Space Day at Riverside Applied Learning Center

Presented by

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Abstract

This paper describes the activities on the day of the event and all of the activities leading up to the event including classroom demonstrations, visual sighting parties, classroom to classroom conversations on HF, Parrott Repeater in the classroom and on Sunsat, model rockets, etc.

On the day of the event we utilized everything available: HF for schedules with a Space Museum, with an Astronaut, and with Steve Ford at W1AW; Arrow Demos on LEO Birds; receipt of world wide traffic on Digital Birds (requested prior to the event); and SSB QSOs on LEO Birds. The main purpose of the paper would be to illustrate the many possibilities for use of satellites in the classroom. It should be pointed out that this was aimed at Grades K-5 with major emphasis on Grades 1-3.

About the Author

Keith Pugh has been an active Amateur Radio Operator since August, 1953, and has been active in AMSAT since 1982 starting with AO-08. During the early days of AO-40 he held the position of AMSAT VP of Operations. He holds an Amateur Extra class license and is a retired Radar and Navigation Systems Engineer from Lockheed Martin Aeronautics Company. He has been active in AMSAT education projects since the ‘90s with emphasis on the elementary schools.

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1 The Plan

Have you ever been “tracked down” by an enthusiastic First Grade school teacher and put on the spot for assistance with a worth while project aimed at introducing “special” Elementary School Kids to space? I have! Dr. Debbie Coonrod had heard that Amateur Radio Operators could help her school kids talk to the Cosmonauts/Astronauts aboard the Russian Mir Space Station, and she wanted to arrange such a contact to occur in conjunction with a Young Astronaut Fair for the benefit of the whole school (grades Kindergarten through Fifth Grade).

With boundless enthusiasm, Debbie located and followed a vehicle with Amateur Radio Call Plates to its destination and approached the driver. He was unable to help directly, but he provided her with a lead to Pappy, K5DSP. Pappy directed her to me, and the rest was soon history.

After a couple of coordination meetings, a plan evolved. First, the Young Astronaut Fair was planned for 24 April 1998. This was short notice since I first learned of the opportunity in mid March. School contacts with MIR can be arranged through the Educational Activities Department (EAD) of the ARRL so I immediately contacted Rosalie White, WA1STO, Manager of the ARRL EAD, and confirmed my suspicions. They were currently scheduling contacts for schools that applied in 1995! Rosalie was very nice about it and agreed to put us on the “listen only” list in the event something happens on 24 April.

After this setback, another plan came to mind. Why not talk to space related people through Amateur Radio Satellites? There are sixteen or seventeen active Amateur Radio Satellites that can be utilized on a daily basis. All we need to do is set up a satellite station at the school and arrange some contacts. Although HF Radio contacts do not involve satellites, HF Propagation is dependent upon space (the Ionosphere) and could be used as well to illustrate uses of space for communications. Of course that meant setting up an HF Station as well.

My first thought was to arrange contacts with W0WR, the Amateur Radio Satellite Station in the Kansas Cosmosphere in Hutchinson, Kansas. I had visited this fantastic place over the Christmas Holiday as a guest of Cleyon Yowell, AD6P, the founder of the satellite station. Arrangements were made, through Cleyon, to make this happen via the satellites with a forty meter backup. The second thought was to utilize AO-27 for live demos with an “Arrow Antenna” and a dual band HT. Stations from throughout the country can check in “live” and be plotted on a giant map. AO-27 contacts could be accomplished before the 24th and during the Young Astronaut Fair as well. The third idea involved the Digital Satellites. The plan was to put out the word ahead of time and solicit greetings from all over the world via the digital “Birds.” The greetings were to be downloaded “live,” on a giant screen, during the Young Astronaut Fair. MIR was to be utilized to demonstrate use of the MIR Personal Message System, and replay of the special APRS experiment that took place in March. MIR was also to be used as a visual and audible space object in the evenings before the Space Fair. Last, schedules were made on 20 meters with Astronaut Dr. Ron Parise, WA4SIR, at WA3NAN, the Goddard Space Flight Center Radio Club Station , and with Steve Ford, WB8IMY, of the ARRL Staff, via W1AW.

2 Execution

April 16 was picked for the first visit with the Kids based on an excellent MIR visual sighting opportunity that evening. A time was arranged in the morning to give Dr. Coonrod's First Grade a special introduction to Amateur Radio Satellites. Mike Heskett, WB5QLD, and I talked for about 90 minutes to about 90 Kids about Amateur Radio, Space, HF Propagation, and Satellites. The talk was illustrated with a Globe, simulated orbit tracks, Laser Pen, mirrors, QSL Cards, a Computer running Satellite Tracking Software, radios, antennas, etc. The Kids "ate it up" and asked many good questions.

Following the talk, the Kids were taken outside into the school yard and treated to the first AO-27 demo. This was an Easterly pass and many stations were heard by all. We were successful in making several contacts near the end of the pass. After a lunch break, the Kids came back for the second AO-27 pass. This Westerly pass was higher elevation and we had much better luck making contacts. Many contacts were made all over North America with nothing more than a dual band HT and the Arrow Antenna. Before the pass was over, the Kids were eagerly plotting all of the stations heard and worked on a large map of North America spread out on the lawn.

MIR came by immediately after AO-27 and its PMS was going strong on 145.985 MHz. We had a radio, TNC, and computer set up to receive and decode the packet information. The Kids were fascinated by the noise and the information. All 90 Kids cycled by the computer screen to view the information.

MIR was also the "star" of the last event on April 16. A brilliant visual sighting opportunity was to be available at 2115 local (a weather contingency backup date of April 18 was planned). The Kids were told to get ready for bed, since it would be "bed time" by the time the pass was over and to bring their parents to the school at 2030 for a talk and the "Visual Sighting Party." Approximately 200 Kids and Parents came back to the school for the party. The weather was perfect! The sighting geometry was discussed and illustrated in the school Gymnasium for about 30 minutes before going out to the school yard again. MIR appeared on schedule, made a brilliant visual pass, and disappeared into the Earth's shadow as if done on cue from the ground. Everyone, Teachers, Parents, and Kids were impressed! We also listened to the PMS and displayed the information again on a computer. The pass lasted for about 8 minutes starting at 2115, but, judging from the level of enthusiasm displayed, I'll bet most of the Kids talked about it until at least 2300 and didn't get to bed on time.

Mike, Doug Howard, KG5OA, and I returned to the school on 23 April to set up the station for the Young Astronaut Fair on 24 April. Transporting the equipment, setting it up, and checking it all out was an all day job. The station was set up in a corner of the Gymnasium and the antennas were placed on the roof of the Gymnasium directly over the station. The satellite antennas were a pair of CushCraft A270-10S dual band Yagis mounted and fed as a circular polarized pair on 2 meters and 70 cm. They were mounted on a short tripod and pointed by a Ken Pro 5400 Az-El Rotor. Pre-amps were installed on the tripod for both bands. Feed lines to the station were about 60 feet. The HF antennas consisted of a 40 meter "inverted vee," broadside to Hutchinson, KS and a two element 20 meter wire beam aimed at the East Coast. Support for both HF antennas was 30 feet of TV mast "Duck Taped" to a ladder up on the roof and further guyed by the wire antennas. Feed Lines for the HF antennas were approximately 120-feet long.

The Satellite Station was made up of a Yaesu FT-736R, a DSP-12, and a computer running WISP. The HF Station was an Icom IC-735. MIR was received by a 2 meter FM radio and displayed on a separate computer. The school provided a video projector which we utilized for projection of both computer screens and selected video tapes. In front of a large screen for the video, we had a World Map taped to the floor.

On April 24, Young Astronaut Fair day, we became a part of the Fair. Other events were paintings, video tapes, space models, model rocket launches, etc. Our schedule accounted for nearly all of the available time from 0830 until 1400, the end of the Fair. We had propagation trouble on the morning 40 meter schedule with W0WR (long skip) but managed a contact through relays provided by stations in Colorado and California. The "Fuji Birds" provided the best analog contacts and stole the show from AO-27 this day. It was gratifying to see Doug covered up by Kids working the "Fuji Birds." MIR again generated a lot of interest with its PMS traffic. The "Digital Birds" were stars of the show. The Kids were fascinated by the message traffic displayed. We received messages, on show day, from USA, Canada, UK, and Austria. Messages were uploaded, on show day, inviting people to continue the message traffic after the Fair. As a result, approximately a dozen additional messages were received from USA, UK, Belgium, Japan and Australia for forwarding to the school.

Twenty meter propagation gave us a scare initially on the schedule with Ron Parise. Ron initially tried to use his mobile radio tied to a tri-band beam at WA3NAN, but met with no success. Ron went into WA3NAN and took the Shuttle Re-transmissions off of 20 Meters and commandeered the 20 meter kilowatt rig for our schedule. With this rig, we were successful and spent an enjoyable hour letting the Kids ask Ron questions via 20 meters. This interview was piped throughout the school on the PA System and everyone enjoyed it!

An hour later, we had a successful contact with Steve Ford via W1AW. About the time we ran out of anything to say, the band folded and we lost W1AW. For those not familiar with the US, when we cannot hear W1AW in North Texas, the band is certainly dead. Forty meters opened up in the afternoon for our second schedule with W0WR, but the Fair was winding down by that time and there was not much involvement by the Kids.

3 Space Day Summary

In general, everything went as planned. Only the HF propagation proved troublesome. It has been years since I received this much satisfaction for anything I did. Seeing the Kids smile, ask questions, and pay attention restored my faith in our youth. We hear so many bad stories today about Kids that it is refreshing to see the interest generated in this group. The real "hero" of this whole operation is Dr. Debbie Coonrod. If we could clone her many times over, there would not be any problems in the schools today. This was my first involvement with the Applied Learn Process and I am impressed. The Kids "learn by doing" projects. Parents are required to participate in the school projects with the Kids as a condition to keeping the Kids in the program. This parental involvement is a "breath of fresh air" too, and is certainly key to the success of the program. We have been asked back to the school for a Career Day, and Dr. Coonrod, although not currently a "ham," plans to start a school radio club next year. I was sure we'd be back again.

4 RALC Communications Club

For the next two years Ralph Coonrod, (Dr. Debbie's Husband), and I ran the Riverside Applied Learning Center Communications Club. This club was one of several clubs set up by Dr. Debbie and the Principal to reward special students. The clubs met every Friday afternoon for an hour. If students were behind in regular studies, were misbehaving, or had other problems they were denied access to the club of their choice. Over the course of the two years we took on several projects.

We "took the temperature" of RS-18, a scale model of Sputnik, built by French students and placed in orbit from MIR. This project was a "natural." We were able to make a model of RS-18 from Styrofoam and dowels, record the sounds from the real RS-18 and perform an experiment involving matching the transmitted tone during part of the message with an audio generator utilizing an oscilloscope, and measuring the resultant frequency with a counter. Knowing the frequency and the calibration curve on the satellite, one could then determine the temperature. This was successfully done during the graduation ceremony in the Gymnasium at the end of the semester.

We utilized a Radio Shack Parrott Repeater to help Kids with their diction in preparation for a contact with SunSat. This was a very successful project. Kids would "mumble" when put on the radio. After hearing their voice coming back from the Parrott, the improvement was immediate. This technique was used, with great success, on the real SunSat from the Gymnasium during an assembly.

We also did construction projects such as Model Rockets, Crystal Radios, etc. I'll never forget the quieting effect of coil winding on normally loud, noisy, and nervous Kids.

5 Overall Summary

These are just a few of the possible uses of satellites and communications techniques that can be used to interest Kids in Math, and Science through space. Use your own imagination – the sky's the limit. I believe that "the earlier the better" when it comes to impressing Kids with these goals.

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AMSAT Area Coordinator