



THE CENTER FOR SPACE ENTREPRENEURSHIP

MISSION UPDATE

2010



Over the past 18 months, eSpace has emerged from a conceptual idea to a 501(c)3 organization with thriving programs and an impressive board of directors. Simultaneously, it has garnered national attention as a truly unique resource for aerospace entrepreneurs, for advancing our national and commercial aerospace agendas, for fostering the development of a workforce that will help replace retiring Apollo- and Shuttle-era workers, and for providing a model for aerospace entrepreneurship that can be replicated nationally.

“eSpace has become a nexus for making connections among space entrepreneurs. We’re enabling connections that did not exist before, and amazing things are coming of it.”

Consider some of the highlights you’ll read about inside:

- We brought the eSpace Incubator online and worked closely with three very promising companies. Only two of these companies needed funding, but all three of them were supported by an outstanding mentor and assistance with numerous Small Business Innovation Research (SBIR) proposals and networking connections that opened doors to other companies and government agencies interested in the products they are developing.
- We launched the Venture Design program, too, supporting 36 students in five exciting student and faculty research projects in concert with the University of Colorado. The funding and mentoring that we have been able to bring to these projects has enabled them to go forward when other funding was largely unavailable.
- We engaged with more than 125 companies for the Straight to Space (S2S) program, resulting in 31 placements of individuals into entrepreneurial space companies.

And there’s more:

- eSpace has become a member of the Colorado Space Coalition.
- eSpace has entered into a Space Act Agreement (SAA) with NASA Ames, which formalizes a relationship between eSpace and NASA.

Throughout 2009, we have discovered that membranes separating our programs are very thin—that, in fact, there is an almost symbiotic relationship among the programs that is proving to be beneficial for eSpace, the individuals and ventures we’re supporting, and the aerospace industry at large. Projects that start in the Venture Design program may soon become companies we support in the eSpace Incubator. As companies grow within the eSpace Incubator, they find themselves turning to the S2S program for qualified technicians and engineers. As their products move from research to development to production, these companies find themselves already integrated into the broader aerospace ecosystem by virtue of the contacts they have made through their involvement with eSpace.

So read on. Inside this 2010 Mission Update, you’ll find a lot more detail about how the first stage of this mission is faring.



— Scott Tibbitts,
Executive Director of eSpace

— Diane Dimeff,
Director of eSpace



WE CAN SUM UP THE FIRST YEAR OF OPERATIONS AT eSPACE: THE
CENTER FOR SPACE ENTREPRENEURSHIP IN ONE WORD:
EXTRAORDINARY!



We envisioned the eSpace Incubator as a suite of resources designed specifically around the unique needs of entrepreneurs developing new businesses in aerospace. Our intention was to provide startup grants and office infrastructure, as well as access to industry-approved manufacturing and testing facilities, connections to government and private funding, and inroads to our network of successful space entrepreneurs and advisors. Looking back, we consider 2009 to be an unqualified success in all these areas.

When we announced the creation of the eSpace Incubator one year ago, some 30 companies expressed interest. Half of those appeared to have good business ideas, but for our first year we selected only three to support. To each of those companies—Zybek Advanced Products, Inc, Space Awareness Services, and Net-Centric Design Professionals—eSpace provided access to development space, mentors, industry contacts, and, in two cases, cash grants of \$20,000.

In addition to our formal work with our three participating companies, eSpace has worked informally with eight additional companies making appropriate industry connections for them and helping them mature their research and development to a point where they are qualified candidates for the eSpace Incubator.

Finally, a very exciting development this year for our incubator companies is this: eSpace has entered into a Space Act Agreement (SAA) with NASA Ames, which formalizes a relationship between the two organizations. This formal relationship with NASA enables eSpace to provide an unparalleled opportunity for the companies with which we work to showcase their new technologies to NASA for evaluation. SAAs are difficult to earn, and we are excited that we have been able to enter into this agreement.

“WE HAVE FOUND THAT THE LARGE ESTABLISHED AEROSPACE COMPANIES ARE VERY INTERESTED IN HAVING ACCESS TO THE POOL OF TALENT WE’RE SUPPORTING HERE.”

INDEED, THOUGH ONLY ONE YEAR OLD,

eSPACE: THE CENTER FOR SPACE ENTREPRENEURSHIP IS QUICKLY FINDING ITSELF AT THE NEXUS OF THE AEROSPACE INDUSTRY.

With the help of an extraordinary board of directors, now ten strong, we are creating important new connections between upcoming companies, the University of Colorado, and the vanguard of established aerospace companies throughout the country. One example: In the course of outreach work we were doing, we described the development work we were supporting at Space Awareness Services, which has developed a system for predicting where orbital debris will be found. A listener who works for a company that provides satellite-

based imaging services, was very interested, as that company was having difficulty determining when one of its imaging satellites might encounter space debris. eSpace made the appropriate introductions, and now the two companies are exploring space together.

But that is not the end of the story. One month later, the same company contacted us to see if we knew of anyone who wanted an operational, orbiting spacecraft that it was about to scuttle. The spacecraft was worth hundreds of millions

of dollars, but it was not useful for imagery as it was no longer able to capture images. Without that capability, the spacecraft was not worth the cost of keeping it in orbit, and the company wanted to know if we knew of anyone who could use it. We made some connections for them, with the result that the spacecraft will be donated to an entrepreneurial space company and the University of Colorado at Colorado Springs to provide a real orbital satellite on which to train their students.



ZYBEK'S PLASMA MELTING PROCESS AT 20,000°C

"we've worked with these companies in exciting ways, and we've developed these programs far beyond our expectations. we have found that the large established aerospace companies are very interested in having access to the pool of talent we're supporting here. we've been able to broker introductions between some of the firms we're incubating and senior managers within these larger companies. the smaller companies would not have otherwise been able to reach out to the right people at the larger companies; the people in the larger companies might never have learned about the smaller companies and the work they're doing. in that role, the eSpace incubator has been of benefit to all parties concerned."

— Scott Tibbitts, Executive Director of eSpace

ZYBEK ADVANCED PRODUCTS, INC.

is an established, woman-owned engineering, system development, and manufacturing company that wanted to expand its advanced plasma business to include the production of "lunar simulant," or synthetic moon rock, based on specifications supplied by NASA. Immediate applications of lunar simulant include testing the performance of landers, rovers, and other equipment bound for the moon. Exciting terrestrial applications for the technology are being developed for diverse areas such as ground water remediation and lithium ion battery performance. Future applications may include synthetic gem production and green technologies such as the production of coal nanoparticles that may be able to increase the efficiency and reduce CO2 emissions from coal-fired power plants.

SPACE AWARENESS SERVICES

uses commercial telescopes and specialized software to track orbital objects and provide customized data and services to private- and public-sector satellite organizations. Immediate applications include establishing timely and accurate orbits of space debris so that operators can avoid collisions with satellites, rockets, etc. Future applications may include any that require knowing the precise location of debris, satellites, rockets, and other objects in space. The importance of having this information became apparent early last year, when, for the first time in history, two spacecraft unexpectedly collided, destroying both spacecraft and creating thousands of new pieces of "space junk."

NET-CENTRIC DESIGN PROFESSIONALS

(NDP) designs and develops complex computer networks used for communications between spacecraft and end-user organizations on Earth. The company is working with eSpace to expand its base of customers, partners, and business opportunities in order to move beyond government programs and pursue commercial projects. Such prospects include working with eSpace and the University of Colorado to present NASA with a proposal for making the Internet accessible from lunar outposts. Other applications include the distribution of space-derived information (such as satellite imagery) to government, industry, and academic users.





VENTURE DESIGN PROGRAM

The first year of the eSpace Venture Design program has been exciting. The Venture Design program works in conjunction with the University of Colorado Aerospace Engineering Sciences department and sponsors student and faculty research leading to potential entrepreneurial opportunities. During 2009, eSpace sponsored 36 students in five undergraduate and graduate hands-on design projects and is working closely with both program participants and the University to transition these project teams into the eSpace incubator as start-up companies.

R & D projects supported in 2009 through the eSpace Venture Design program included:

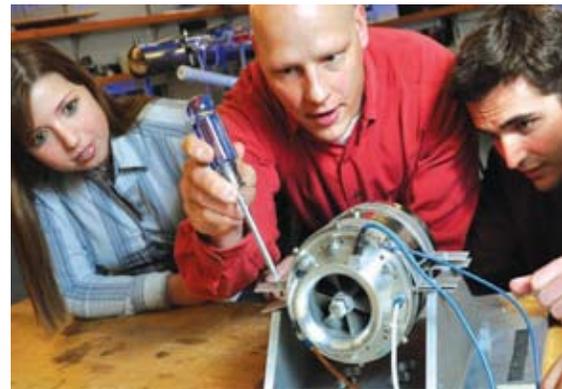
- **Colorado Student Space Weather Experiment** Designing a nano-satellite small enough to be held in the hand that can help forecast space weather, thereby helping to predict how solar storms will impact earth's magnetic field, earth-based communication, and GPS accuracy.
- **Mini Jet Engines for Unmanned Aerial Vehicles** Designing and building a small jet engine that can be held in the hand, yet has 50 lbs of thrust and can power small unmanned aerial vehicles (UAVs).
- **LIDAR Wind-Temperature Aerosol Sensor** Developing an airborne or space-borne laser ranging system for the simultaneous measurement of wind, temperature, and aerosols content of the atmosphere with high resolution and long duration.
- **Smartsondes for Atmospheric Testing** Designing and building an instrument package that can be delivered by UAVs to dangerous atmospheric events such as pre-tornadic storms and wildfires to provide atmospheric data vital to understanding and predicting the evolution of these events.

- **CU Lunar Lander Design** Developing a trade space analysis methodology based on functional decomposition that is intended to identify and mitigate risk during the conceptual phase of a complex spacecraft system design.

Of these five faculty/student projects, three have already moved to the next stage of viability. One has received an NSF grant of \$840,000 for further research and development; one is of interest to NASA; and one is in the process of patenting the technology for a much broader commercial application than had originally been thought possible.

In addition to working with the five projects teams listed above, eSpace is working with three master's-level student teams in developing their innovative technologies into viable business ventures. eSpace has also helped the University of Colorado develop an entrepreneurship component of the curriculum offered in the Venture Design course and provided lectures and advising on entrepreneurship, strategy, and market analysis.

Finally, eSpace has been active in evangelizing these faculty/student projects with aerospace industry companies, and this has catalyzed a greater level of industry involvement at an early stage. eSpace brokered an agreement between the University of Colorado and United Launch Alliance (ULA), for example, in which ULA has agreed to provide \$60,000 worth of funding for two additional student and faculty R & D projects. Given the longstanding concern in both industry and academia about a lack of communication between these areas, it is safe to say that eSpace has taken a bold step to strengthen the connections among the university, established aerospace companies, and emerging companies that are evolving from our incubator.



— Professor Ryan Starkey and student team members work on the Mini Jet Engine project

“more undergraduate and graduates students are considering the possibility of starting their own companies.”

“AS a RESULT OF THE new entrepreneurial focus that eSpace has developed within the University of Colorado Aerospace Engineering Sciences department, more undergraduate and graduate students are considering the possibility of starting their own companies—and more graduate students are choosing the University of Colorado because of this opportunity to gain entrepreneurial skills.”

“our goal has been to work with students and faculty from the early stages of an R & D project and to get them thinking about the business potential of a product while they're designing it. there are far too many companies that waited until the end of the product design phase to do this, and their products fail.”

— Diane Dimeff, Director of eSpace



STRAIGHT TO SPACE: THE WORKFORCE DEVELOPMENT PROGRAM

In recent years, Colorado has ranked first out of the 50 states in the United States for private aerospace employment concentration, and, ranked by total private employment, Colorado's aerospace industry cluster is the second largest nationwide. Yet many of the Apollo- and Shuttle-era employees are retiring. To facilitate business continuity, eSpace has developed the Straight to Space (S2S) program as a workforce replacement initiative that encourages individuals to consider the aerospace industry as a career path.

The S2S program supports the placement of high school, community college, and college graduates into Colorado entrepreneurial space companies, providing an onramp to a professional career that might never have been thought possible by these individuals. By providing training grants to companies for on-the-job training, the S2S program encourages a corporate behavior that hires from outside the industry, thereby rebuilding the aerospace workforce at a critical time when attrition

threatens the continuity of the industry.

In 2009 the S2S program placed 31 people with nine different companies, eight of which were small entrepreneurial companies. eSpace provided each company with training grants of between \$1,000 and \$4,000, and for many of those smaller companies this grant made hiring and training those workers possible. eSpace could have placed more individuals but reached the maximum funding that had been provided through the 2009 Workforce Innovation in Regional Economic Development (WIRED) grant. eSpace also provided extensive entrepreneurial training, albeit on a more informal basis, to more than a dozen individuals at other companies in the region.

Finally, eSpace has been working with the Community College of Denver to form its SpaceTec program. eSpace Director Diane Dimeff is the chair of the SpaceTec board of advisors and spearheaded the development of a survey to determine which skilled technicians

are most needed by the region's aerospace companies. The survey was sent to more than 500 Colorado companies, and the results have been important in developing and refining the SpaceTec curriculum. In two years, when the SpaceTec program graduates its first class, these students will be ideal candidates for the S2S program.

“workforce development really is an issue of national significance, particularly when unemployment is at such a high level. eSpace is playing an important role.”

“THE NEXT GENERATION OF space workers has been raised on google, facebook, twitter, and youtube, and they're heavily influenced by the culture of technology. they expect to work in a fast-paced, creative environment that values their input and ideas. eSpace brings that entrepreneurial attitude to aerospace, enabling U.S. space companies to create jobs and attract the country's best-and-brightest talent to maintain the company's competitive advantage.”

“workforce development really is an issue of national significance, particularly when unemployment is at such a high level. eSpace is playing an important role. the aerospace industry is graying, and more and more workers will be retiring over the next few years. the S2S program is providing people who might not have gone into aerospace with the skills they need to succeed in the industry, and it's providing aerospace companies with the resources they need to move forward.”

—Diane Dimeff, Director of eSpace



LOOKING FORWARD

Our mission for 2010 is clear: build on the successes of 2009, incorporate the lessons learned during this first year, expand our programs geographically, and evolve our response to the needs of the aerospace industry, especially in light of the recent government decision to commercialize human space flight.

Not only will we continue to bring fledgling companies into the eSpace Incubator program, but we'll also continue to facilitate their growth with mentorship programs. While the impending wave of retiring senior Apollo- and Shuttle-era veterans means a loss for many of the established companies in the area, it also means a watershed of talent that now has both the time and the interest in starting their own companies or in working with startup companies, and we'll be working to facilitate connections for all parties concerned. Looking forward to 2010, eSpace has 15 candidate companies interested in entrepreneurial training and education; it is likely that we will invite four to six of these companies to participate in the training program.

Within the context of the Venture Design program, we're also talking to some of these larger companies about sponsoring some of the student and faculty research and design projects. Again, our position as the intermediary between academia and the industry puts us in a strong position to match R & D projects with those organizations that might benefit most from them.

In the S2S program, we're revisiting the value of the training grants we administer. Some companies are in a position to hire without the need of a training grant. Others need slightly more funds than we could make available last year. As we look at helping companies prepare to train senior people to fill the roles vacated by the exiting Apollo- and Shuttle-era engineers,

we may increase the value of certain training grants to as much as \$10,000.

Across all these endeavors, we're doing more work to forge connections between smaller and larger companies in the industry. It's clear that there's a strong need for innovation transfer within the community, and eSpace is emerging as a talent scout to facilitate that. Already we are beginning to see the formation of an eSpace village, where the aerospace workforce, emerging entrepreneurial companies, prime contractors, and national agencies such as NASA and the Department of Defense (DoD) are coming together. It's a village in which we can introduce those with the large challenges to those who are positioned to develop the breakthrough solutions.

For all these reasons, as we look forward to 2010, we anticipate another extraordinary year. Incredibly exciting things are happening within the world of small emerging space companies, with new, transformative technologies in development and talented, passionate individuals working to change the way we reach, explore, and use space. Before the creation of eSpace, there was no national resource to help foster entrepreneurial space companies. It has been an opportunity missed, as entrepreneurial space companies are engines of innovation, economic growth, and workforce expansion that are helping to make space more affordable and accessible—even as they create technologies that can improve life right here on earth.

eSpace brings together the three key players—government, industry, and academia—to bring structure and intent to the creation and development of tomorrow's critical aerospace companies. That's good for Colorado, and that's good for the nation.





"ALL THE programs we INITIATED DURING 2009 STARTED OFF INDEPENDENTLY, BUT AS WE LEARN FROM OUR OWN EXPERIENCES AND AS WE TRY TO INCORPORATE THAT KNOWLEDGE INTO OUR OPERATIONS, WE REALIZE THAT WE COULD BE INVOLVED WITH THESE PROJECTS FROM THE GROUND UP. RATHER THAN VIEWING AND RUNNING ALL OUR PROGRAMS INDEPENDENTLY, WE'RE TAKING A MORE HOLISTIC APPROACH. WE ARE TRYING TO COORDINATE ALL THE ELEMENTS—FROM RESEARCH AND DESIGN TO BUSINESS INCUBATION TO WORKFORCE DEVELOPMENT TO PRODUCT DEVELOPMENT AND DELIVERY. HISTORICALLY, ALL THOSE ACTIVITIES HAVE TAKEN PLACE INDEPENDENTLY, BUT WE'RE LEARNING THAT THE OUTCOME CAN BE MORE POWERFUL, FOR ALL PARTIES, WHEN WE TREAT THESE PROCESSES HOLISTICALLY."

—Diane Dimeff, Director of eSpace

eSPACE: The Center for Space Entrepreneurship is a 501(c) 3 non-profit organization formed from a partnership of the University of Colorado, a national leader in aerospace engineering, and the Space Systems Group of Sierra Nevada Corporation, a leading entrepreneurial space company located in Louisville, Colorado. eSpace is dedicated to creating new entrepreneurial space companies, commercializing aerospace technologies created within these companies, and developing a passionate aerospace workforce to support these companies. Visit us online at eSpacecenter.org.

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