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COMUNICACIONES  
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AEM

AGENCIA  
ESPACIAL  
MEXICANA

# ANEXO II GUÍA DE PROYECTOS

## CONVOCATORIA

“OPORTUNIDAD DE ESTANCIAS EN NASA-AMES  
(THE NATIONAL AERONAUTICS AND  
SPACE ADMINISTRATION)”

PARA  
ESTUDIANTES MEXICANOS DE  
INSTITUCIONES MEXICANAS  
DE EDUCACIÓN SUPERIOR

## ANEXO II GUÍA DE PROYECTOS.

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2. *Bio-mimetic Optical Sensor for Real-time Measurement of Aircraft Wing Deflection*
3. *Biosensor Development*
4. *Computer Science Programmer*
5. *CubeSat Cluster Test-Bed*
6. *Data Mining and Analysis for Sustainability Base*
7. *Detecting Human Automation Interaction Errors in Safety-Critical Systems*
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**I. ADVANCED LIFE SUPPORT INTERSHIP OPORTUNITY.**

<b>Project Title</b>	Advanced Life Support Internship Opportunity
<b>Organizartion Code</b>	Code SC, Bioengineering
<b>Research Area/ Field</b>	Water Recycling
<b>Project Description</b>	<p>Advanced life support systems include all systems and technologies required to keep astronauts alive in space: water recycling, air recycling and waste treatment. This Internship is primarily focused on water recycling but is cognizant that an optimized system will include integration with air and waste systems. Our research areas include:</p> <ul style="list-style-type: none"> <li>• Systems that can recover energy from waste.</li> <li>• In situ resource utilization in spacecraft and on planetary surfaces</li> <li>• Application of space flight systems technologies to sustainable terrestrial development.</li> </ul>
<b>Requirements</b>	<p>Innovation a required skill. Our group focuses on training the next generation of NASA scientists on how to innovate and to develop the next generation of water recycling space flight systems that will enable the human exploration and colonization of the Solar System.</p> <p>The ideal candidate is an undergraduate or graduate student in the fields of: Engineering (Chemical, Environmental, Electrical, Industrial, Civil, Computer), Mathematics, Chemistry, Biology, Physics, and Environmental Science and must have at least completed their freshman year of college and a GPA of 3.00 (out of 4). Professional Working Proficiency (ILR level 3) of the English language is the minimum level required. The participant must be a team player and comfortable working with professionals of different cultural and scientific background. At the end of the internship the participant will be required to submit a white paper.</p>
<b>Hours</b>	40 hours per week (standard)

## II. BIO-MIMETIC OPTICAL SENSOR FOR REAL-TIME MEASUREMENT OF AIRCRAFT WING DEFLECTION

<b>Project Title</b>	Bio-mimetic Optical Sensor for Real-time Measurement of Aircraft Wing Deflection
<b>Research Area/ Field</b>	
<b>Project Description</b>	<p>We are characterizing and developing a new bio-mimetic optical sensor, based on the physiological aspects of the eye (and vision-related neural layers) of the common housefly (<i>Musca domestica</i>). We call the sensor the "FlyEye." We are excited about the potential applications for this innovative sensor.</p> <p>During the internship experience the student will carry out experiments with the sensor, assist in the development of a robust target tracking algorithm, and participate in the development of the next generation of the sensor. Experimentation would involve testing new targets, collecting data, varying things like light level, target motion, and distance from target.</p> <p>Target tracking algorithm development will occur simultaneously with experimentation in the lab. The students will be able to dictate what types of experiments should be performed to determine individual aspects of the sensor's performance. No prior experience is required. This part of the project most closely resembles pattern recognition, the student will have to look through the produced data to find features and draw conclusions.</p> <p>For the development of the next generation of the FlyEye sensor the student will have the opportunity to study optics and produce a new solid model of the sensor body. This model can be 3D printed and tested. Solid modeling skills would be beneficial but are not required.</p> <p><b>Expected Opportunity Outcome:</b></p> <p>We would like the student to produce contributions to the hardware or software associated with the project. The student should also produce a final report and poster based on their individual experience with the project. Technical paper publication potential will be based on the extent of research done during the internship period.</p>
<b>Requirements</b>	Matlab, Python, LabVIEW, Circuit Analysis, Arduino, Solidworks, Autodesk Inventor, 3D Printing, Optics.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

### III. BIOSENSOR DEVELOPMENT

<b>Project Title</b>	Advanced Life Support Internship Opportunity
<b>Organization Code</b>	Code SC, Bioengineering
<b>Research Area/ Field</b>	Water Recycling
<b>Project Description</b>	<p>Advanced life support systems include all systems and technologies required to keep astronauts alive in space: water recycling, air recycling and waste treatment. This Internship is primarily focused on water recycling but is cognizant that an optimized system will include integration with air and waste systems. Our research areas include:</p> <ul style="list-style-type: none"> <li>• Systems that can recover energy from waste.</li> <li>• In situ resource utilization in spacecraft and on planetary surfaces</li> <li>• Application of space flight systems technologies to sustainable terrestrial development.</li> </ul>
<b>Requirements</b>	<p>Innovation a required skill. Our group focuses on training the next generation of NASA scientists on how to innovate and to develop the next generation of water recycling space flight systems that will enable the human exploration and colonization of the Solar System.</p> <p>The ideal candidate is an undergraduate or graduate student in the fields of: Engineering (Chemical, Environmental, Electrical, Industrial, Civil, Computer), Mathematics, Chemistry, Biology, Physics, and Environmental Science and must have at least completed their freshman year of college and a GPA of 3.00 (out of 4). Professional Working Proficiency (ILR level 3) of the English language is the minimum level required. The participant must be a team player and comfortable working with professionals of different cultural and scientific background. At the end of the internship the participant will be required to submit a white paper.</p>
<b>Hours</b>	40 hours per week (standard)

## IV. COMPUTER SCIENCE PROGRAMMER

<b>Project Title</b>	Computer Science Programmer
<b>Research Area/ Field</b>	
<b>Project Description</b>	<p>Develop 3D virtual globe technology and applications in Java, C++, iOS and Android</p> <p>We are delighted at the prospect of Inzamam Rahaman working for NASA this summer as part of the Intern Program. We have a lot of challenging things to accomplish with NASA World Wind technology, <a href="http://goworldwind.org/">http://goworldwind.org/</a> as we port it from Java to JavaScript.</p> <p><a href="http://worldwindserver.net/webworldwind/examples/BasicExample.html">http://worldwindserver.net/webworldwind/examples/BasicExample.html</a>  <a href="http://worldwindserver.net/webworldwind/examples/BingLayers.html">http://worldwindserver.net/webworldwind/examples/BingLayers.html</a>  <a href="http://worldwindserver.net/webworldwind/examples/Shapefiles.html">http://worldwindserver.net/webworldwind/examples/Shapefiles.html</a>  <a href="http://worldwindserver.net/webworldwind/examples/MultiWindow.html">http://worldwindserver.net/webworldwind/examples/MultiWindow.html</a></p> <p>Source Code:  <a href="http://worldwind31.arc.nasa.gov/svn/trunk/WebWorldWind/">http://worldwind31.arc.nasa.gov/svn/trunk/WebWorldWind/</a></p> <p>API documentation:  <a href="http://worldwindserver.net/webworldwind/api-doc/">http://worldwindserver.net/webworldwind/api-doc/</a></p>
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## V. CUBESAT CLUSTER TEST-BED Ames Research Center

<b>Project Title</b>	CubeSat Cluster Test-Bed
<b>Research Area/ Field</b>	Small Sats
<b>Project Description</b>	<p>Team members will use available off-the-shelf or spare laboratory hardware to develop laboratory test bed of at least two "Cubesats" and one ground station that will be used for on-going software and communications architecture development.</p> <p>The "Cubesats" may be complete units with all subsystems, flat-sats, or development units consisting of just a processor and RF subsystem. The team will develop ground software as necessary to demonstrate operation of the units including simulated intersatellite communications and simulated downlink.</p>
<b>Requirements</b>	Student should have an Aerospace Engineering, Mechanical Engineering or Mechatronics, Electrical Engineering, Systems Engineering or other related engineering major.
<b>Hours</b>	40 hours per week (standard)

## VI. DATA MINING AND ANALYSIS FOR SUSTAINABILITY BASE

<b>Project Title</b>	Data Mining and Analysis for Sustainability Base
<b>Research Area/ Field</b>	Data Mining
<b>Project Description</b>	<p>The Intelligent Systems Division at NASA Ames Research Center will be integrating advanced technologies into a new "Green" building known as "Sustainability Base" at the Ames campus. Sustainability Base is high-performance, LEED Platinum certified building that will incorporate NASA innovations and technologies to improve energy efficiency, reduce carbon footprint, and lower operating and maintenance expenses compared to traditional buildings. It will function as a living experimental platform, integrating the latest technologies as they evolve.</p> <p>This internship opportunity will assist in defining and implementing demonstrations of NASA technology in Sustainability Base. In particular, the intern will employ advanced data mining algorithms on data acquired from Sustainability Base to learn how the building operates and then monitor how it is performing over time. This could include measurements of energy use, mechanical system performance, environmental parameters, and other key performance indicators. For example, correlations between environmental control system settings and temperature ranges in workspaces can be established and then monitored to give early indication of performance degradation or unexpected changes to the building configuration. However, basic data analysis and gaining an intuitive understanding of data from various building systems (BACnet data, lighting, shade, photovoltaic sensor data, etc.) will also be an important precursor to any application of the advanced data mining algorithms. In addition to global building performance, the algorithms can also be used to detect changes in individual energy use as well. In either case, the algorithms will provide early indications of off-nominal performance to building operators or occupants, enabling corrective actions to maximize building performance and efficiency.</p> <p>Additional information on Sustainability Base can be found at <a href="http://www.nasa.gov/sustainability-base/">http://www.nasa.gov/sustainability-base/</a>. Additional information on data mining algorithms can be found at <a href="http://ti.arc.nasa.gov/tech/dash/intelligent-data-understanding/">http://ti.arc.nasa.gov/tech/dash/intelligent-data-understanding/</a>.</p>
<b>Requirements</b>	The focus of this effort may relate more to automated tracking and consolidation of energy data and plug load management and analysis, so the ideal candidate will have experience in scripting or application development to extract real-time data from APIs and websites for logging into a PostgreSQL database. Experience with MATLAB; Familiarity with Linux OS is preferred; Strong analytical and organizational skills; Interest in sustainability; Interest in data mining algorithms for health management. Senior undergraduate at junior/senior level or higher preferred.
<b>Hours</b>	40 hours per week (standard)

## VII. DETECTING HUMAN AUTOMATION INTERACTION ERRORS IN SAFETY-CRITICAL SYSTEMS

<b>Project Title</b>	Detecting Human Automation Interaction Errors in Safety-Critical Systems
<b>Research Area/ Field</b>	Safety Critical Systems
<b>Project Description</b>	<p>Human automation interaction (HAI) is an interdisciplinary domain that has been studied for several years by researchers and spans cognitive science, systems engineering, computer science, and human factors. The complexity of designing and verifying such systems has also driven researchers to investigate the use of formal specification and verification methods in their development. The design of automated systems in the presence of user interactions is a complex task that is susceptible to a number of known Human-Automation Interaction (HAI) vulnerabilities. Such vulnerabilities can be generic, for example non-determinism or incompleteness in requirements; or the vulnerabilities can be specific to HAI, for example, mode confusion. Analysis of such vulnerabilities is better performed during the early design stage, where both the analysis cost and the cost of making modifications are lower. It is a well-known fact that the cost of finding and fixing errors in a system increases by an order of magnitude as we move from one phase of the software development process to the next. This is an important problem in the context of NextGen systems where new automated systems will be added onboard vehicles. Several aspects of these problems are currently being studied by researchers in the Intelligent System Division and Human System Integration Division at NASA Ames Research Center.</p> <p>In this work we will develop an analysis and verification framework for interfaces and models that describe interactions between humans and automated systems. Various modeling frameworks are used for defining interactions between humans and automated system within the safety-critical systems.</p> <p>With students with a background in program analysis, software engineering, or formal methods the goal of this internship is to build a precise verification framework for interface models used in safety critical systems. These that can analyze and reason about various safety and other complex properties (such as avoid mode inconsistencies and mode confusion). With students with an HCI background the goal is the use information provided by the analysis and present it to the user in a more usable meaningful manner.</p>
<b>Requirements</b>	Graduate student in computer science. Has a strong background in HCI design or design of safety critical systems. Alternatively can also have a strong background in formal methods, verification, or automated analysis. Good technical writing skills, strong Java programming skills, familiarity with version control tools such as subversion or mercurial, ability to communicate effectively, successfully work with members of a team.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Exprt Control</b>	Yes

## VIII. DEVELOPING UNDERWATER SYSTEM USING CUBE-SAT-RELATED TECHNOLOGIES.

<b>Project Title</b>	Developing Underwater System Using CubeSat-Related Technologies
<b>Organization Code</b>	Biological Studies (AST)
<b>Research Area/ Field</b>	Small Sats
<b>Project Description</b>	<p>The Mission Design Center at NASA Ames Research Center is exploring the ability to apply CubeSat technologies to submersible applications, with the long-term view of exploring the subsurface liquid environments of scientifically rich and potentially habitable icy extraterrestrial worlds in our solar system such as Ceres, Titan, Enceladus, and Europa. These worlds are very compelling targets in our effort to find life beyond Earth. An exploration mission to an ice-covered ocean world may be a long-term vision, but this work also offers immediate scientific and engineering benefits by lowering the barriers to access previously limited and hard-to-reach underwater environments. One of these is the icy-world analog of Antarctica, where NASA is performing extensive work, but which require further technological developments for the proper exploration of the ice-covered and subglacial lakes.</p> <p>Ames Research Center has been working to develop low-cost small spacecraft mission concepts capable of reaching Europa. To send an exploration vehicle that will be able to land and start exploring, both above and below the ice, within an affordable budget, will require innovative engineering that takes advantage of new technologies to keep size and mass, and thus cost, low.</p> <p>The NASA Ames' Mission Design Center (MDC) provides concurrent engineering facilities and software for rapid mission development and analysis. The MDC is staffed by subject matter experts covering the domains required to fully develop successful spacecraft mission concepts. The MDC staff use and develop design tools supporting the full mission, including for example, orbit / trajectory design, thermal and electrical analyses, avionics and guidance, navigation and control design, development of operations concepts, and costing. The MDC facilities and staff conduct scheduled and rapid-response design cycles to develop initial mission concepts into proposal-ready, fully supportable technical packages. The intern will be involved in early-stage concept development and technology maturation supporting such a future mission using CubeSat technologies and commercial off-the-shelf (COTS) components. This project will make use of NASA Ames expertise in smartphone based satellites and free-flyers, facilities for design and rapid prototyping, and world-renown scientific leadership in Space Science and Astrobiology.</p> <p>In particular, the intern will employ his/her knowledge in areas, such as mechanics, electronics, and software development, to develop and test technologies. The intern will use resources at Ames, such as rapid-prototyping facilities and the local pool for fast turnaround design and testing. For example, recent studies include subsurface multi-node networking and distributed sensing using Arduino-based components.</p>
<b>Requirements</b>	<p>The student(s) should have, or be willing to learn, a mixture of skills in order to carry a prototyping project forward, including mechanics, electronics, and software development.</p> <p>Familiarity with mechatronics and microcontrollers are preferred, as well as CubeSat technologies and submersibles.</p>
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## IX. EXPLORE IMPACT OF NETWORK DELAYS ON DISTRIBUTED SPACECRAFT TESTING

<b>Project Title</b>	Explore Impact of Network Delays on Distributed Spacecraft Testing
<b>Research Area/ Field</b>	Small Sats
<b>Project Description</b>	Team members will use available off-the-shelf or spare laboratory hardware to explore the possibility of using standard network systems and protocols to run mission simulation and closed-loop hardware-in-the-loop tests remotely where significant parts of the system are connected over the internet. For example, a spacecraft bus could be at one location, a payload at a second location and a dynamic simulation environment could be at a third location, all connected over the internet. The team would identify the problems associated with such an arrangement (e.g. latency) and suggest approaches to mitigate them.
<b>Requirements</b>	Student should have an Aerospace Engineering, Mechanical Engineering or Mechatronics, Electrical Engineering, Systems Engineering or other related engineering major.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## X. HUMAN NUTRIENT PRODUCTION IN SPACE

<b>Project Title</b>	Human Nutrient Production in Space
<b>Research Area/ Field</b>	
<b>Project Description</b>	<p>Future long-duration missions face significant challenges maintaining crew health. A critical area is supplying adequate nutrition, as certain vitamins and nutrients in supplied foods will degrade during extended storage. Likewise, certain nutrients are more effectively utilized when supplied in fresh form as opposed to a preserved format (pills). We are therefore developing a platform technology that demonstrates in situ microbial production of targeted nutrients which currently pose challenges in long duration missions (e.g., lutein, zeaxanthin). The concept is similar to making familiar fermented foods (e.g., yogurt, bread) but in this case with dramatically less processing time and infrastructure.</p> <p>A candidate is sought to participate in the research and development of advanced microbial strategies for the production of nutrients within crewed spacecraft and habitats. Of special interest is creating a lightweight, reliable, safe and rapid system that minimizes crew time and launch costs. Tasks will include microbial growth experiments, genetic engineering of yeast to produce target nutrient compounds, and system integration. The candidate will be working in the laboratory conducting experiments, compiling and analyzing data, writing reports, and participate in general laboratory duties.</p> <p>This project will be conducted at NASA Ames Research Center, Moffett Field, CA in the Bioengineering Branch.</p> <p>Educational Requirements: Applicant must either possess or be pursuing a degree in an appropriate discipline, such as biotechnology, bioengineering, molecular biology or similar program.</p>
<b>Requirements</b>	<p>This project will be conducted at NASA Ames Research Center, Moffett Field, CA in the Bioengineering Branch.</p> <p>Educational Requirements: Applicant must either possess or be pursuing a degree in an appropriate discipline, such as biotechnology, bioengineering, molecular biology or similar program.</p>
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## XI. HUMAN SYSTEM INTEGRATION IN THE NATIONAL AIRSPACE (NAS)

<b>Project Title</b>	Human System Integration in the National Airspace (NAS)
<b>Research Area/ Field</b>	
<b>Project Description</b>	The project within the SMART NAS program consists of building and analyzing models related to human and system integration with respect to the current as well NextGen procedures and concepts in the NAS. The goal of the project is to evaluate new procedures for NextGen systems that will be integrated within NAS in the next 5 to 10 years. The intern on this project will work with research from Intelligent System Division as well as the Human Factors Division at NASA Ames to study current as well NextGen air traffic management (ATM) procedures, develop models , and develop analyzes to validate as well as verify the models. The candidate should have good communication skills, some programming experience, and an ability to work in a team. The goal of the project is to propose new procedures to the FAA such that the procedures can reduce the delays in the New York metroplex.
<b>Hours</b>	40 hours per week
<b>Approved by Export Control</b>	Yes

## XII. LABORATORY RESEARCH IN MICROBIAL ECOLOGY AND SPACE BIOLOGY **Ames Research Center**

<b>Project Title</b>	Laboratory Research in Microbial Ecology and Space Biology
<b>Research Area/ Field</b>	
<b>Project Description</b>	Our laboratory is studying the ecology of complex microbial ecosystems. We are conducting research on naturally occurring communities of algae and cyanobacteria known as microbial mats. We are interested in these communities for a number of reasons including: 1) they are modern analogs of some of the earliest ecosystems on Earth, 2) they are informing our search for life elsewhere, and 3) they may be useful microbial ecosystems to study the effects of spaceflight on microbes. We are also conducting a number of projects in our laboratory which are directed at utilizing cyanobacteria and microalgae from extreme environments for NASA applications (bioregenerative life support and biological in situ resource utilization) as well as for "Greentech" applications on Earth (e.g., microalgae for biofuels and higher value co-products). The successful applicant will have the opportunity to participate in a number of these projects and to conduct original research in collaboration with investigators in our lab. We use a variety of experimental techniques in our research including: photophysiological and biogeochemical measurements as well as molecular ecological tools.
<b>Requirements</b>	General familiarity with Mac and PC computers and Microsoft Office products. We expect to generate data that will result in peer-reviewed publications as well as reports and posters required by internship programs.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

### XIII. LUNAR TOPOGRAPHIC PRODUCTS FROM ORBITAL IMAGES

**Ames Research Center**

<b>Project Title</b>	Lunar Topographic Products from Orbital Images
<b>Research Area/ Field</b>	Computer Science
<b>Project Description</b>	Digital terrain models are essential for cartography, science analysis, mission planning and operations. The NASA Ames Intelligent Robotics Group (IRG) has developed software to automatically generate high-quality topographic and albedo models from satellite images. Our software, the Ames Stereo Pipeline (ASP), uses stereo vision and photoclinometric techniques to produce 3D models of the Earth, Moon, and Mars with very high accuracy and resolution. The intern will assist IRG to improve the quality of topographic products from lunar orbital images. In particular, the intern will help develop multi-stage stereogrammetric methods to exploit the full potential of multiple, overlapping views of a planetary surface. The intern will work closely with NASA researchers and engineers throughout the internship. Very strong emphasis is placed on incorporating and integrating the intern's research into IRG's on-going projects. Research results may be published in one (or more) technical forums: as a NASA technical report, a conference paper, or journal article.
<b>Requirements</b>	The intern must have a background in Computer Science or Mathematics. Practical experience with computer programming, Linux-based software development and open-source tools (gcc, git, etc) is required. Experience with C++ is strongly encouraged.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## XIV. METABOLIC CONTROL FOR ADAPTATION TO SPACEFLIGHT ENVIRONMENT

<b>Project Title</b>	Metabolic control for adaptation to spaceflight environment
<b>Organization Code</b>	Code SC, Division of Space Biosciences
<b>Research Area/ Field</b>	Space Biology/Metabolism
<b>Project Description</b>	<p>With the growing interest in long haul flights and the colonization of the solar system, it is becoming important to develop organism self-regulatory control systems which would be able to meet the requirements of extraterrestrial environments rather than requiring an Earthly environment in space. A better mechanistic understanding of metabolism offers a means for sustaining astronauts in long-duration missions beyond the low Earth orbit. Recent data obtained from several research reports have shown that metabolic suppression could protect biological organisms from damaging effects of space radiation and microgravity.</p> <p>The ability to drastically reduce and suspend metabolism appears to be closely tied to the unique survival of bacteria and some invertebrates (e.g., tardigrades) after a prolonged exposure to cosmic vacuum and radiation. It is possible that there is a monophyletic origin for this adaptation at the molecular level among a variety of different organisms. Our ultimate goals are to demonstrate proof-of-principle for metabolic suppression as means to reduce the negative effects of spaceflight environmental issues such as radiation and microgravity.</p> <p>In order to demonstrate the potential application of the metabolic control technology the PI's laboratory at NASA Ames Research Center has engineered a hypo-metabolic chamber with a range of life-monitoring equipment for high-throughput testing of hypo-metabolic parameters and conditions that enable reversible induction of a state of suspended animation in non-hibernating animals. This internship opportunity will assist in defining and implementing demonstrations of the metabolic control technology using different animal models.</p> <p>Objectives of this research are:</p> <ul style="list-style-type: none"> <li>• To characterize the hypometabolic state</li> <li>• To develop methodology for real time monitoring of respiratory and other physiological parameters and conditions associated with the hypometabolic stasis.</li> </ul> <p>In the proposed experiments, the intern will work in collaboration with molecular biologists and engineers to (1) reproduce induction of the reversible suspended animation-like state in selected animal models, and to (2) establish a comprehensive life support system for monitoring physiological parameters of the hypometabolic state.</p>
<b>Requirements</b>	<p>Student should be willing to work with animals. He/she should have basic knowledge of life support systems (respiratory parameters, ventilation, and core body temperature control), have basic laboratory skills and technical knowledge for monitoring physical parameter from telemetric devices, and have software management skills.</p> <p>Strong analytical and organizational skills; interest in biology; interest in data analysis. Senior undergraduate at junior/senior level or higher preferred.</p>
<b>Hours</b>	40 hours per week (standard)

## XV. MONITORING CHANGES IN ASRS REPORTS USING PYTHON AND TEXT MINING

<b>Project Title</b>	Monitoring Changes in ASRS Reports using Python and Text Mining
<b>Organization Code</b>	Computer Science
<b>Research Area/ Field</b>	Space Biology/Metabolism
<b>Project Description</b>	Students applying for fellowship opportunities will be required to submit a proposal to the mentor. Prior to submitting a proposal, students will create a proposal summary with a description of their idea, and they will submit it to the mentor for their approval. The mentor has 10 business days to respond to each proposal summary. It is anticipated that mentors will only approve a couple proposal summaries, and they will work with those students to create their proposals and to make sure the topic is mutually beneficial to both the mentor and student.
<b>Requirements</b>	We aim to develop tools that can be used to monitor the changes in the aviation safety reports submitted to NASA Aviation Safety Reporting System (ASRS) program. ASRS collects and analysis the voluntarily submitted aviation safety incidents reports in order to reduce the ikelihood of aviation accidents. We need tools that can help ASRS to monitor changes in the narratives of the reports over time and can summarize these reports.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## XVI. NANOTECHNOLOGY IN ELECTRONICS AND SENSOR DEVELOPMENT

<b>Project Title</b>	Nanotechnology in electronics and sensor development
<b>Organization Code</b>	Code T; co-mentors: Code-TSN
<b>Research Area/ Field</b>	Nanotechnology
<b>Project Description</b>	<p>Nanomaterials such as carbon nanotubes (CNTs), graphene and a variety of inorganic nanowires offer tremendous potential for future nanoelectronics, nanosensors and related devices. We have active ongoing programs in these areas. Several examples are given below. Chemical sensors to detect trace amounts of gases and vapors are needed in planetary exploration, crew cabin air quality monitoring and leak detection; there are numerous societal applications as well. We have been working on CNT based sensors amenable for various platforms including smartphones.</p> <p>Flexible electronics on substrates such as textile and paper is of great deal of interest to us. We have fabricated gas/vapor sensors on cotton textile as well as cellulose paper. Other interests in paper electronics and flexible substrates include memory devices, energy storage devices, displays and detectors. Finally, we have also been revisiting vacuum tubes although in the nanoscale, using entirely silicon based technology. These radiation resistant devices offer exceptionally high frequency performance. Our interest here extends to exploring the nano vacuum tubes for THz electronics applications.</p> <p>In all the areas, the projects include material growth, characterization, device fabrication, device testing and evaluation, reliability and lifetime assessment.</p>
<b>Requirements</b>	We aim to develop tools that can be used to monitor the changes in the aviations safety reports submitted to NASA Aviation Safety Reporting System (ASRS) program. ASRS collects and analysis the voluntarily submitted aviation safety incidents reports in order to reduce the ikelihood of aviation accidents. We need tools that can help ASRS to monitor changes in the narratives of the reports over time and can summarize these reports.
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## XVII. PROGNOSTICS AND HEALTH MANAGEMENT

<b>Project Title</b>	Prognostics and Health Management
<b>Research Area/ Field</b>	
<b>Project Description</b>	Explore prognostic and forecasting concepts in the context of aeronautics vehicles and airspace operations. The task involves literature review, algorithm development (likely in matlab) and realization of some of the concepts in relevant aeronautics simulations. It may also involve some lab experiments during which the candidate would age components relevant in an aeronautics context.
<b>Requirements</b>	<p>The outcome would be one or more of:</p> <ul style="list-style-type: none"> <li>• algorithms</li> <li>• experimental data</li> <li>• report or publication</li> <li>• poster presentation</li> </ul> <p>Matlab required, labview desired.</p>
<b>Hours</b>	40 hours per week (standard)
<b>Approved by Export Control</b>	Yes

## XVIII. THE EFFECTS OF MECHANICAL UNLOADING ON BIOLOGICAL FUNCTION

<b>Project Title</b>	Prognostics and Health Management
<b>Hours</b>	40 hours per week (standard)

## XIX. UPGRADING A SPACE DEBRIS SIMULATION SOFTWARE FOR PLANETARY DEFENSE ASSESSMENTS

<b>Project Title</b>	Upgrading a Space Debris Simulation Software for planetary defense assessments
<b>Organization Code</b>	RD, Mission Design Division
<b>Research Area/ Field</b>	Space Debris Mitigation / Planetary Defense
<b>Project Description</b>	<p>NASA Ames Research Center has developed a simulation software that models the space debris environment in Low Earth Orbit (LEO). The goal of the current software is to assess the efficiency of a concept for collision avoidance between debris and active satellites. The investigated system would use photon pressure from ground based lasers to slightly change orbits to avoid collisions on warning.</p> <p>For the internship, the main task will be to upgrade the simulation software to include the near earth object (NEO) environment (asteroids) and enable the assessment of cubesat based asteroid detection systems. You will change the main body of the previous simulation from the sun to the earth, introduce a population of asteroids into the model and investigate the utility of cubesats to detect those asteroids as they come close to Earth. In addition, you also will help to maintain the original software for space debris modeling.</p>
<b>Requirements</b>	The intern should have a background in the sciences or engineering, and ideally Aerospace Engineering or Physics. The project requires programming skills in C and Matlab and an understanding of orbital dynamics.
<b>Hours</b>	40 hours per week (standard)