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ACTS



NASA ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE

ACTS SCIENCE EDUCATION NETWORK

PROPOSED TWO-YEAR PILOT PROJECT

SOLARQUEST®

SUMMARY

The ACTS SCIENCE EDUCATION NETWORK is an advanced technology education program designed to improve science and technology education in public and private schools throughout the United States and worldwide by utilizing the NASA ACTS satellite as a test-bed for new and emerging technology-aided pedagogies.

October 2003

ACTS SCIENCE EDUCATION NETWORK

The ACTS Science Education Network (ACTS Network) is a joint program of SolarQuest®, EcoSage Corporation, and the Ohio Consortium for Advanced Communications Technology (OCACT). The program proposes to utilize the National Aeronautics and Space Administration (NASA) Advanced Communications Technology Satellite (ACTS Satellite) to link remote science research facilities in the Galapagos Archipelago to classrooms throughout the United States. The ACTS Network provides an opportunity for public and private partners to advance science research and education while providing technical assistance and human capacity development for the inhabitants of the Galapagos Islands. The goal of the program is twofold: i) to advance science research and education by demonstrating pedagogical applications of advanced space communications technologies; and ii) to demonstrate the potential for advanced space communications technologies to support sustainable economic development in remote regions of the world through the creation of an information economy based on knowledge management and science education content.

EDUCATIONAL ACTIVITIES

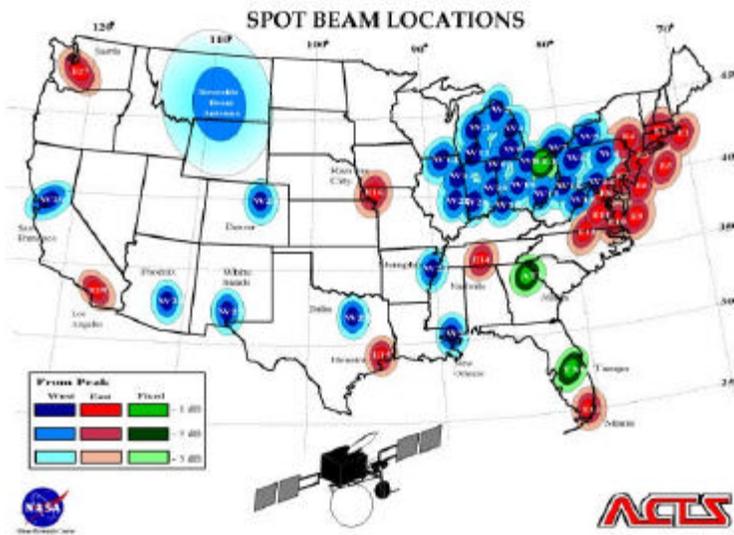
The ACTS Network will support four primary educational activities:

1. The Center for Excellence for Telecommunications and Space (CETS): Funded by NASA, CETS is a joint program of Morehouse College and Ohio University to address the need for a skilled workforce in the telecommunications and space communications industries, and to assure strong minority participation in telecommunications and space professions. CETS will utilize the ACTS Satellite as a hands-on, learning laboratory.
2. Renewable Energy Curriculum: In collaboration with the e7 Fund for Expertise on the Global Environment (e7), the ACTS Network will support K-12 renewable energy education worldwide through an Internet-based, distance learning technology---the SolarQuest® Virtual Schoolhouse---utilizing real-time and archived production data from renewable energy resources in the Galapagos.
3. Galapagos Virtual Observatory: The ACTS Network will provide live web casts, or “virtual observatories,” from scientific observation posts throughout the Galapagos. Web casts with relevant science content featuring the wildlife of the marine ecosystems in the Galapagos will be archived as a broadcast-on-demand special observation series with a companion curriculum and professional development support for teachers. The program will be available to the 126,500 public schools and 52 million school children in the United States, and millions of other students in schools with an Internet connection worldwide.
4. e7 Micro-Solar Distance Learning Initiative: The ACTS Network will provide direct support to the e7 Micro-Solar Distance Learning Initiative with the goal to build human capacity through education and employment training in the Galapagos Islands in order to support the development of an information economy based on knowledge management and science education content.

ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE (ACTS)

The Advanced Communications Technology Satellite (ACTS) was launched as the primary payload aboard the Space Shuttle Discovery (OV-103) from the Kennedy Space Center, Pad 39B, as part of the STS-51 mission on September 12, 1993. NASA experimentation utilizing ACTS as a technology test-bed continued until June 2000. In May, 2001, the Ohio Consortium for Advanced Communications Technology (OACT) formally assumed control of ACTS under the provisions of a Space Act Agreement executed between the NASA Glenn Research Center, the Ohio Board of Regents, and Ohio University. OACT reimburses NASA for the cost of continuing ACTS operations. The School of Electrical Engineering and Computer Science and the J. Warren McClure School of Communication Systems Management at Ohio University assumed the role of Managing Member of OACT in May, 2001. EcoSage Corporation / SolarQuest® are Educational Program Managers of OACT with the responsibility of developing programs utilizing ACTS for education.

The onboard ACTS communications payload combined with ultra-small, non-invasive portable earth stations encompasses several one-of-a-kind advanced technologies which support a full range of on-demand voice, video, and data communications services. This technology permits the ACTS SCIENCE EDUCATION NETWORK to access remote research facilities in environmentally sensitive areas of the Galapagos Archipelago with high broadband services. A steerable spot beam with a 200-mile diameter footprint on the Galapagos Archipelago will provide connectivity at high data rate transfers from the ultra-small, non-invasive earth stations to the Master Ground Terminal located at the NASA Glenn Research Center. The Master Ground Station transmits commands to the satellite, receives all spacecraft telemetry, provides network control for all user communications, and links all remote communications over ACTS to terrestrial networks in the United States. Data from the Galapagos Archipelago will be transferred to SolarQuest® servers in Santa Cruz, California, via the Internet. SolarQuest® servers will distribute and archive alternative energy systems performance and virtual observatory data, and manage distance learning curriculum for distribution to schools within the Network.

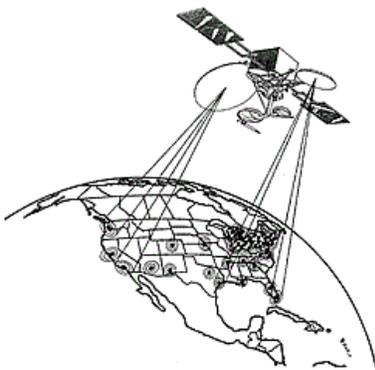


CENTER FOR EXCELLENCE IN TELECOMMUNICATIONS AND SPACE (CETS)

Morehouse College and Ohio University, principal members of OCACT, are establishing the Center of Excellence in Telecommunications and Space (CETS) to address the need for a skilled workforce in the telecommunications and space communications industries. The goal of CETS is to improve the supply of professionals in the area of telecommunications and space communications, and to insure a strong minority participation in these professions. CETS is currently funded by NASA.

The Center will be based on the undergraduate telecommunications program at Morehouse College and the graduate programs at School of Electrical Engineering and Computer Science and the J. Warren McClure School of Communication Systems Management at Ohio University. Morehouse College will develop distance learning programs with key collaborators such as Ohio University and NASA to educate future leaders with expertise in telecommunications technology, policy, and organizational management.

A state-of-the-art satellite ground station to be installed at Morehouse College, and the existing lab and satellite communications facilities at Ohio University, are all key elements in the success of CETS. Students will utilize the ACTS Satellite as a hands-on, learning laboratory under real-world applications, a learning experience so unique to prospective students that the Center will be able to attract very high quality students and prepare them for the most challenging careers in this industry.



CETS aims to provide a comprehensive curriculum in space communications to its students at the undergraduate and graduate levels, and to develop extensive outreach and curriculum activities at the secondary education level. Secondary education outreach and curriculum activities will include events centered on telecommunications, space, math, science, and engineering. CETS will also explore ways to use communications to bring virtual art exhibits or performances to schools, to have multiple schools cooperate in art project and cross-cultural exchanges, and to have students explore remote areas of the world through virtual interaction with scientists in the field. To assure broad participation in CETS programs, distance education technologies and a mobile communications facility will be deployed to deliver components of the curriculum to all students regardless of their physical location.

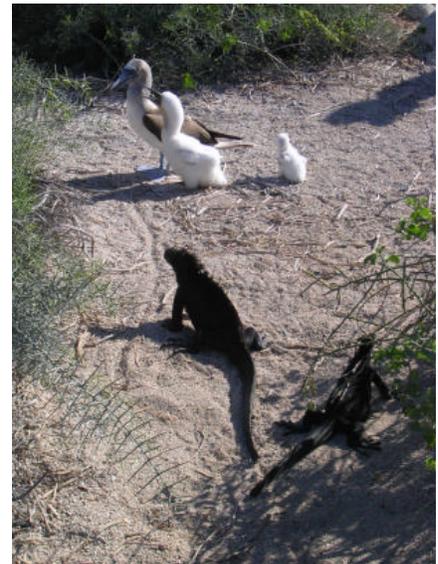
CETS will also provide an advanced research facilities for graduate, post graduate, and faculty in space communications and other disciplines requiring advanced communications technologies. CETS will conduct research in magnetic field events in the vicinity of ACTS, radiation effects on Ka-band hardware, and performance of Ka-band hardware under various solar wind conditions. CETS will also function as a test-bed for government and private industry in the development of Ka-band technologies.

THE GALAPAGOS VIRTUAL OBSERVATORY

Each year in the United States and other countries throughout the world, millions of students learn scientific concepts, such as evolution and natural selection, almost exclusively identified with Charles Darwin and the research that Darwin conducted on the Galapagos Archipelago in 1835. Designated as a Natural World Heritage Marine Reserve by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), and popularized in science education as a "living laboratory of evolution," the Galapagos has received increasing attention in public school curriculum, supplemental educational programming, and public television broadcasts. SolarQuest® will build upon the pedagogical fascination with the Galapagos to build an Internet-based viewing audience in public schools and among the general public.



Utilizing connectivity provided by the ACTS satellite, the ACTS Network will provide 24-hour live web casts, or "virtual observatories," from scientific observation posts throughout the Galapagos. Portions of the web casts with relevant science content focused primarily on the wildlife of the marine ecosystems will be archived and developed into a broadcast-on-demand observation series with a companion science curriculum and professional development support for teachers. Multiple observation posts will be deployed throughout the Galapagos with varied science content in accordance with the seasonal behavior of species within the marine ecosystem. Announcements of the web cast series schedule and content will be distributed to over 340,000 science and technology teachers in the United States through an electronic newsletter in collaboration with the National Science Teachers Association.



e7 MICRO-SOLAR DISTANCE LEARNING INITIATIVE

The ACTS Network will provide broadband telecommunications support for the e7 Micro-Solar Distance Learning Initiative in the Galapagos Archipelago. This initiative, funded by the e7 Expertise on the Global Environment, is designed to utilize broadband telecommunications to build human capacity through education and employment training in the Galapagos Islands.

The ACTS Network will explore the potential for developing an information economy in the Galapagos based on knowledge management and science education content in collaboration with the Charles Darwin Research Station (CDRS), the Galapagos National Park Service (GNPS), and the National Institute of the Galapagos (INGALA) by deploying the ACTS Satellite to support advanced IT services, such as “Access Grid” and “Tele-Immersion” technologies.

Combining Access Grid and Tele-Immersion technologies with ACTS Satellite communications technologies, students and researchers throughout the world can participate in the development of complex environmental problem sets and construct interactive database modeling to examine predictive solutions for the conservation of the environment in the Galapagos Archipelago.

Modeling of an information economy in the Galapagos will be conducted in collaboration with the Ohio SchoolNet Commission, the Third Frontier Network (Ohio), and the Ohio Supercomputing Center.

Technology Architecture

SYSTEMS INTEGRATION
Advanced Satellite Telecommunications
Information Technology / Renewable Energy
Distance Learning / Remote Management
Access Grid / Tele-immersion

TECHNOLOGY PARTNERS & CAPACITIES
Government / Universities / Industry
Non-Governmental Agencies
Remote Monitoring · Technology Test Beds

The diagram illustrates the ACTS satellite system architecture. At the top, a satellite is shown in orbit, connected to a ground station in Ohio, California. The system is linked to the Internet and a network of computers. A NASA logo is also present. Below the diagram are images of a solar panel installation, a person using a VR headset, and a multi-screen computer interface.

PILOT PROJECT SCHEDULE

Organizational and curriculum development for the ACTS SCIENCE EDUCATION NETWORK began in August 2003, with the first-phase installation of the e7 Micro-Solar Distance Learning Initiative on the Island of San Cristobal. During the academic year 2003-04, the ACTS Network will develop core curriculum for the four key education programs. Several short pilot programs will be implemented in the 2003-04 school year in preparation for a full one-year program operating cycle during the 2004-05 academic year. A capital campaign will be launched in October 2003 to support funding requirements.

ESTIMATED PROJECT BUDGET

The two-year ACTS SCIENCE EDUCATION NETWORK project budget is estimated at approximately \$6.5 million as follows:

TWO-YEAR PROJECT BUDGET	
ADMINISTRATION & CURRICULUM	
Administration / Operations	\$ 680,000
Curriculum Development / Curriculum	1,330,000
Professional Development / Outreach	600,000
FACILITIES & EQUIPMENT	
NASA ACTS Satellite Operations	1,510,000
Network & Monitoring Equipment	1,200,000
Mobile Visualization / Training Lab	700,000
SITE ACCESS & SCIENTIFIC SERVICES	
Charles Darwin Research Station	250,000
Galapagos National Park Service	<u>250,000</u>
TWO-YEAR PROGRAM TOTAL	\$ 6,520,000

FOR MORE INFORMATION ONLINE

SOLARQUEST®

<http://www.solarquest.com>

ECOSAGE CORPORATION

<http://www.ecosage.com>

OHIO CONSORTIUM FOR ADVANCED COMMUNICATIONS TECHNOLOGY (OFACT)

<http://www.csm.ohiou.edu/ocact/>

NASA ADVANCED COMMUNICATIONS TECHNOLOGY SATELLITE (ACTS)

<http://acts.grc.nasa.gov/>

GALAPAGOS NATIONAL PARK SERVICE

<http://www.galapagospark.org/en/home.htm>

CHARLES DARWIN FOUNDATION

<http://www.darwinfoundation.org/>

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SOLARQUEST®

ABOUT SOLARQUEST®

SolarQuest® is a Vermont-based not-for-profit organization founded for the purpose of providing advanced technology education to schools throughout the United States and developing countries in Asia, Africa, and the Americas. SolarQuest® has worked under the sponsorship of EcoSage Corporation since 1998, providing programs to schools worldwide. SolarQuest® operates the popular **iNet News** Service, a multi-media, project-based, experiential learning program for a broad range of students from 13 to 30 years of age. Serving as **iNet News** Team correspondents, students with a demonstrated interest in sustainable development participate in and report on local, national, and international events. Past events have included the 10th Anniversary of the NESEA American Tour de Sol (May, 1998) and the President's Council for Sustainable Development National Town Meeting for a Sustainable America (May, 1999). In August of 1999 as a partner with the White House Millennium Council and former First Lady Hillary Rodham Clinton, SolarQuest® managed the installation of 100 solar lighting installations by American and African students in schools throughout Uganda and Tanzania. From 1999 to 2002, SolarQuest® provided educational opportunities for minority students as news reporters to the US-Africa Energy Ministerial meetings in collaboration with the United States Department of Energy. In 2000 and 2001, SolarQuest® collaborated with the White House Millennium Council and American Electric Power to install the first solar-powered, satellite-based distance education center in Bolivia under the G-8 mandate for universal service. In 2002, the SolarQuest® *iNetNews* service covered the events of the World Summit on Sustainable Development in Johannesburg, South Africa. SolarQuest® continues to pioneer technology-aided education and distance learning with the proposed ACTS SCIENCE EDUCATION NETWORK in collaboration with the Ohio Consortium for Advanced Communications Technologies (OACT) at Ohio University.