The Radio Amateur Satellite Corporation

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The Importance of Education Outreach to AMSAT

November 5, 2011

AMSAT's Bylaws

- Develop and provide satellite and related equipment and technology used or useful for amateur radio communications

- Conduct experiments by suitably equipped amateur radio stations throughout the world on a non-discriminatory basis

- Encourage development of skills and advancement of specialized knowledge in the art of and practice of amateur radio communications and space science.

AMSAT's 2004 Mission Statement

"AMSAT is a non-profit volunteer organization which designs, builds and operates experimental satellites and promotes space education. We work in partnership with government, industry, educational institutions and fellow amateur radio societies. We encourage technical and scientific innovation and promote the training and development of skilled satellite and ground system designers and operators."

Two key components:

- Promoting Space Education
- Working in partnerships with various organizations

"Space Education"

- **AMSAT'S early attempts met limited success**
  - » Created "Director of Education" position in 1998
  - » Held by various individuals through 2006, each having different skillsets and interests
  - » AMSAT was struggling to define what role it should play in education
  - » Needs/opportunities of various constituents vary widely
  - » No significant development of an "education team" within AMSAT
  - » While Education was highlighted in the "AMSAT Journal", little progress was made outside of AMSAT
  - » Meanwhile, ARISS, with ARRL and NASA support, was providing support for "STEM"

ARISSat-1 Demonstrates Importance of Education Outreach

- Ability of ARISSat-1 to fly student payloads generates interest with ISS National Lab Education Project Office as a prototype demonstrator

- NASA's significant support provided resources that overcame a number of challenges

- As NASA's support was provided, there were questions raised within NASA Education as to the amount of benefit generated by the project

- With the ever increasing cost of launches, finding a means for NASA to support AMSAT projects offers significant possibilities
  - » Lower costs for AMSAT
  - » Potential for repeatable launches

ARISSat-1 Evolving Expectations

NASA placed a requirement on AMSAT for 'education content' to include materials for ground-based educators

● AMSAT 'reluctantly' agreed to this request, recognizing that NASA's support was paramount

● AMSAT presumed that there would be time following spacecraft delivery to develop educational materials tailored to ARISSat-1

● For a variety of reasons, including extensive management focus on the project following delivery, AMSAT did not have the resources to develop materials

● Consequently, NASA Education has expressed disappointment with AMSAT's failure to provide materials

What is AMSAT? (cont'd)

- AMSAT is a STEM-based 'Education Package Provider'

- NASA essentially asked AMSAT to become a 'contractor', providing not only the ARISSat-1 hardware, but developing education content in support of STEM once deployed, creating a requirement beyond the hardware/software development of the satellite itself

- AMSAT became the 'manager' of education content and was expected to find resources in response to this new expectation

ARISSat-1 User Results-to-date

- ARISSat-1 has demonstrated world-wide interest by both amateur radio operators and the education community
- As of 30 SEP 11:
  - » 700 "Certificates of Recognition" awarded under three different categories: Secret Word Contest, SSTV reception, Voice telemetry reception
  - » Ground-based station software developed by KA2UPS/W and N3RZN was used by 258 different stations to receive and forward satellite and experimental data.
    - – 133,800 telemetry frames forwarded
    - – Only 1/3 of stations were in the US
    - – An average of 49.5 stations/day were forwarding data
    - – Performance clear demonstrates the ability of amateur radio operators to support data collection of student payloads
  - » Over 2,700 SSTV images were forwarded to the ARISS-SSTV Gallery

ARISSat-1 User Results-to-date

- As of 30 SEP 11 (cont'd):
  - » Chicken Little Contest
    - – By 15 OCT submission deadline:
      - 53 adults from 13 countries and 6 continents
      - K-8 : 3 classes/clubs, USA and Germany
      - High School: 2 classes/clubs, UK and Hungary + 1 individual (UK)
  - » CW Contest

- N7HPR's 'Survey Monkey' documented degree of interest as well.
  - » As of 30 SEP, 500 respondents (10% identified as students or teachers)
  - » Updated statistics provided by Steve at the AMSAT Space Symposium
- However, from NASA's perspective, is this 'enough' to justify investment in an AMSAT spacecraft with student experiment?

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Next Steps

- Continue to address the need for 'Education Content'
  - » Volunteers needed to develop materials suitable for the current ARISSat-1 mission
  - » Materials developed 'today' would be useful for future 'ARISSat-x' missions or other ISS National Lab-related projects
  - » Additional materials can help demonstrate AMSAT's desire to 'make good'
  - » Future opportunities may be impacted by AMSAT's reputation

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Other Opportunties

- **Working with Universities**
  - » AMSAT developed space package houses university experiment
  - » Potential for amateur radio to fly on flights secured by others
  - » Still must deal with ITAR concerns

- **Qualify for Launch Grants**
  - » NASA-supported ELaNa cubesat programs now recognizes 'non-profit' satellite programs
  - » Program is becoming an annual event
  - » AMSAT to file for such a grant this month (November)

- **Nurturing the Next Generation of satellite builders**
  - » AMSAT-University relationships (such as SUNY-Binghamton & Penn State-Erie)

Lessons Learned

- Need for documentation of agreements between organizations
  - » Define expectations and roles/responsibilities
- An "Education Team" approach is necessary to cover the broad range of possibilities under "education outreach"
  - » One individual can't do it all
  - » Different needs/expectations at various education levels (K-8, 9-12, university)
- AMSAT must reach out to broaden the volunteer base
  - » Must manage processes/develop resources
  - » Volunteers needed who can:
    - – understand the needs of educators
    - – develop materials suitable for guiding teachers to use amateur radio resources

Lessons Learned

- The scope/cost of a program goes beyond "Nuts and Bolts"
  - » Ground Station software: telemetry and experimental data support
  - » Creating 'educational content'

- If AMSAT is the 'prime contractor' for future ARISSat-type missions, AMSAT must enter formal agreements for 'deliverables'
  - » Volunteers don't always complete projects 'on time'
  - » Mission critical deliverables must be timely
  - » Partner with professional education content creators
  - » Apply for education grants to cover costs

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Lessons Learned

- Potential 'payoff' for non-satellite investments can be huge
  - » AMSAT has a precedent for producing products in exchange for launch opportunities (such as the P3-D Specific Bearing Structure-SBS
- Cost of providing 'education products' can be looked at as:
  - » Fulfilling AMSAT's long standing vision/mission to support education
  - » Fulfilling part of the 'cost of doing business' for launch opportunties
  - » Recognizing that providing 'hardware only' may not be 'enough' to secure a launch opportunity
- AMSAT is likely competing for NASA support
  - » Other organizations are looking for 'opportunities'
  - » NASA is looking for the 'biggest bang for their buck'
  - » NASA is looking to third parties for developing STEM support