicate whether the intended research will result in environmental impacts outside the laboratory and how the proposer will ensure compliance with environmental statutes and regulations. Attach the proposal narrative to R & R Other Project Information form in field 7.

Project Narrative - Statement of Objectives – Describe the actual research to be completed, including goals and objectives, on one-

page titled Statement of Objectives. This statement of objectives may be incorporated into the award instead of incorporating the entire technical proposal. Active verbs should be used in this statement (for example, “conduct” research into a topic, “investigate” a problem, “determine” to test a hypothesis). It should not contain proprietary information.

Project Narrative - Research Effort – Describe in detail the research to be performed. State the objectives and approach and their relationship and comparable objectives in progress elsewhere. Additionally, state knowledge in the field and include a bibliography and a list of literature citations. Discuss the nature of the expected results. The adequacy of this information will influence the overall evaluation. Proposals for renewal of existing support must include a description of progress if the proposed objectives are related.

Project Narrative – **Principal Investigator (PI) Time.** PI time is required. List the estimate of time the principal investigator and other senior professional personnel will devote to the research. This shall include information pertaining to other commitments of time, such as sabbatical or extended leave and proportion of time to be devoted to this research and to other research. Awards may be terminated when the principal investigator severs connections with the organization or is unable to continue active participation in the research. State the number of graduate students for whom each senior staff member is responsible. If the principal investigator or other key personnel are currently engaged in research under other auspices, or expect to receive support from other agencies for research during the time proposed for USAFA support, state the title of the other research, the proportion of time to be devoted to it, the

amount of support, name of agency, dates, etc. Send any changes in this information as soon as they are known. Submit a short abstract (including title, objectives and approach) of research and a copy of the budget for both present and pending research projects.

Project Narrative – **Facilities**. Describe facilities available for performing the proposed research and any additional facilities or equipment the organization proposes to acquire at its own expense. Indicate government-owned facilities or equipment already possessed will be used. Reference the facilities contract number or, in the absence of a facilities contract, the specific facilities or equipment and the number of the award under which they are accountable.

Project Narrative – **Special Test Equipment.** List special test equipment or other property required to perform the proposed research. Segregate items to be acquired with award funds from those to be furnished by the Government. When possible and practicable, give a description or title and estimated cost of each item. When information on individual items is unknown or not available, group the items by class and estimate the values. In addition, state why it is necessary to acquire the property with award funds.

Project Narrative – **Equipment.** Justify the need for each equipment item. Additional facilities and equipment will not be provided unless the research cannot be completed by any other practical means. Include the proposed life expectancy of the equipment and whether it will be integrated with a larger assemblage or apparatus. If so, state who owns the existing apparatus.

Project Narrative – **High Performance Computing Availability.** Researchers are supported under a USAFA grant, contract or cooperative agreement and meet certain restrictions, are eligible to apply for special accounts and participation in a full-spectrum of activities within the DOD high performance computing modernization program. This program provides, at no cost to the user, access to a range of state-of-the-art high performance computing assets and training opportunities will allow the user to fully exploit these assets. Details of the capabilities of the program can be found at the following Internet address: www.hpcmo.hpc.mil. Researchers needing high performance cycles should address the utilization of this program to meet their required needs. USAFA Technical Program Managers will facilitate the establishment of accounts awarded.

i) **R & R Budget Form -** Estimate the total research project cost. Categorize funds by year and provide separate annual budgets for projects lasting more than one year. In addition to the R & R Budget forms available on Grants.gov, the budget proposal should include a budget justification for each year, clearly explaining the need for each item. Applicants who enter a fee on Part J of the budget will not be eligible to receive a grant or cooperative agreement. Should a grant be awarded USAFA will make payments to educational and non-profit recipients based upon a predetermined payment schedule. Payments will normally be made quarterly in advance of performance, based upon a spending profile which must be provided as part of the proposal. Payments should be limited to the amounts needed to conduct research during each respective period. Educational and Non-profit organizations shall submit a spending

profile with their cost proposal. Attach the budget justification and/or spending profile to Section K of the R & R Budget form.

3.) Other Submission Requirements

Electronic proposals must be submitted through Grants.gov. There are several one-time actions your organization must have completed before it will be able to submit applications through Grants.gov. Should you have questions relating to the registration process, system requirements, how an application form works or the submittal process, call Grants.gov at 1-800-518-4726 or support@Grants.gov.

Application Receipt Notices

a) **For Electronic Submission** - The applicant's approved account holder for Grants.gov will receive a confirmation page upon completing the submission to Grants.gov. This confirmation page is a record of the time and date stamp is used to determine whether the proposal was submitted by the deadline. After an institution submits an application, Grants.gov generates a submission receipt via email and also sets the application status to "Received". This receipt verifies the Application has been successfully delivered to the Grants.gov system. Next, Grants.gov verifies the submission is valid by ensuring it does not contain viruses, the opportunity is still open and the applicant login and applicant DUNS number match. If the submission is valid, Grants.gov generates a submission validation receipt via email and sets the application status to "Validated". If the application is not validated, the application status is set to "Rejected". The system sends a rejection email notification to the institution and the institution must resubmit the application

package. Applicants can track the status of their application by logging in to Grants.gov.

4.) **Submission Due Dates and Times.** This announcement remains open until superseded or cancelled. Proposals may be submitted at any time. For additional information regarding the BAA process and for ease of offerors and consistency, USAFA has adopted the procedures used in the ARFL BAA Guide for Industry at www.wpafb.af.mil/library/factsheets/factsheet.asp?id=6790.

V. Application Review Information

Proposals submitted under this BAA are evaluated through a peer or scientific review process. If selected for contract award, evaluation will be on a competitive basis according to Public Law 98-369, Competition in Contracting Act of 1984, 10 USC 2361 and 10 USC 2374. If selected for grant/assistance instrument award, evaluation will use merit-based competitive procedures according to DoDGARS citation of 32 C.F.R Sec 22.315. Proposals will be evaluated by the appropriate USAFA Technological Program Manager. Additionally, proposals may be evaluated by outside evaluators retained by USAFA which may include support contractor personnel. Employees of commercial firms under contract to the Government may be used to administratively process proposals. These support contracts include nondisclosure agreements prohibiting their contractor employees from disclosing any information submitted by other contractors. Proposals submitted for a particular research area listed in Section I shall be evaluated under criteria as specified in their description. Subject to funding availability, all other proposals will be evaluated under the following four primary criteria, of equal importance, as follows:

1. Technical merits of the proposed research.
2. Potential relationship of the proposed research to the Department of Defense

3. Potential for cadet involvement in the proposed research.
4. The proposer’s, principal investigator’s, team leader's, or key personnel’s qualifications, capabilities, related experience, facilities, or techniques or a combination of these factors are integral to achieving USAF objectives.

Other evaluation criteria used in the technical reviews, which are of lesser importance than the primary criteria and of equal importance to each other, are:

1. The likelihood of the proposed effort to develop new research capabilities and broaden the research base in support of U.S. national defense.
2. The proposer’s and associated personnel’s record of past performance.
3. The realism and reasonableness of proposed costs.

Following the evaluation, proposals will be placed in one of 3 categories. Category I proposals will be funded as possible, Category II would only be funded following those in Category I and proposals considered to be Category 3 will not receive funding.

Category I

- Proposal is well conceived
- Scientifically & technically sound
- Pertinent to program goals and objective
- Offered by a responsible contractor
- Competent staff
- Supporting resources

Category II

- Scientifically or technically sound but requires further development

Category III

- Not scientifically or technically sound or does not meet agency needs

Offerors must indicate in their proposal, unless a match is required, if they are “not willing or able to cost share” or able to cost share and/or offer these facilities/equipment/etc.”

Additional administrative information regarding submission of applications is contained in Section VIII. The technical and cost information will be analyzed simultaneously during the evaluation process.

For conference support, please see the evaluation criteria listed under the heading of “Conferences and Workshops” under Section I of this announcement.

Proposals may be submitted for one or more topics or for a specific portion of one topic. A proposer may submit separate proposals on different topics or different proposals on the same topic. The U.S. Government does not guarantee an award in each topic area. Further, be advised as funds are limited, otherwise meritorious proposals may not be funded. Therefore, it is important proposals show strength in as many of the evaluation areas as practicable for maximum competitiveness.

VI. Award Administration Information

1. **Award Notices.** Should your proposal be selected for award, the contracting or grants/agreements officer will receive a letter from the Technical Program Manager stating this information. This is not an authorization to begin work. Your business office will be contacted by the grant/agreements or contracting officer to negotiate the terms of your award.

2. **Reporting Requirements.** Grants and cooperative agreements typically require annual and final technical reports, financial reports and final patent reports. Contracts typically require annual and final technical and patent reports. Additional deliverables may be required based on the research being conducted.

Additional reporting requirements associated with certain awards will be based on the nature and source of funding.

VII. Agency Contacts

Should you have questions about a technical research area contact the Technical Program Manager listed for the research topic areas listed in Section I.

** Important Notice Regarding Questions of a Business Nature ** All questions shall be submitted in writing by electronic mail. Questions presented by telephone call, fax message, or other means will not be responded to.

VIII. Additional Information

1. The cost of proposal preparation in response to this Announcement is not considered an allowable direct charge to any resulting award. Such cost is, however, an allowable expense to the normal bid and proposal indirect cost specified in FAR 31.205-18, or OMB Circular A-21, Cost Principles for Educational Institutions or OMB Circular A-122, Cost Principles for Nonprofit Organizations.

2. Every effort will be made to protect the confidentiality of the proposal and any evaluations. The proposer must mark the proposal with a protective legend in accordance with FAR 52.215-1(e), Instructions to Offerors – Competitive Acquisition (Jan 2004), if protection is desired for proprietary or confidential information.

3. Offerors are advised employees of commercial firms under contract to the Government may be used to administratively process proposals. These support

contracts include nondisclosure agreements prohibiting their contractor employees from disclosing any information submitted by other contractors.

4. Only contracting or grants officers are legally authorized to bind the government.

5. Responses should reference Broad Agency Announcement USAFA-BAA-2009-1.

6. Prospective awardees shall be registered in the CCR database prior to award, during performance and through final payment of any award resulting from this announcement. Offerors may obtain information on registration and annual confirmation requirements via the Internet at www.ccr.gov or by calling 1-866-606-8220.

7. USAFA expects the performance of research funded by this announcement to be fundamental. DoD Directive 5230.24 and DoD Instruction 5230.27 define contracted fundamental research in a DoD context as follows:

   “Contracted Fundamental Research. Includes [research performed under] grants and contracts are (a) funded by budget Category 6.1 ("Research"), whether performed by universities or industry or (b) funded by budget Category 6.2 ("Exploratory Development") and performed on-campus at a university. The research shall not be considered fundamental in those rare and exceptional circumstances where the 6.2-funded effort presents a high likelihood of disclosing performance characteristics of military systems or manufacturing technologies are unique and critical to defense and where agreement on restrictions have been recorded in the contract or grant."

8. Indirect Cost Limitation for Basic Research Awards Notices:

The purpose of this notice is to make potential proposers aware of the Indirect Cost Limitation for Basic Research Awards set forth in Section 8109 of the Department of Defense Appropriations Act, 2009 (P.L. 110-329). Section 8109 of the DoD Appropriations limits payments of negotiated indirect cost rates on contracts, grants and cooperative agreements (or similar arrangements), which are funded with FY 2009 Basic Research appropriations to not more than 35 percent of the total cost of the instrument. This limitation also applies to any new award made by another Federal agency to a non-Federal entity on behalf of the DoD using FY 2009 Basic Research appropriations.

- The restriction on payment of indirect costs applies to all FY 2008 or FY2009 Basic and Applied Research appropriations obligated by any award – i.e., procurement contract, grant, cooperative agreement, or any other obligation arrangement – to a non-Federal entity or awardee on or after 14 November 2007.

- The limitation on payment of indirect costs applies to an award entered into at the prime level only and does not flow down to subordinate instruments.

- For the restriction on payment of indirect cost as a percentage of total cost, “total cost” has the meaning given in the Government-wide cost principles apply to the particular awardee (2 CFR part 220, 225, or 230, or 48 CFR part 31). “Indirect costs” are all costs of a prime award are Facilities and Administration costs (for awardees subject to the cost principles in 2 CFR part 220) or indirect costs (for awardees subject to the cost principles in 2 CFR part 225 or 230 or 48 CFR part 31.