



# Radio Waves

News you can use for license instruction and radio science education

**ARRL** — The national association for AMATEUR RADIO

Winter 2017

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## Don't Miss...

In February's QST article, "To the Edge of Space and Back with Ham Radio," author Chase Mertz, KG5KKX, describes how the student engineers in the Eldorado Space Program design, build, and program instrument packages for high-altitude balloon launches. ARRL members can access the online link [here](#).

## Local Connections Spark High School Club

BY LEANN WILLIAMS, KK6KWL

Thanks to an ARRL Teachers Institute workshop (Introduction to Wireless Technology, TI-1), an Education & Technology Program (ETP) equipment grant, and help from Amateur Radio operators in the community, students at Yucaipa High School (YHS) in Yucaipa, California, have a new school radio club.

I had attended the TI-1 looking for strategies to help connect teaching mathematics to the real world. With my principal's go-ahead, I started the YHS Ham Radio Club with six members. Because we didn't have a radio shack initially, I made arrangements for students to visit the radio club at our local veterans hospital, VA Loma Linda. The highly experienced members of the Jerry L. Pettis VA Amateur Radio Club, W6VAH, provided a great introduction to the hobby and really got the students hooked.

I applied for and received the club call sign W6YHS, and then, with the sponsorship of my local club, San Geronio Pass Amateur Radio Club (W6PRC), applied for an ETP grant. The application was successful, and soon we had a Yaesu FT-991 radio. W6PRC continued to support us, serving as mentors and donating time, talent, equipment, and skill. They even purchased a mini tower for our antenna. W6PRC has run joint Field



YHS Ham Radio Club members on the air. [Leann Williams, KK6KWL, photo]

Days with W6YHS, and the interaction between these experienced operators and my students has been amazing to watch.

Currently, the YHS Ham Radio Club has 12 active members, four of whom have their Technician licenses. During the school year, 70 students have visited our radio shack, and many were able to operate or log during School Club Roundup. We also recently held our first licensing test here on campus, with seven students attending and three earning their Technician class licenses.

*Leann Williams, KK6KWL, is a math teacher at Yucaipa High School. She holds an Amateur Extra class license.*

# Outreach: How to Start a High School Amateur Radio Club in Six Easy Steps

BY BOB LIGHTNER, W4GJ



Thyra Hammarlund, great-grandchild of Oscar Hammarlund, in the ham shack of the W. Travis Loften High School Amateur Radio Club, K4WTL, holding a *Hammarlund Short Wave Manual*.

It was in my capacity as a semi-retired substitute teacher at the W. Travis Loften High School, a professional academy magnet school in Gainesville, Florida, that I made my way to the headmaster's office. What I had to offer was a six-step plan to establish an Amateur Radio club. Below is a brief summary of those steps and how I translated them into action.

**Step 1: Fit the radio lessons into the curriculum.** For instance, as W. Travis Loften High School has several "academies," we determined that the Fire and Emergency Medical Services Academy and the Robotics and Engineering Academy would benefit.

**Step 2: Apply for an Amateur Radio club license.** We applied through the W5YI group, and as soon as our license arrived, requested the vanity call K4WTL (the school's initials).

**Step 3: Locate equipment.** Some generous local hams donated used transceivers and even a new Yaesu FT DX 1200. We strung up a G5RV 80-10 meter inverted V.

**Step 4: Contact interested students.**

- A graphics student designed a banner, and an art student helped make a QSL card for the new club.
- We notified the yearbook staff, which sent photographers and reporters to document our first activity.
- We did an all-day demonstration. Our Spanish teacher brought students by to listen to South and Central American hams; science classes visited to talk about the electromagnetic spectrum and sunspots; geography students got lessons in practical geography; and Fire/EMS Academy students got on the air and made contacts all across the U.S.

**Step 5: Establish a comfortable environment for the equipment and students.** The Fire/EMS Academy director gave us room and an operating desk in his area for our radio equipment, and we hope to soon have a permanent antenna in the air.

**Step 6: Hold well-advertised meetings.** We have once-a-month meetings, license study sessions, and field trips to our local county Emergency Operations Center, two local college and university Amateur Radio club stations, and an FM radio station. Most of our students are bussed to campus early in the day, so that time prior the start of classes will be available to them to get on the air.

So, if you are thinking of starting an amateur club at a local school, don't be afraid of giving it a try. Just take it step by step.

*Bob Lightner, W4GJ, was first licensed after coming to the US as WN4JOM in 1962. He is the Trustee for K4WTL and a substitute teacher.*



## Rhode Island School ARISS Contact Takes Off with the Public

BY BOB BEATTY, WB4SON

**M**ike Cullen, K1NPT, a member of Rhode Island's Newport County Radio Club (NCRC, call sign W1SYE), along with other volunteers, has been working to bring STEAM (Science, Technology, Engineering, Arts, and Mathematics) to All Saints Academy (ASA), a parochial K-8 school in Middletown, Rhode Island. Recently, he and NCRC helped put together an ARISS (Amateur Radio on the International Space Station) contact for ASA, a first in Rhode Island.

Cullen worked closely with the school leadership to integrate space sciences into their curriculum, a key requirement for ARISS approval. The original ARISS Education Proposal, which detailed the program and communications plan, was approved, as well as the subsequent Equipment Plan, which dealt with the Amateur Radio side of the event as well as technical details like video and audio production. Cullen and his team, including ARISS volunteers, met frequently to understand the needs of the various stakeholders, to plan, and to practice. News releases were written and distributed, and communications for the school and radio club were produced.

The efforts paid off when the big day came, on May 5, 2016. A pre-program of comments and background information began at 11:45 am. At 12:43 pm, the first call went out to NA1SS, the ISS Amateur Radio station. It took seven contact attempts before astronaut Jeff Williams, KD5TVQ's voice filled the auditorium

to thunderous applause. Astronaut Williams answered all 24 questions students asked, and by 1 pm the contact was history.

About 150 people witnessed the event live at All Saints, and hundreds more viewed it live-streamed over the Internet. But a much greater audience was reached as all three local TV stations — ABC6, NBC10, and CBS12 — had news coverage during their shows, and several local newspapers ran stories. Amateur Radio in Rhode Island benefited from the positive press, which drew several new members to NCRC.

The most unexpected benefit, however, came as a bit of serendipity. Recently, there has been a movement to integrate Amateur Radio into the state's emergency response plans, and during a meeting of the Rhode Island Association of Emergency Managers, one town manager noted the success of the ARISS event, stating, "If Amateur Radio operators can contact the International Space Station moving thousands of miles per hour above our heads, imagine how their skills can help provide resilient communications for our state during an emergency."

The desire to do something exciting for the students of one school brought benefits to Amateur Radio far beyond all initial expectations. (For more, see the *Newport Daily News* article [here](#) and watch an online video of the contact [here](#)).

*Bob Beatty, WB4SON, a semi-retired electronic engineer, teaches enrichment programs and radio license classes in Rhode Island. He may be reached at [WB4SON@gmail.com](mailto:WB4SON@gmail.com).*

All Saints Academy STEAM students halfway through their 24-question "RI Space Chat" with ISS astronaut Jeff Williams, KD5TVQ, in May 2016. [Photo by Philip Sherman/*Newport Daily News*, [www.newportri.com/](http://www.newportri.com/)]



## Update on Recent ARISS Activities

There's always something exciting in the air with the Amateur Radio on the International Space Station (ARISS) program. Below are summaries of the most recent contacts between schools in the United States and the ISS astronauts. To learn more about ARISS, including how your school or organization can apply for contact consideration, visit [www.arrl.org/amateur-radio-on-the-international-space-station](http://www.arrl.org/amateur-radio-on-the-international-space-station).

A direct contact with students at the **Palmetto Scholars Academy, North Charleston, SC**, was successful on February 10, 2017. *(Editor's Note: Watch for a write-up in the next issue of Radio Waves about student radio activities in preparation for the event.)*

A telebridge contact via K6DUE at the **Space Exploration Educators Conference, Houston, TX**, was successful on February 9, 2017.

A telebridge contact via ON4ISS with students at the **South Street School and Westside Middle School in Danbury, CT**, was successful on February 2, 2017.

A direct contact via W6FOG with students at the **World Genesis Foundation (WGF), Goodyear, AZ**, and **Quartzsite in Motion, Quartzsite,**

**AZ**, was successful on January 11, 2017. Watch the online video recapping the event [here](#).

A direct contact via K4JMC between astronaut Shane Kimbrough, KE5HOD, and students at **Rainbow Middle School in Rainbow City, AL**, was successful on January 4, 2017.

A direct contact via W2IR with the **Museum of Innovation and Science (miSci) in Schenectady, NY**, was successful on December 10, 2016.

A direct contact via N4BRF with students at **Boca Raton Christian School, Boca Raton, FL**, was successful on November 11, 2016.

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For information about upcoming ARISS contacts, visit [www.ariss.org/upcoming-contacts.html](http://www.ariss.org/upcoming-contacts.html).



A student at Rainbow Middle School takes her turn at the mic to ask a question of astronaut Shane Kimbrough, KE5HOD.



The team involved in the ARISS contact at Rainbow Middle School in Rainbow City, AL.



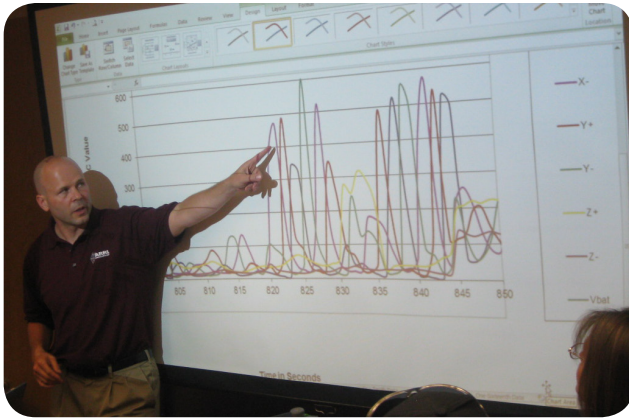
### ARISS Application Window Now Open

The current window for ARISS proposals for contacts to be scheduled between January and June 2018 will be open from February 15 to April 15, 2017. For information on applying, visit [www.arrl.org/hosting-an-ariss-contact](http://www.arrl.org/hosting-an-ariss-contact).



## In the Classroom

### Citizen Scientist Opportunities for Radio Amateurs



ARRL Education & Technology Program instructor Matt Severin, N8MS, reviews telemetry data downloaded from the materials science experiment on the FunCube satellite with participants at the Teachers Institute Remote Sensing Data Gathering workshop.

The past few years have seen renewed interest in HF communication links and in the geophysics of the upper atmosphere. This has led to numerous research projects that are of interest to the radio amateur. In response, a group of researchers got together and formed the HamSCI ([www.hamsci.org](http://www.hamsci.org)) platform to collect information on these projects and to encourage individual hams to do some science themselves.

Interested amateurs will have a rare chance to contribute during this year's total solar eclipse, occurring on August 21. The eclipse will greatly affect the ionosphere and HF propagation, and researchers wish to use this opportunity to measure those effects. By participating in the Solar Eclipse QSO Party on the day of the eclipse, hams can generate a lot of valuable data for the research community.

To learn more, see "HamSCI: Ham Radio Science Citizen Investigation" in

the August 2016 issue of *QST* [here](#), and "The Solar Eclipse QSO Party" in *QST*'s February 2017 issue [here](#). There will also be an article in *QST*'s July 2017 issue, offering final rules and tips on how to participate effectively.

### Wanted: Researchers

#### Calling All Volunteer Scientists

Looking for even more opportunities to add to the body of scientific knowledge? Check out Zooniverse ([www.zooniverse.org](http://www.zooniverse.org)). According to its website, "The Zooniverse is the world's largest and most popular platform for people-powered research," and it brings together hundreds of thousands of volunteers from around the world to assist professional researchers. In one ongoing Zooniverse initiative, The Milky Way Project, citizen scientists scan images from NASA's Spitzer Space Telescope to help identify new and interesting phenomena. More information can be found at [www.zooniverse.org/projects?status=live](http://www.zooniverse.org/projects?status=live).

### Science Lessons for Solar Week

Multiverse at the University of California, Berkeley Space Sciences Laboratory, provides earth and space science educational opportunities and resources, many of which are easily related to Amateur Radio propagation/solar cycle-solar flares.

With Solar Week just around the corner (March 27–31), readers will want to check out the educational material found on Multiverse's website. There you'll see tabs, marked with the days of the week, that lead to topics like "Monday: The Sun as a Star" and "Tuesday: Solar Close-Ups." The tabs drill down into subtopics, many of which are directly related to Amateur Radio. These include, "Learn About the Active Sun" and "The Effect on Earth," and offer relevant lessons, images, and graphs.

Additional links offer material on the solar cycle, solar flares, the magnetosphere, the electromagnetic spectrum and wavelength, and more. Visit <http://multiverse.ssl.berkeley.edu/Solar-Week>.

Also, NSTA Press has published a new resource for teachers who want to engage students in studies related to the solar eclipse: "Solar Science: Exploring Sunspots, Seasons, Eclipses, and More." Its website offers downloadable worksheets and an observing guide. Find more information [here](#).

# Instructor Corner — News, Ideas, Support

## Update on Instructor Reporting and Recognition Program

As reported in the Fall 2016 issue of *Radio Waves*, in October last year we introduced a new web-based recognition program for ARRL Registered Instructors. This program is designed to provide ARRL and field organization leadership with valuable information about classes and instructor activities. It also gives us a way to recognize the important contributions instructors make to Amateur Radio. Over the past few months, we have been receiving the first feedback reports from registered instructors who have completed classes listed in ARRL's online database since the program launch. While there have been some bugs with the website interface, we are working through the issues and starting to receive reliable data. Many thanks to those who are following up to send a report!

Please let us know if you are having difficulty listing your class or accessing ARRL instructor materials on our website. You can contact Education Services Assistant Lisa Kustosik, KA1UFZ, at [lkustosik@arrl.org](mailto:lkustosik@arrl.org) for assistance. Hopefully, you've taken advantage of the new feature we've added, offering an online link to print a certificate that acknowledges your registration with the ARRL as an instructor. Remember that you need to be registered with the ARRL and logged into the ARRL website to access these features. If you haven't registered, here's the link: [www.arrl.org/license-instructor-registration](http://www.arrl.org/license-instructor-registration).

## Recent Licensing Statistics

The following report of FCC licenses issued is supplied by ARRL VEC Manager Maria Somma, AB1FM. Somma notes that 2016 was another outstanding year for Amateur Radio licensing. Licenses issued are down only slightly from 2015, while 2014 was a record-setting year for new licenses issued. We continue to see an elevated interest in obtaining an Amateur Radio license.

The total number of US radio amateurs has continued to grow each year since the FCC license class restructure in 2007. As of December 31, 2016, the number of licensees in the FCC database is 742,787, up from last year's total of 735,405.

### New and Upgraded FCC Licenses Issued per Year

| FCC License Activity | 2011          | 2012          | 2013          | 2014          | 2015          | 2016          |
|----------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Technician           | 21,316        | 23,974        | 25,621        | 29,223        | 28,504        | 28,927        |
| General              | 9,667         | 10,132        | 9,567         | 10,902        | 11,179        | 10,287        |
| Amateur Extra        | 3,426         | 3,259         | 3,023         | 3,672         | 3,618         | 3,955         |
| <b>Total Issued</b>  | <b>34,409</b> | <b>37,365</b> | <b>38,211</b> | <b>43,797</b> | <b>43,301</b> | <b>43,169</b> |

## Tools for Outreach

### Downloadable Intro to Amateur Radio

A *PowerPoint™* slide presentation, developed by Tim Watson, KB1HNZ, for the Wireless Society of Southern Maine, provides an engaging introduction to Amateur Radio and is available for outreach use. You can access it at [www.qsl.net/ws1sm/Ham\\_Radio\\_Intro.pptx](http://www.qsl.net/ws1sm/Ham_Radio_Intro.pptx).

## NCVEC Invites Comments for Tech Question Pool Update

The National Conference of Volunteer Examiner Coordinators (NCVEC, [www.ncvec.org](http://www.ncvec.org)) Question Pool Committee (QPC) is reviewing the 2014–2018 Technician question pool for revisions and updates. The QPC will accept comments and suggestions from the Amateur Radio community via e-mail at [qpcinput@ncvec.org](mailto:qpcinput@ncvec.org) through March 31, 2017.

The NCVEC QPC will take all comments and suggestions into consideration as it updates the Technician question pool for 2018–2022. Input from the Amateur Radio community may include suggestions for new questions, changes to the topic areas, or changes to existing questions in any of the current Amateur Radio examination question pools.

## Education & Technology Program News

### Summer 2017 Teachers Institute Schedule Announced



This is what professional development looks like at ARRL's Teachers Institutes. The top photo shows TI participants actively engaged in lessons hosted by Douglas County STEM School and Academy in Colorado. (Larry Kendall, K6NDL, photo). The bottom photo shows instructor Tommy Gober, N5DUX, teaching modulation at the TI at Headquarters. [Debra Johnson, K1DMJ, photo].

ARRL has announced the 2017 schedule for our Teachers Institute on Wireless Technology. The ARRL Teachers Institute is an expenses-paid, intensive professional development opportunity for educators who want to receive training and resources to explore wireless technology in the classroom. Topics at the TI-1 Introduction to Wireless Technology course include basic electronics, radio science, microcontroller programming, and basic robotics. ARRL will also offer an advanced Teachers Institute (TI-2) on Remote Sensing and Data Gathering. Point your web browser [here](#) for an article from the March issue of *QST* that includes the schedule and descriptions of this summer's offerings.

You can also watch a new video [here](#) for an inside look at the Teachers Institute.

#### 2017 Teachers Institute Schedule

Application Deadline for All Sessions is **May 1, 2017**

| Date                                            | Location                                     |
|-------------------------------------------------|----------------------------------------------|
| <b>TI-1 Introduction to Wireless Technology</b> |                                              |
| July 17 – 21, 2017                              | Dayton Amateur Radio Association, Dayton, OH |
| July 24 – 28, 2017                              | ARRL Headquarters, Newington, CT             |
| <b>TI-2 Remote Sensing and Data Gathering</b>   |                                              |
| July 10 – 13, 2017                              | ARRL Headquarters, Newington, CT             |

### ETP Grants for 2016 – 2017

The ARRL Education & Technology Program awarded three station grants and one progress grant for the 2016–2017 school year, to schools in Illinois, California, Ohio, and Connecticut. Read more about the recent grant awards in this *ARRL News* [story](#). Find more information about the grant program at [www.arrl.org/etp-grants](http://www.arrl.org/etp-grants).

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[www.arrl.org/resources-for-license-instruction](http://www.arrl.org/resources-for-license-instruction)

Resources for Teachers:  
[www.arrl.org/amateur-radio-in-the-classroom](http://www.arrl.org/amateur-radio-in-the-classroom)

Education & Technology Program:  
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Teachers Institute on Wireless Technology:  
[www.arrl.org/teachers-institute-on-wireless-technology](http://www.arrl.org/teachers-institute-on-wireless-technology)

ARRL Program:  
[www.arrl.org/amateur-radio-on-the-international-space-station](http://www.arrl.org/amateur-radio-on-the-international-space-station)

**Access Radio Waves**

Find this and other issues of *Radio Waves* in an interactive online format at  
[www.arrl.org/radio-waves](http://www.arrl.org/radio-waves)

## Announcements, Upcoming Events, Opportunities, and Deadlines

**ARRL Proposal Window Now Open** — The ARRL Program's proposal window for accepting submissions from educational organizations seeking to host scheduled contacts with the ISS from January – June 2018 is open between **February 15 and April 15, 2017**. Details and opportunities to participate in Information Sessions will be posted at [www.arrl.org/hosting-an-ariss-contact](http://www.arrl.org/hosting-an-ariss-contact).

**Herb S. Brier Instructor of the Year Award** — The deadline for nominations for this year's Herb S. Brier Award is **March 15, 2017**. Visit [www.arrl.org/herb-s-brier-award](http://www.arrl.org/herb-s-brier-award) for details. Please note that the documentation that must accompany a nomination may take some preparation time.

**Now Accepting Applications for the Teachers Institute, Summer 2017** — The deadline for applications for the 2017 Summer Teachers Institute is **May 1, 2017**. Application forms are available online at [www.arrl.org/teachers-institute-application](http://www.arrl.org/teachers-institute-application).

**FAR Scholarships** — The Foundation for Amateur Radio is accepting applications until April 15, 2017. The application process is open to all licensed Amateur Radio operators worldwide. Visit [www.farweb.org/scholarship-information](http://www.farweb.org/scholarship-information).

**Kids Day, June 18, 2017** — Kids Day gives young people on-the-air experience and provides a chance to interest them in getting a license of their own. For more information, see [www.arrl.org/kids-day](http://www.arrl.org/kids-day).

**Mark Your Calendar**

It's not too early to begin planning for **ARRL Field Day, June 24 – 25, 2017**. Information about this opportunity for public outreach can be found at [www.arrl.org/field-day](http://www.arrl.org/field-day).

You are subscribed to receive the ARRL Instructor/Teacher E-Letter. If you have an ARRL website user account, you can manage all of your e-mail preferences at [www.arrl.org/myarrl](http://www.arrl.org/myarrl). If not, contact us at [ead@arrl.org](mailto:ead@arrl.org) to subscribe/unsubscribe.



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