ARISS – Talking to the Astronauts via Ham Radio and How it Inspires Students

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What is ARISS?

- ARISS (Amateur Radio on International Space Station) is a program designed to excite and motivate students worldwide to pursue interests and careers in science technology engineering and math (STEM) through amateur radio communications opportunities with the ISS on-orbit crew.
- ARISS is managed by an international consortium of amateur radio organizations and space agencies.
- The NASA GRC Space Communications and Spectrum Management Office (SCaN), the NASA Glenn Amateur Radio Club (NGARC) and the Girl Scout of North East Ohio (GSNEO) group was selected in 2017 by the ARISS program to help Girl Scouts make contact with the ISS crew.

The ARISS Application

- Direct
  - Radio link between an amateur radio station set up at the school and the amateur station on board the ISS
- Telebridge
  - Dedicated ARISS amateur radio ground station, located somewhere in the world, establishes the radio link with the ISS.
  - Voice communications between the students and the astronauts are then patched over regular telephone lines.
- Application Part A – Direct/Telebridge
  - Contact information: Educational. Organization, Partner, Amateur Radio POCs.
  - Schedule Plan: Preferred day/time; are weekend/holidays/nights a problem?
  - Educational Plan: how will you utilize ARISS contact to enrich STEM activities, support educational objectives, etc.
  - Media Plan: Describe how you will engage your community.
- This program is not intended to incur cost burden to the school or educational entity.

The ARISS Application (cont'd)

- Application Part B – Direct only
  - Radio Contact Coordinator info
  - Site info: latitude/longitude/elevation
  - Callsign at contact site
  - Station and equipment data for radio station #1
  - Station and equipment data for radio station #2
  - Note any antenna obscuration data

- Post Contact Report – Direct/Telebridge

The Planning

- NGARC led the technical planning and execution of the contact
- SCaN took the lead in planning and organizing the overall event
- Collaborated with NASA GRC Imaging Technology Office, GRC Exhibits and BestBuy Geek Squad
  - Photos/video, livestream audio/video, microphones and screens to view event
- Weekly meetings for planning/logistics
- Coordinated site visits
- Coordinated exhibits and activities on day of event
- Coordinated volunteers to support exhibits/activities
- Uncertainly on final date/time of contact does effect large event planning

Exhibits and activities on day of event

The Equipment Gathering/Dry Run

- NASA Glenn Amateur Radio Club used a variety of means to gather the primary and backup radio station equipment
  - NA8SA club equipment
  - Equipment from past ARISS contacts
  - Equipment from club members
  - After submitting initial Equipment Plan, our ARISS mentor provided some recommendation to our antenna setup based on his experience.
  - SCaN procured 2 hi-gain antennas (M squared, 2MCP14, crossed yagi) and 2 pre-amps (Ar2 Communication, MSP144VDG-160) for our primary and backup station
  - NGARC did an on-site dry run with all equipment to ensure both stations were operational

Antenna Setup at Camp Timberlane

Organization (GSNEO) Activities

- GSNEO selected 16 girls from among the Girl Scout Level: Daisy, Brownie, Juniors, Cadettes, Senior and Ambassador (increased to 22)
- Girls selected based on questions submitted. For the older girls, GSNEO picked the girls
- Girls family and troops invited to ARISS event
- Week long space camp program during the summer to promote this event, including activity on ARRL Radio and Wireless Technology Patch and Morse code activity. Independent from ARISS contact due to camp schedule.
- Promoted event via GSNEO mailing list, press release, twitter, streaming event, Facebook, etc.

Schools Activities

- Promote ARISS contact via all their classroom curriculum
  - History: discussion on the Space Program from Mercury through ISS
  - Geography/Remote Sensing: Images of the Earth from ISS
  - Math/Science: – ISS orbits, microgravity concepts; experiments done on ISS
  - Languages: international crew speak different languages
  - Technology – ham radio; communication methods
  - Humanities/English: write articles in their school paper; explain why they selected the question they did
  - Art: made drawings about NASA and space related activities
- Promote this event in their community, school district and with the media

Waiting for First Contact

Girl Scouts ARISS contact

Girl Scouts waiting their turn for ARISS contact

Success after the Contact!

Meeting Astronaut Jack Fischer

Six months after return, astronauts visit the various NASA Center whose experiments they operated.

During Jack Fischer's visit to GRC, I was able to get him to meet and talk with the Girl Scouts who talked to him during the ARISS event

Past ARISS Contacts

- St. Albert the Great School – Jan 11, 2006
  - Contact held at St. Albert the Great Church with 800 students and 400 faculty in attendance
  - Contact initiated by NGARC employee who became a SK in 2003
  - 17 of 18 questions asked during 10 min pass
- Cleveland Heights HS – March 17, 2006
  - Contact included students from Wiley Middle School, Noble Elementary School and Gesu Catholic School
  - Students viewed the contact from the auditorium via a video linkup set up in the ham station class
  - Contact initiated by Math teacher and NASA faculty member
  - 22 of 25 questions were asked during 10 min pass
- University Schools – March 16, 2007
  - Contact made in auditorium at school with students in attendance
  - Contact initiated by University school teacher and NASA faculty member
  - 12 students asked questions during 9 min pass

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- GSNEO: Deborah Kroupa, Emily Fein, many others
- NASA GRC Imaging Technology Office, GRC Exhibits, BestBuy Geek Squad, GRC Volunteers and GRC Mgmt
- Case Amateur Radio Club: Dave AD8Y, Kristina KD8OXT
- ARISS: Dave AA4KN (mentor), Frank KA3HDO (chair), many others

Questions?

Backup

Equipment:

Radio Station #1 (Primary)

- Transceiver: ICOM 275A or ICOM 275H
- Receive preamplifier: Ar2 Communication, MSP144VDG-160
- Antenna: M squared, 2MCP14, crossed yagi
- Rotator: Yaesu G-5500 Elevation-Az Dual controller
- Coax: LMR 400 and RG-8
- Tracking program: SATPC32
- Power source: commercial mains and will have UPS
- ICOM SP-20 speaker
- ICOM PS-55 power supply

Radio Station #2 (Backup)

- Identical to Primary