

Welcome to the 20th Annual Solar Car Challenge Workshop

Dan Lepinski

41st Year in the Solar Energy Industry

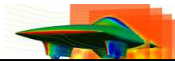
46th Year as an Amateur Radio Operator

5th Year as Co-host of “Ask Andrea”

A Nationally syndicated home-improvement radio show broadcast on the USA Radio Network and Select National Public Radio Stations.



Solar Car Challenge Workshop
March 10, 2013



Presentation Focus Today:

Communication Between Solar Car Driver and Support Team.

This summer, you'll need a reliable means of communicating between the driver of your solar car, and the adults and others in your team's support vehicles.

Your options are:

Cell Phones

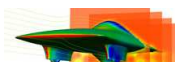
Citizen's Band Radio (“CB”)

Family Radio Service (“FRS”)

General Mobile Radio Service (“GMRS”)

.. hand signals, tin-can telephones, megaphones, mirrors, yelling ... or ...

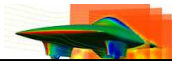
Amateur Radio.



What Are You Likely to Experience if You Use...

Cell Phones?

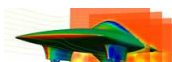
- ☼ Must be dialed each time to make contact.
- ☼ Can only involve one other party in the conversation.
- ☼ Road noise from the car and other sources make it difficult to hear and be heard.
- ☼ Limited coverage in sparsely populated areas (and there are many “wide open spaces” out west!).
- ☼ Subject to “breaking up” and “dropped connections” in weak signal locations.



What Are You Likely to Experience if You Use...

Citizen's Band (“CB”) Radio?

- ☼ Limited frequency range with overcrowded and abused “channels”.
- ☼ Interference from electronics, DC motors, as well as power lines, automobile ignition, lightning, and other sources.
- ☼ Overrun by many illegal high-power stations, especially in cities.
- ☼ Requires a longer antenna to be effective for any distance.
- ☼ Few walkie-talkies available means installing a large radio in the race car.



What Are You Likely to Experience if You Use...

Family Radio Service (“FRS”)?

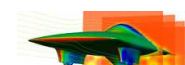
- ☼ No license required, but....
- ☼ Low power (1/2 watt) limits communication distance.
- ☼ Shared with the public. May have others talking on the same radio channel as your team.
- ☼ Small batteries with short life, especially if transmitting often.
- ☼ Tiny speaker makes it difficult to hear, especially over road noise.



What Are You Likely to Experience if You Use...

General Mobile Radio Service (“GMRS”)?

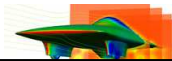
- ☼ Similar operating characteristics to the Family Radio Service.
- ☼ Higher power than FRS, but still very limited range.
- ☼ Like “FRS”, “GMRS” is a line-of-sight mode of communication.
- ☼ “GMRS” radios cost more than “FRS”. Sometimes much more.
- ☼ With “FRS” and “GMRS”, you’re on your own as far as buying and using the equipment.
- ☼ License required. One license can cover all the operators, but only while using the radios for the race. They are NOT licensed to operate away from the license holder.



What Are You Likely to Experience if You Use...

Amateur Radio?

- ☀ Reliable direct communication up to a mile or more.
- ☀ Learn skills you can use useful for the rest of your lives.
- ☀ Many different options than just “talking”.
- ☀ Hobby. Emergency communications. Public service.
- ☀ Ready “pool” of licensed amateur radio operators willing to help your team get started, procure equipment, train you and your students, and get it all working.



What IS “Amateur Radio”?



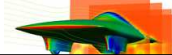
Guglielmo Marconi (1874-1937)

It's a worldwide hobby where people of all ages, nationalities, and genders use radio for local, regional, and international communication using an invention by this man .. Guglielmo Marconi, credited with inventing radio.

It's a unique mix of fun, public service and convenience. These are the distinguishing characteristics of Amateur Radio.

It's also a richly rewarding high-tech hobby that has many different appeals to different people. Whether talking to local friends, sending data with personal messages or vital information in an emergency, talking to other amateurs anywhere in the world, or engaging in contests with other radio amateurs, there's something in amateur radio for everyone.

Although people become amateur radio operators for many reasons, they all share in common a basic knowledge of radio technology and operating principles, and pass an examination to obtain a Federal Communications Commission license.



Early Radio Signals Used Morse Code (invented by Samuel B. Morse).

Form No. 4-108-17,811. Date 14 APR 1912

The Marconi International Marine Communication Co., Ltd.
WATERGATE HOUSE, YORK BUILDINGS, ADLPHI, LONDON, W.C.

No. "O-L-Y-M-P-I-C" OFFICE 14 Apr 19 12

Charges to Pay.

Handed in at TITANIC

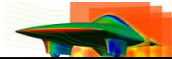
This message has been transmitted without the assistance of any land station, which have been agreed to by the sender. If the accuracy of this message is doubted, the Receiver in paying the necessary charges, may have it repeated whenever possible, from Office to Office, and the Company's charges, and should any error be shown in case of charges for land stations will be adjusted. This form must accompany any receipt regarding this Telegram.

Total

To OLYMPIC

**Eleven pm NEW YORK TIME TITANIC SENDING OUT SIGNALS OF DISTRESS ANSWERED HIS CALLS.
TITANIC REPLIES AND GIVES ME HIS POSITION 41.46 N 50 14 W AND SAYS "WE HAVE STRUCK AN ICE BERG".
OUR DISTANCE FROM TITANIC 505 MILES.**

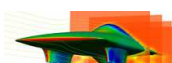
This is the original Morse code record of the distress signal received by the steamship "Olympic" sent by the Titanic that fateful night.



Today's Amateur Radio Operators Still Use Morse Code, but Also Use...

- ⊗ Voice (AM, FM, "Sideband", Digitized)
- ⊗ Satellites
- ⊗ Digital Communication (computer-to-radio-to-computer)
- ⊗ Teletype
- ⊗ Earth-Moon-Earth ("Moon-bounce")
- ⊗ "Slow-scan" television
- ⊗ Fast-scan television (more conventional television)
- ⊗ "VLF", "HF", "VHF", "UHF", Micro-wave frequencies
- ⊗ Remote control stations
- ⊗ Facsimile (image transmission)
- ⊗ Morse Code (because they enjoy it!)
- ⊗ .. and other modes as well!

And what do amateur radio operators do with all these different modes and methods of communication?



Amateur Radio Operators...

Enjoy it as a hobby to communicate with friends locally, nationally, and around the world.

They also frequently offer public service assistance providing communication services for parades, races, walks, runs, bike tours, fund raisers, marathons, March of Dimes, the annual Boy Scout "Jamboree on the Air", and many other events.



What Else Is "Amateur Radio"?



Disaster Services



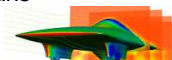
Weather Watch



Emergency Aid

It's often found that amateur radio works when all other systems fail.

Amateur radio was the only means of communication in New Orleans for almost two weeks after Hurricane Katrina struck in 2005.



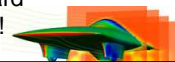
Who Is Involved in "Amateur Radio"?



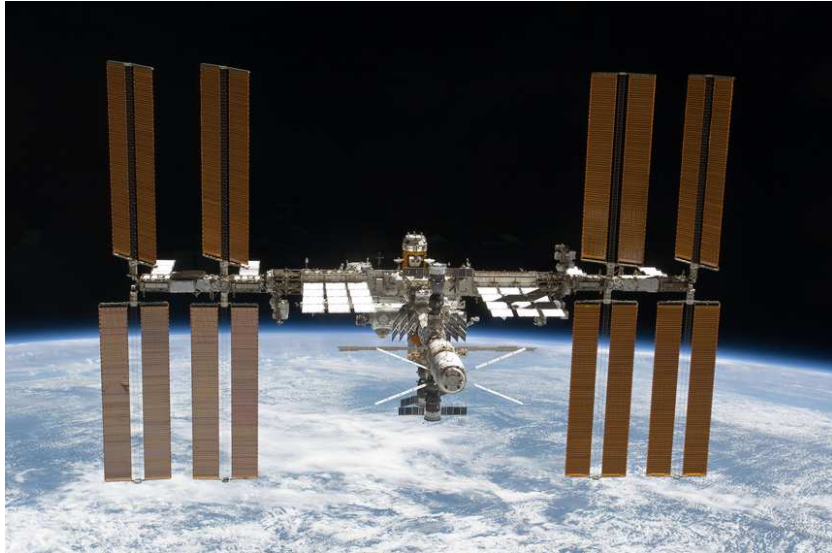
How about this guy? Recognize him?



It's Doug Wheelock, American astronaut. He logged 178 days on board the International Space Station. He's also an amateur radio operator!



This was Doug's home for 178 days.



While there, Doug talked with many other amateur radio operators - especially students! Here, he answers a question from a student named "Maya".

Why is Amateur Radio Referred to as "Ham" Radio?

Amateur radio is often called "ham" radio, which is simply a shorter way of saying "amateur". No one is certain just where the term "ham" originated, but it's been around for more than 100 years.

Just as "automobile" became "car" ... "amateur radio" became "ham radio".

... and no .. It's not THIS type of "ham" radio!



Who Are "Typical" Ham Radio Operators?

Anyone! Amateur Radio operators come from all walks of life, and from all over the world – movie stars, doctors, students, missionaries, politicians, truck drivers, mechanics, and even teachers ... to name a few! They're men and women, boys and girls of all ages, income levels and nationalities .. without regard for physical abilities or limitations.

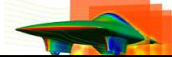


Ronnie Milsap – (Country Pop Singer)
(By the way - Ronnie has been blind since birth!)



Patty Loveless (Country Singer)

Some others include: Burl Ives (actor), Keizo Obuchi (Prime Minister of Japan), Yuri Gagarin (first human in space), Walter Cronkite (TV news anchor), Joe Walsh (singer with "The Eagles"), Kathryn Dwyer Sullivan (first woman to walk in space), Clarence Fender (designed the Fender guitar) ... and countless others. Presidents, heads of countries, athletes, inventors, and millions of everyday people like us!



There Are Three Classes of License: Technician, General, Extra

Technician

35-question test on radio theory, regulations and operating practices.
Gives access to all Amateur Radio frequencies above 30 megahertz.
Also allows for limited privileges on the HF bands for international communications.

General

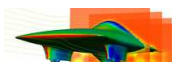
35-question exam (must previously pass the Technician test).
Provides some operating privileges on all amateur radio frequencies and all operating modes.

Extra

50-question test (must have passed Technician and General tests first).
All available U.S. Amateur Radio operating privileges on all bands and all modes.

Licenses are valid for 10 years, and can be renewed without re-testing.

The License itself is free, but requires a nominal fee to cover expenses.
(Typically less than \$20.)

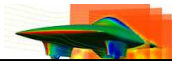


Getting Licensed – Where Do We Start?

The easiest way is to find a ham radio club in your area. They can help get the study materials you'll need, and may also have a group of volunteer examiners that are authorized to administer the required tests!

For the race this summer, start with a "Technician" license. It's the minimum level needed. Ambitious students may try for a higher class license (if their time permits) and gain even more operating privileges for later use, but the "Technician" level will suffice for the race.

Note: Any team members using ham radio for communication must have a valid amateur radio license. Licenses can't be "shared".



The screenshot shows the ARRL website header with the logo and navigation menu. A red circle highlights the "Find a Club" link in the menu. A red arrow points from this link to a text box. Below the menu is a banner with the text "ARRL Devoted Entirely to Amateur Radio" and a "Learn More" button. A second text box points to the "Learn More" button.

How Do We Find a Ham Club in Our Area?

ARRL AMATEUR RADIO®

Site Login: Username, Password, Forgot Password? Register

Website Search: Keyword, Category, Call Sign / Name Search, Search Licenses

ARRL Devoted Entirely to Amateur Radio

Learn More

Public Service, Advocacy, Education, Technology, Membership

1 2 3 4 5

Visit: www.arrl.org

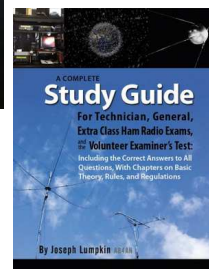
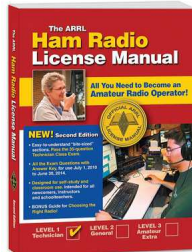
To find a license class in your area, click here.

Same for finding a nearby ham club!



Getting Licensed – How Long Does it Take?

Plan on six to eight weeks of study. If you commit more time to learning, it could take less. Remember too .. your team will be building a solar race car at the same time!



What Equipment Will Our Team Need (at a minimum)?

Handheld radios. Preferably with 12 Volt DC power to plug into your car.

Chase vehicle: Mobile radio & external antenna (handheld will also work).

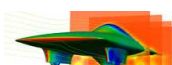
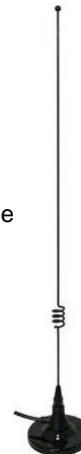
Race car: Handheld radio securely mounted. Headset / microphone with "remote pushbutton transmit" highly recommended.

External antennas recommended for all radios. They will extend the range of your radios significantly.

Include spare battery packs and chargers!

Suggested radios: 144-148 Mhz ("2 Meters"), but "UHF" also OK.

(Be aware of "theft factor" for any radio equipment!)



Where Do We Obtain Ham Radio Equipment?

Check with a ham radio club in your area. Many times they'll loan, or sell at low-cost, excess equipment they may have.

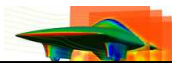
Many hams will also help install the equipment they provide AND make sure it's operating properly.

Some will even go the extra mile and teach your team how to use the equipment!

If you don't have a ham club nearby, there are many retail outlets around the USA. Search for "Ham Radio" on the internet, then call around. Tell them who you are, and why you need the radios.

(However, don't let them sell you more than you need. Enlist the help of a neighborhood ham if at all possible.)

If you do purchase from a retail store, try to purchase locally. Support the area stores, so they can support you!



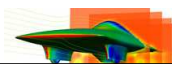
Parents! Students who get their ham radio license have advantages in:

- * Communication Arts, Language Arts
- * Mathematics: Algebra, Geometry, Business Math, Scientific Notation
- * Social Studies, World Studies, Government, Geography
- * Computer Science
- * Physics
- * Electronics Technology
- * Foreign Languages
- * Graphic Arts
- * Industrial Arts



Also .. Scholarships!

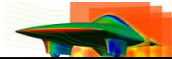
There are nearly 70 college scholarship programs through the American Radio Relay League alone for which students that are licensed amateur radio operators can apply! More exist through other sources!



And of Course .. There's Also Ham Radio and Solar Energy!



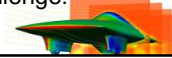
“Field Day” is an annual exercise in which amateur radio operators around America hone their skills in a simulated emergency situation, frequently utilizing alternative sources of power such as solar electricity.



And finally .. would you trust your ham radios to this team?



The Hurst, Texas Amateur Radio Club did! Their members tutored these students from Ben Barber Career Tech Academy in Mansfield, Texas last year, and nearly every one of the team passed their test and became a licensed amateur radio operator in time for the 2012 Solar Car Challenge!



Your team can accomplish this too!



A ham radio license works not only for the Solar Car Challenge race, but is a hobby good for a lifetime!

Who knows where it may take you?



No matter what your interest in Amateur Radio ... whether it be for the Solar Car Challenge race .. or for years afterwards ...



Emergencies



Public Service



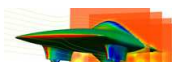
International
Communication



Fun

**“Ham” May Be a Short Way of Saying “Amateur”... but today,
a more applicable meaning of the term might just be...**

HELPING ALL MANKIND.



For More Information:

American Radio Relay League - Local Clubs, License information
www.arrl.org

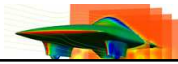
Find a Ham Radio Class in Your Area:
www.arrl.org/licensing-education-training

Teachers: Students Talk with Astronauts Using Amateur Radio
www.nasa.gov/audience/foreducators/teachingfromspace/students/ariss.html

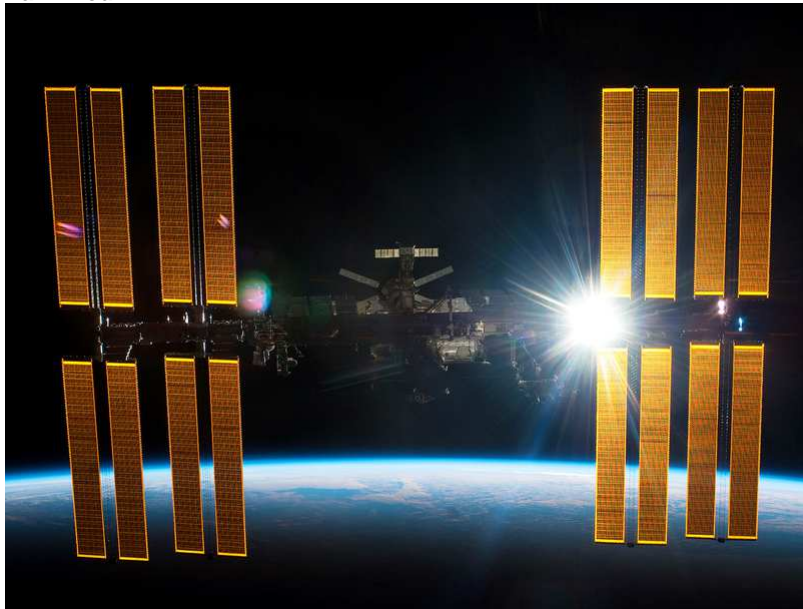
College Scholarships for Graduating High School Seniors
www.arrl.org/scholarship-descriptions

Handi-Hams, An Organization for Amateur Radio Operators with Disabilities
www.handiham.org

Your presenter's access:
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Thank You.



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