“How to Manage a Successful Planning Grant”

Lessons Learnt in Establishing ASTREC

(ADVANCED SPACE TECHNOLOGIES RESEARCH & ENGINEERING CENTER)

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ASTREC Objective
To provide industry-driven leading-edge research that produces integrated, concurrent small satellite designs, including fabrication and validation, with the objective of improvements in time to orbit, lower cost, maximum flexibility in design accommodation, and performance.

Methodology
- Utilize a SEMATECH-like approach to identify and mature the required technology
- Conduct focused research; i.e., an application driven research agenda

http://www.sematech.org/corporate/history.htm

What is an I/UCRC?
I/UCRC - Industry/University Cooperative Research Center
- An NSF program to develop “win-win” partnerships between industry, government, and academe
- Conducts research to create new products and processes of interest to partners
- Produces an educated and experienced workforce
- Leverages NSF’s seed funding through industry and government partnerships
- In existence since 1981 with greater than 80% success rate (approximately 50 I/UCRCs currently exist)

http://www.nsf.gov/eng/iip/iucrc/

ASTREC Research Approach

Schedule
- Jan 2007: Letter of Intent submitted
- Feb 2007: LOI approved
- March 2007: Planning grant proposals submitted
- Jan 2008: Planning Meeting
- March 2008: Full Center proposal submitted
- July 2008: NSF decision announced
- Nov 18-19, 2008: Initiate Center

University Partners
- UF - Norman Fitz-Coy (nfc@ufl.edu)
- NCSU - William Edmonson (wwedmons@ncsu.edu)
- Others – CalPoly SLO, UCF, …

URL: http://astrec.us
Pre-eminence of U.S. in the industry is no longer guaranteed

"The Commission’s urgent purpose is to call attention to how the critical underpinnings of this nation’s aerospace industry are showing signs of faltering — and to raise the alarm."

"Over the last several decades, the U.S. aerospace sector has been living off the research investments made primarily for defense during the Cold War—intercontinental ballistic missiles, the Saturn V, spacebased reconnaissance, the global positioning system, stealth and unmanned aerial vehicles. The challenges posed by our rapidly changing world—asymmetric threats, international competition, environmental awareness, advances in technology—demand that we, like the Wright brothers 100 years ago, look at the challenges as opportunities for aerospace and turn them into reality."


"Sustain and strengthen the nation's traditional commitment to long-term basic research that has the potential to be transformational to maintain the flow of new ideas that fuel the economy, provide security, and enhance the quality of life."

Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future

Excerpted from “Responsive Space for the Army” by Dr. Rodney Robertson, Director, SMDC at the RS6 Conference
Background: Partnerships and Outcomes

Outputs

ORS ISR Space Tourism
SSA BFT Space Science
Space Exploration ...

Photonics Insurance
Geriatric Medicine
BioAgriculture ...

ASTREC

Inputs

Industry/NonProfit

Pure Basic Research
Application Specific R&D
Pure Applied Research

Academe

UF NCSU
CalPoly U. NM UCF UM

Government

UF UNIVERSITY OF FLORIDA
NSF National Science Foundation
NC STATE UNIVERSITY
Background: ASTREC’s Timeline of Activities

- Workshops, briefings, etc
- Planning activities
- Campus visitors
- Funding opportunities
- Future activities

**2004-2005**
- EAS 4530: 11 students – ACS, science, MEMS
- Visited GSFC and met with colleagues who were NOT excited by CubeSats; referred to them as space debris!
- Inflate-A-Brake (passive deorbiter was born)
- Students were finalist in 2005 AIAA/Utah State Small Satellite Conference

**2008**
- I/UCRC proposal
- FUNSAT Competition
- AFRL PM (Scott Erwin & Lawrence Robertson)
- NSF Space Weather proposal
- NASA LSP Review
- NASA Ames Director (Pete Worden)
- Launch of SwampSat

**2013**
- Establish ASTREC (Nov)
- Establish/demonstrate Capabilities
- Sustainable Operations
“Receding Horizon” Planning

ASTREC’s R&D activities are application specific; i.e., our applied and fundamental research are relevant to the needs of the space industry and address improvements in cost, schedule and/or performance.

**Short Term (1-5 yrs)**
(Establish and demonstrate ASTREC’s credibility)
- Conduct fundamental and applied research
- Validate the research outcomes on pico- and nano-class of satellites
  **SwampSat (scheduled for spring ’09 launch)**

**Mid Term (5-10 yrs)**
(Leverage s/c expertise into sustainable portfolio)
- Further develop missions and satellite through
  - Lesson learned
  - Technology growth
  - Infused research outcome
- Demonstrate Responsive Space capabilities

**Long Term (>10 yrs)**
(Create economic impact locally and statewide)
- Center will be self sufficient and self sustaining
- Technology transfer from research
Challenges: Coordination of Partners

University Admin.

Inter- and Intra-university

University Colleagues

Industrial Partners

Credits for T&P (team rather than individual)

Benefits to Academic Research

Importance of focused applied research

Credits for T&P (team rather than individual)

Benefits to Academic Research

Importance of focused applied research
High Level Executive Support

Strong **institutional support** from academic administrators, the university president, deans, and department chairs is vital in attracting cross-disciplinary research teams of quality faculty members and students. Issues of tenure, funding allocation, overhead reimbursement or waiver, space assignment, access to equipment, and course development and credit may hamper an I/UCRC if key administrators are not supportive.”


**Figure 2-2** Building blocks for successful I/UCRC start-up.
Suggestions: Hosting the Workshop

- Utilize resources
  - If possible, attend an I/UCRC workshop (experience in invaluable)
  - Mimic other centers; e.g., CHREC (Alan George at UF), MemFAST (Behnam Pourdeyhimi at NCSU)
  - Communicate with NSF I/UCRC PM (Babu, Alex)
  - External Evaluators

- Secure venue (with sufficient lead time)
  - Arrange parking (especially if on-campus)
  - Ensure wireless network is available

- Notify industrial participants early
  - Send “Hold Date Notice” well in advance
  - Send agenda and other presentation materials prior to meeting
  - Do NOT overwhelm with emails

- Secure additional funding (if necessary)

- Collect registration info from ALL attendees (online or otherwise)
  - Name preference for badges – indicate sponsor/faculty/admin
  - Meal preference
  - Audio/visual needs (for presenters)

- Ensure presentations are loaded and operate properly prior to meeting
Suggestions: Hosting the Workshop (contd)

- Engage faculty in the planning activity
  - Get input on potential dates, agenda, etc.
  - Faculty are verbose – be sure they understand the time constraints
  - Content development (build in sufficient lead time to meet deadlines)
  - Do NOT allow last minute changes to presentation material

- Bind presentation materials and distribute to ALL participants

- Meeting Assistants
  - Moderator – to keep meeting on schedule (someone other than PI)
  - Scribe – note taker for each Industry Feedback session

- Involve graduate students in the activity
  - Develop/host research posters
  - Assist with LIFE forms (create online and collect/enter data)
  - Presentation
  - Photographer, check-in host, etc.

- Follow-up with workshop participants immediately after meeting
  - Send thank you letters to everyone involved (including students)
  - Address action items from meeting

- Listen to input from the industrial participants
  - Use input to refine research agenda
**Suggestion: ASTREREC Planning Meeting (sample)**

**Wednesday January 16, 2008 (Meetings in Century B & C)**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00-8:00 am</td>
<td><strong>Registration</strong> (Century B &amp; C) and <strong>Breakfast</strong> (Break Pavilion)</td>
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<tr>
<td>8:00-8:30 am</td>
<td><strong>Welcome</strong> - Win Phillips (VP of Research, UF) &amp; Chris Brown (Assistant VC of Research, NCSU)</td>
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<tr>
<td>8:30-9:00 am</td>
<td><strong>Vision and Capabilities</strong> - Norman Fitz-Coy</td>
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<td>9:00-10:00 am</td>
<td><strong>NSF I/UCRC Presentation</strong> - Alex Schwarkopf &amp; Babu DasGupta</td>
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<td>10:10-10:15 am</td>
<td><strong>ASTREC Programmatic Overview</strong> - William Edmonson</td>
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<td>10:15-10:30 am</td>
<td><strong>Break</strong> (Break Pavilion)</td>
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<tr>
<td>10:30-12:10 noon</td>
<td><strong>Project Presentations I</strong> - Discuss missions to be pursued (use LIFE forms)</td>
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<tr>
<td></td>
<td>10:30-10:50  Space Observations</td>
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<td></td>
<td>10:50-11:00  NSF Atmospheric Sciences</td>
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<td></td>
<td>11:00-11:30  NRO</td>
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<tr>
<td></td>
<td>11:30-11:50  Space/Earth Science</td>
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<tr>
<td></td>
<td>11:50-12:10  Astrobiology</td>
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<tr>
<td>12:10-1:15 pm</td>
<td><strong>Lunch</strong></td>
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<tr>
<td>1:15-3:15 pm</td>
<td><strong>Project Presentations II</strong> - Discuss technology areas/projects (use LIFE forms)</td>
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<tr>
<td></td>
<td>1:15-1:20 Programmatic/subsystem overview</td>
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<tr>
<td></td>
<td>1:20-1:40 Communications/Telemetry</td>
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<td></td>
<td>1:40-2:00 Power</td>
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<td>2:00-2:20 Propulsion</td>
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<td></td>
<td>2:20-2:40 C&amp;DH</td>
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<td>2:40-3:00 GNC</td>
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<td></td>
<td>3:00-3:15 Cost Overview</td>
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<tr>
<td>3:15-3:30 pm</td>
<td><strong>Break</strong> (Break Pavilion)</td>
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<tr>
<td>3:30-5:00 pm</td>
<td>Industry Workshop</td>
</tr>
<tr>
<td>6:00-9:00 pm</td>
<td><strong>Reception and Dinner</strong> - Poster viewing</td>
</tr>
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<td>8:00 - 9:00 am</td>
<td>Feedback from Industry Workshop – Industry moderated</td>
</tr>
<tr>
<td>9:00 – 10:30 am</td>
<td>LIFE form Review and Discussion</td>
</tr>
<tr>
<td>10:30-11:00 am</td>
<td>NSF Closed Session with Industry - NSF moderated</td>
</tr>
<tr>
<td>11:00 – 11:30 am</td>
<td>Closing Remarks by Site Directors – Norman Fitz-Coy &amp; William Edmonson</td>
</tr>
<tr>
<td>11:30 – 12:00 noon</td>
<td>Closing Remarks - Pramod Khargonekar (Dean, College of Engineering, UF)</td>
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<tr>
<td>12:00 – 12:30 pm</td>
<td>Adjourn/Lunch (box lunch)</td>
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Suggestion: Marketing Your Center

Develop
• Brochure
• Website
• Prospectus
• Other...

Desiderata
The U.S. Space Industry was once a world leader in technology development. Nearly the past few decades, however, the industry has lost its innovative edge and is becoming known for its long delivery times with numerous delays and high cost over-runs.

The Advanced Space Technologies Research & Education Center (ASTREC) breaks this status quo, offering the space industry a risk-tolerant rather than risk-averse paradigm. Using newly developed technologies, the space industry is being transformed into a more innovative and efficient environment.

Rather than spending billions of dollars with decades-long delays, utilizing Multi-Satellite systems will allow innovative satellite systems to provide incremental growth in capability at significantly lower costs with rapid delivery times. Economics based technology — that’s innovative!

Objectives
Transform the culture of the Space Industry from flatliner to R&D dynamo. Through this transformation, the ASTREC will provide the industry a responsive, cost-effective approach to space exploration and utilization.

The ASTREC offers an alternative to the current industry paradigm

ASTREC is an IUCRC
An IUCRC (Industry/University Cooperative Research Center) is a National Science Foundation program to develop a long-term partnership between academia, industry, and government.

Found in 1981 with over 50 centers nationwide
• NSF funds leveraged through partnerships with industry and government
• UF and NCSU support since 1997

For more information, visit the NSF’s website www.nsf.gov/iucrc/ucrc

Implementation
The ASTREC offers an alternative to the current industry paradigm

ASTREC - Advanced Space Technologies Research & Education Center

Methodology
Utilizes innovative satellite systems to provide an alternative to the traditional Space Industry by developing and demonstrating low cost satellites within timeframes of less than five years from idea to launch.

The ASTREC will implement the FF4 philosophy

Design — Technology R & D
Build — Technology maturation
Fly — Technology demonstration (on orbit)

Benefits of Multi-Satellite Systems

• Provides a technology development pipeline
• Access to leadership research
• Provides additional value over traditional technologies
• Multipurpose/multi-disciplinary researchers and academics
• Thematic approach rather than innovativeness
• Utilizing current resources
• Partner funds used directly to support research
• Administrative support provided by NSF
• Shares costs for development
• Students are cognizant of industry needs

Reassess the U.S. Leadership in Space Technology Development

ASTREC Partnership Advantages

• Provides a technology development pipeline
• Access to leadership research
• Provides additional value over traditional technologies
• Multipurpose/multi-disciplinary researchers and academics
• Thematic approach rather than innovativeness
• Utilizing current resources
• Partner funds used directly to support research
• Administrative support provided by NSF
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• Students are cognizant of industry needs

Reassess the U.S. Leadership in Space Technology Development

Transition technologies to other satellite classes — micro, mini and beyond

Technology Research Focus

Astronomy

Industry/University Cooperative Research Center

Industry/University Cooperative Research Center
Reasons to Join ASTREC

**Mission:** To provide leading-edge research that is industry-driven to produce integrated, concurrent small satellite design including fabrication and validation with the objective of improvements in time to orbit, lower cost, maximum flexibility in design accommodation, and performance.

1. ASTREC Provides Synergistic Solutions to Relevant Satellite Design Problems Through
   - Access to Multidisciplinary/Interdisciplinary researchers and assistants
   - Thematic approach rather than individualized research
   - Applied and fundamental research geared toward an objective of improving space systems and processes
   - An Industry Advisory Board (IAB) that identifies specific problems that are of vital interest to the industry (all members are represented on the IAB and have voting rights)

2. Access to Trained Students
   - ASTREC serves as a basis for industry recruitment of experienced students
   - Students working on industry problems and solutions are cognizant of industry needs and processes

3. NSF Accredited National Research Center
   - Access to leading-edge research
   - Access to a larger university community
   - Access to all IP developed within the center

4. Research Amplification – ASTREC leverages funds to maximize impact of the funded research
   - Member funds are used only for specific research as defined by the IAB
   - Membership fees are not subject to university overhead (typically 40%)
   - Administrative costs to operate ASTREC are covered by NSF and universities contributions (i.e., the universities are true partners in this activity – the NSF award requires university support)
   - Member funds are leveraged with other members to provide critical levels of funding for the research projects as identified by the IAB

5. Technology Clearing House
   - On-orbit validation of technology
   - As an academic research center, ASTREC risks can be higher thus enabling the development and verification of more challenging technologies
   - Experienced technology transfer specialists are available to assist as necessary

Additional info available at:
http://www.nsf.gov/programs/astrec/
http://www.advancedspacetech.org
Other Insights and Helpful Tips

- Develop and maintain a common vision across the center
- Be patient (but forceful) with your sponsored research office, eventually it will be their idea
  - Membership Agreements, Bylaws, operational protocols, etc.
- Develop a “Things to Do” list an revise shortly after the meeting
- Need both “big picture” and “details” personnel on the planning team
- Invite sponsors other than those who have committed
  - Uncommitted may be influenced to join
- Plan sufficient well to minimize changes/modification to meeting agenda
  - Avoid constantly emailing changes
- Don’t “swim upstream” too often
  - Paradigm shifts are inherently against the flow so try to avoid additional confrontational activities
- First impressions are lasting – use time with sponsors wisely
  - Know the limitations of the meeting venue (e.g., electronic media not allowed in secure areas)
  - Develop “elevator speech” to get to point quickly
  - Have an answer for “How does this benefit us?”
  - Be knowledgeable of the various funding options/avenues that can be used
Closing Observations

ASTREC's Tenets

“*We can't solve problems by using the same kind of thinking we used when we created them.*”

(“No problem can be solved from the same level of consciousness that created it.”)

- Albert Einstein

“*People are very open-minded about new things - as long as they're exactly like the old ones.*”

- Charles Kettering

“*Those who do not learn from history are doomed to repeat it.*”

- George Santayana