



Celebrate!

The Aero Aerial

The Newsletter of the Aero Amateur Radio Club
Middle River, MD
Volume 16, Issue 7
July 2020

Editor Georgeann Vleck KB3PGN

Officers

President	Joe Miko WB3FMT	Repeater	Phil Hock W3VRD Jerry Cimildora N3VBJ Ken Erisman NE3A Dave Brunner AC3EO
Vice-President	Rob Ballou KC3ROB	VE Testing	Pat Stone AC3F
Recording Secretary	Larry Hill KB3QWC	Public Service	Bob Landis WA3SWA
Corresponding Secretary	Pat Stone AC3F	Webmaster, Facebook	Jerry Cimildora N3VBJ
Treasurer	Warren Hartman W3JDF	Trustee:	Dave Fredrick KB3KRV (W3PGA) Jim Marshalek KC3FBL (AE3RO)
Resource Coordinator	Ron Distler W3JEH	Club Nets	Joe Miko WB3FMT
		Contests	Bob Venanzi ND3D

Website: <http://w3pga.org>

Facebook: <https://www.facebook.com/pages/Aero-Amateur-Radio-Club/719248141439348>

About the Aero Amateur Radio Club

Meetings

The Aero Amateur Radio Club meets at 7:30 pm on the first and third Wednesdays of the month at Essex SkyPark, 1401 Diffendall Road, Essex. Meetings begin at 7:30 p.m. local time. Meetings are canceled if Baltimore County Public Schools are closed or dismiss early.

Repeaters

W3PGA **2 M :** INPUT : 147.84 MHz, OUTPUT : 147.24 MHz, PL 123.0
W3PGA **70 Cm:** INPUT : 444.575 MHz, OUTPUT : 449.575 MHz, PL123.0
W3JEH **1.25 M:** INPUT : 222.24 MHz, OUTPUT : 223.84 MHz

Club Nets

Second Wednesday Net – 70 Centimeters (449.575 MHz Repeater) @ 8 p.m. Local Time

Fourth Wednesday Net – 2 Meters (147.24 MHz Repeater) @ 8 p.m. Local Time

Fifth Wednesday Net – 10 Meters (28.445 MHz) @ 8 p.m. Local Time

Radio License Exams

The Aero Amateur Radio Club sponsors Amateur Radio License Exams with the ARRL VEC. Examination sessions are throughout the year. Walk-ins are welcome; arrive no later than 30 minutes after start time. \$15 charge.

2020 Examination Schedule DUE TO COVID19 May and June DATES May be **Canceled!**

Time:	1:15 pm	1:15 pm	
Dates:			
Where:			

White Marsh Library, 8133 Sandpiper Circle, White Marsh, MD

Contact: Patricia Stone AC3F, email: ac3f@juno.com, landline: 410-687-7209

LOCAL AREA NETS

Day	Time	Freq. (MHz)	Net Name
Daily	9 – 10 am	145.330	Oriole Net
Daily	6 pm	3.820	Maryland Emergency Phone Net
Daily	6:30 – 7 pm	145.330 no PL	Balto. Traffic Net (b/u 146.670 PL 107.2)
Daily	7 pm & 10 pm	3.643	MD/DC/DE Traffic Net
2 nd Tue	7:30 pm	146.670	Baltimore County RACES Net
2 nd Wed	8 pm	449.575	Aero ARC Net
4 th Wed	8 pm	147.240	Aero ARC Net
5 th Wed	8 pm	28.445	Aero ARC Net
Fridays	7:30 pm	145.330	Back in the Day Net
When activated by NOAA		147.030	SkyWarn (primary)

CLUB NEWS

6/3/2020 Aero ARC Meeting Notes via Zoom Video Conference Call

Start Time: 07:15pm End time: 08:18 Date: 6/03/2020

Members Present: Joe WB3FMT, Rob AE3B, Steve KD3TP, Pat AC3F, Lou KC3NMT, Don K3DON, Gus AA3GG, Rich KB3VAE, Larry KB3QWC, George KB3TBH, Bob WA3SWA, Ken KB3JVP, Dave KB3KRV
13 members present

Treasury Report: Bank \$2,892.02 On Hand: \$ \$31.00 /FD Food

Disbursed: Ck to Md Restrooms for \$159.00 and \$25.00 Cash to Keven the club's web domain name.

Repeater Report: 2 mtrs: No Problems 70 cm: No Problems

Correspondence: None

Public Service: Notice was sent out all members about checking in with and helping neighbors and your fellow hams if possible.

EmCOM: Nothing scheduled before the end of hurricane season.

Tropical Storm Arthur 3rd named storm of the 2020 hurricane season is a depression, no longer listed as an active storm.

SKYWARN Classes: Flood Class Thursday 6/18 – Online Webinar

You must register for the session, the time is 6:00 pm – 8:30 pm

VE Testing : The next on is scheduled for FD Saturday the 27th this is planned for the Essex Skypark as of this time. **As of 6/3/20 Pat had received 5 request for test takers, 4 Tech 1 Extra, she does expect Saturday walk-ins.** We would have testing limited to 10 participants. If more then 10, than break the test sessions into 2 one-hour sessions. Meet the 6-foot social spacing and require a face mask. Testing would be done outside using canopies the skypark long tables. Mask must be worn if required by the County. In case of inclement weather, testing might be done in participants cars. VEC would not be required to stay for other FD activities, unless they want too.

Old Business: Aviation Scouting event at the Essex Skypark has been rescheduled for November 6,7,8. The first weekend in November. We will be doing the same as we did last year. We need the following topics support for this event:

- Morse Code
- American Sign Language
- Braille

- Semaphore
- Nautical Flags
- Aircraft Signals
- Radio Operations Voice and CW
- The club will setup and operate a station during the event.

Wings and Wheels event

- There is no information about the September Wings and Wheels event.

Field Day 2020 Planning:

We decided to have our FD. It will be a reduced FD activity.

- **Field Day 2020v2.0** - It was decided to go with a modified FD20 a 3A instead of a 5A. Why?

 1. As shown in the photos it appears that there are 2 partial aircraft in the community hanger. We need to have a work around.
 2. Because of hanger space, we came up as a 3A configuration, 1 CW/Digital, and 2 HF stations. Just G5RVs and OCFDs.
 3. Try to set up an operator schedule. If you want a set time send me an email and I will make a schedule. If you want a specific time, send me an email and I will make the radio available for your use.
 4. I also need a list of PCs for logging and HF Rigs for the 3A configuration. I will bring a 2-meter/70 cm rig for talk ins.
 5. No supplied dinner made by Susan. Maybe Pizza John carry out, or ROFO chicken.
 6. Because of the reduced operator configurations set-up will begin around Noon on June 26, 2020.
 7. I will try to work up some bonus points, i.e. Safety Officer, Public Service Notice, FD Bulletin, # of Stations, Alt Power Battery, solar on wind etc.

Equipment and Support Stuff

Rich KB3VAE – one 10x10 pavilion w/sides table, FT458 HF rig

Joe WB3FMT – two 10x10 pavilion w/ tables and bench, TS570D HF 160-10

One each OCFD and G5RV

Steve KD3TP - One vertical 10-14

Bob WA3SWA – One OCFD and G5RV, Computers for FD LAN

New Business:

- **Addition Info:** Talked to Warren and he suggested in getting a set of duplexers for the 147.24 repeater and going to a single antenna site. Get rid of the tower and antenna at the gym. He is going to talk to Phil about looking for a duplexer. Warren talked to Phil and Phil agreed to look into getting the Duplexers for the 147.24r.

- **Update Info:** Talked to Warren and Phil they are looking into getting a set of duplexers (6 cans Approximately 3 feet by 6 inches and cables) he suggested in getting a set of duplexers for the 147.24 repeater and going to a single antenna site . Get rid of the tower and antenna at the gym. Warren said that we should be able to get a set of used 2-meter cans for about \$600.00 and we could build our own cables w/ \$2.00 connectors on each end.
- Because of the cost involved the membership of the club must take a vote. **I would like to approve up to \$800.00 just in case they need it.** We will get a consensus of the members at the Zoom meeting. I will send an email out to each member to vote yeah or Nay on the proposal. Members will have 1 week to respond to their voting selection. Per club officers only members in good standing will have their votes counted. Members in good standing means you are current with your dues.
- Voting was held for the spending authority of the 13 members present on the call there were no objections.
- An email will be sent to members to explain what is being proposed. If any member has any questions, they are asked to send me an email with their question(s) or concerns. I will respond to them. This action does not count as a vote for or against. Negative responses by email are by end of day on June 12th. If you don't respond I will take this as a yes vote.

- **COVID-19 Status**

The state is going into Phase 2 of their 3 phased plan. This means non-essential business can start open, and retail business can open with a 50% occupancy, restaurants still cannot open for inside business/ outside is ok providing required spacing is met. As of June 4th Baltimore Co is in Phase 2.

- It is now up to the individual state to change COVID19 health requirements as they feel fit. The MD Governor has released these requirements and has made it the responsibility of each county to open as they see fit. The state is currently in Phase Two. If the Fix Base Operator (FBO) is not ready by July 1st, I will ask Mandy from the Airport if we can use the hanger as an open air meeting area.
- Almost forgot, the election for club officers will take place the next time we have a face to face meeting rather than on May 20, 2020.
- Portable Restroom addition info
Club members on Zoom call, voiced concern about Handwashing for the Porta potty and general area. A call will be made see about getting hand washing station. A call was made on June 4th all hand wash stations were out being used. **None are available in the foreseeable future. Pat and I both called MD Restroom.**

- *Please Note: Due to CONVID19, if any one does not feel comfortable, do not feel you must attend. If you are a care giver, reside with older people, or for any reason you are uncomfortable with? Take the safe route for you and yours.*

JMM

6/17/2020 Aero ARC Meeting Notes via Zoom Video Conference Call

Start Time: 07:36 pm End time: 08:08 Date: 6/17/2020

Members Present: Bob WA3SWA, Harry AC3K, Don K3DON, Dave KB3KRV, Joe WB3FMT, Rob AE3B, Chris AB3WG, Rich KB3VAE, Pat AC3F, Steve KD3TP, Jon K7JKR, Dave KA3SNY, Margaret KC3FZZ, Gus AA3GG, Georgeann KB3PG, Tom WA3QLY, Lou KC3NMT 17 members present

Treasury Report: Bank \$2,892.02 On Hand: \$31.00 /FD Food

Repeater Report: 2 mtrs: No Problems 70 cm: No Problems

Correspondence: None

Public Service: We still need for members to continue checking in with and helping neighbors and your fellow hams if possible.

EmCOM: Nothing scheduled before the end of hurricane season.

SKYWARN Classes - Basic Class Tuesday 6/30 – Online Webinar

You must register for the session, the time is 6:00 pm – 8:00 pm

VE Testing : The next on is scheduled for FD Saturday the 27th this is planned for the Essex Skypark. *As of 6/17/20 Pat had received 5 request for test takers, 4 Tech 1 Extra, she does expect Saturday walk-ins.* We will have testing limited to 10 participants. If more then 10, than break the test sessions into 2 one-hour sessions. Meet the 6-foot social spacing and require a face mask. Testing will be done outside using canopies the skypark long tables. Mask must be worn if required by the County. In case of inclement weather, testing might be done in participants cars. VEC will not be required to stay for other FD activities, unless they want too.

Old Business: BSA Event Rescheduled

Aviation Scouting event at the Essex Skypark has been rescheduled for November 6,7,8. The first weekend in November. We will be doing the same as we did last year. We need the following topics support for this event:

- Morse Code
- American Sign Language

- Braille
- Semaphore
- Nautical Flags
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- 8. Because of hanger space, we came up as a 3A configuration, 1 CW/Digital, and 2 HF stations. Just G5RVs and OCFDs.
- 9. Schedule an Operator Time. If you want a set time send me an email and I will make a schedule. If you want a specific time, send me an email and I will make the radio available for your use. We want to try to set up an operator schedule, to give everyone a chance!
- 10. I also need a list of PCs for logging and HF Rigs for the 3A configuration. I will bring a 2-meter/70 cm rig for talk ins.
- 11. No supplied dinner made by Susan. Maybe Pizza John carry out, or ROFO chicken.
- 12. Because of the reduced operator configurations set-up will begin around Noon on June 26, 2020.
- 13. I will try to work up some bonus points, i.e. Safety Officer, Public Service Notice, FD Bulletin, # of Stations, Alt Power Battery, solar on wind etc. Equipment and Support Stuff below:

Rich KB3VAE – one 10x10 pavilion w/sides table, YAESU FT 450A HF rig

Joe WB3FMT – Two 10x10 pavilion w/ tables and bench

 TS-570D HF 160-10
 FTM-7250D VHF/UHF
 One each OCFD and G5RV
 Mini-refrigerator
 Igloo Cooler
 1 MFJ Fiberglass Tower
 1 Mil-Spec Pole Tower
 Tools

Steve KD3TP - One vertical 10-14

Bob WA3SWA – One OCFD and G5RV, Computers for FD LAN

Still need an additional Radio for CW and Digital and a backup.

New Business:

- Because of the cost involved \$800.00 the membership of the club must take a vote, I got a consensus of the members at the Zoom meeting. I sent an email out to each member to vote yeah or Nay.
- BUT!!! I had to send it out again because I needed to get an actual response "Yes or No". This proves you actually had a chance to vote!
- Voting response as of 6/17/20 the request to spend money has passed without objection. Warren and Phil will be notified.
- **COVID-19 Status**

The state is into Phase 2 of their 3 phased plan. This means non-essential business can start open, and retail business can open with a 50% occupancy, restaurants are open at 50% capacity inside and outside is ok providing required spacing is met. Malls should be opening this Friday or Saturday with some limitations.

- If the Fix Base Operator (FBO) is not ready by July 1st, I will ask Mandy from the Airport if we can use the hanger as an open-air meeting area.
- Almost forgot, the election for club officers will take place the next time we have a face to face meeting. This could be July 1st
- Portable Restroom addition info Hand washing stations.
A call was made on June 4th all hand wash stations were out being used. None are available in the foreseeable future. Pat and I both called MD Restroom.

Please Note: Due to CONVID19, if any one does not feel comfortable, do not feel you must attend. If you are a care giver, reside with older people, or for any reason you are uncomfortable with? Take the safe route for you and yours.

JMM 6-19-20

Net Reports

6-10-20: 440 net, 20:00 to 20:46 local.

W3PGA NCS Joe Essex, N3FOR Don, W3VRD Phil Essex, KB3JVP Ken Middle River, W3JEH Ron Perry Hall, KB3VAE Richard Middle River, KB3QWC Larry Middle River

7 people on the net

6-24-20: 2 meter net, 20:00 to 20:39 local.

W3PGA NCS Joe Essex, KB3JVP Ken Middle River, AC3EO Dave Baltimore City, W3VRD Phil Essex, KB3QWC Larry Middle River, K3DON Don Joppatowne, KB3VAE Richard Middle River, AC3F Pat Middle River, N3FQC Don Perry Hall, W3JEH Ron Perry Hall

10 people on the net

7-8-20: 440 net, 20:00 to 20:24 Local.

W3PGA NCS Joe Essex, KB3VAE Richard Middle River, AC3F Pat Middle River, N3FQC Don Perry Hall, W3VRD Phil Essex, N3RES Ray Baltimore City

6 people on the net



VE CORNER

by Pat Stone, AC3F

No new information received.

MORSE CODE NEWS

In a video, "The Last Active Morse Code Station in the US," Shannon Morse, KM6FPP, of Richmond, California, visits coast station KPH, which provided ship-to-shore communication using Morse code. Maritime Radio Historical Society ([MRHS](#)) volunteers have preserved and maintain the station and keep it on the air (along with the associated amateur station K6KPH). The COVID-19 pandemic has put KPH off the air "for the duration."

Source: The ARRL Letter for June 17, 2020

HAM NEWS

IN CASE YOU MISSED IT . . .

On the Air Magazine

On the Air is a suite of ARRL benefits for new ham radio licensees, anchored by the ARRL bimonthly magazine, *On the Air*. The magazine covers a range of ham radio interests and topics, delivering introductory techniques and stories to help anyone with a beginner-to-intermediate-level of experience. From making your first radio contact to selecting the right equipment to project building and getting involved with public service or your local clubs, *On the Air* magazine and its suite of companion benefits will help you make the most of your amateur radio license. Get active, get involved, get **On the Air!**

Members: read the latest issue of *On the Air* [here](#).

Click [here](#) to see a sample issue.

On the Air Podcast

On the Air podcast is a companion to the bimonthly *On the Air* magazine and takes a deeper dive into select features and projects. Each month, host and *On the Air* Editorial Director Becky Schoenfeld, W1BXY, will offer additional resources, techniques, and hints to help you get the most from the magazine's content.

[**Listen Now**](#)

On the Air Blog

The monthly *On the Air* blog features curated stories from the communicators and makers who, like you, are the driving force of today's amateur radio hobby. Learn about all you can do within the amateur radio community from stories and opinions of the people, their practices and adventures. The *On the Air* blog is an excellent entry point into the world of amateur radio for those looking for original voices and perspectives from the community.

Whether you are new, an expert or somewhere in between we invite you to take part in the conversation, share your stories and experiences by emailing ota-blog@arrl.org.

To read the complete *On the Air* blog, visit www.arrl.org/on-the-air-blog.

On the Air Community

Follow *On the Air* on [**Facebook**](#) and join our community of people who share an interest in radio communication and are looking to learn and explore more about ham radio.

www.facebook.com/ARRLOTA

Source: <http://www.arrl.org/on-the-air-magazine>

Hamfests

NO NOTICE OF CANCELLATION AS OF 7/9/20 Sunday, Oct. 4, 2020: CARAFest 2020

Location: Howard County Fairgrounds, 221 Fairgrounds Rd., West Friendship, MD 21794

Website: <http://www.carafest.org>

Sponsor: Columbia Amateur Radio Association

Talk-In: 147.390/R+ (PL 156.7)

Public Contact: David Parkison , KB3VDY, P.O. Box 911 Columbia, MD 21044, Phone: 443-492-9501

Email: vendorsales@carafest.org

NO NOTICE OF CANCELLATION AS OF 7/9/20 12/12/2020 - SantaFest

Location: Cheltenham, MD

Type: ARRL Hamfest

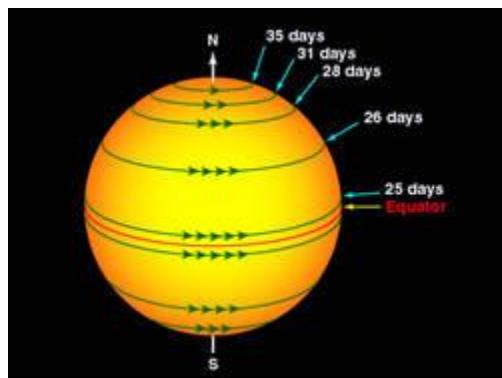
Sponsor: American Legion and Prince George's County Emergency Radio Association

Website: <http://www.pgares.org/>

FEATURE ARTICLE

Why Propagation Repeats About Every 27 Days

The sun rotates in about 27 days, but different solar latitudes rotate with different periods. This is why propagation repeats roughly every 27 days, as NASA [explains](#).



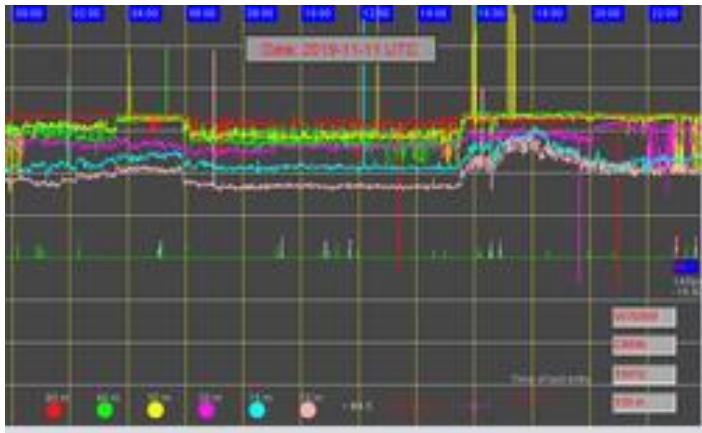
The sun's rotation was first detected by observing the motion of sunspots. The sun's rotation axis is tilted by about 7.25° from the axis of Earth's orbit, so we see more of the sun's north pole in September and more of its south pole in March. Because the sun is a ball of gas/plasma, it does not have to rotate rigidly, as solid planets and moons do. In fact, the sun's equatorial regions rotate faster -- taking only about 24 days -- than the polar regions, which rotate once every 30+ days.

The source of this "differential rotation" is an area of current research in solar astronomy. -- *Thanks to The ARRL Contest Update and NASA*

Source: The ARRL Letter for November 21, 2019

RF-Seismograph Gets Traction in *Hackaday*

[Alex Schwarz, VE7DXW](#), has theorized for some time now that his [RF-Seismograph](#), initially aimed at indicating band openings, seemed to also act as a real seismograph of sorts, with effects of earthquakes affecting HF noise levels and -- going out on a limb -- actually briefly *enhancing* HF propagation (click on image). Schwarz has some support from Professor Kosuke Heki of Hokkaido University in Japan, who has been researching whether changes occur in the ionosphere as a result of an earthquake.



The work of both citizen scientist Schwarz and space geodesy expert Heki caught the attention of *Hackaday*, the online publication with a stated goal of promoting "the free and open exchange of ideas and information." A November 12 *Hackaday article*, "HF Propagation and Earthquakes," outlines the observations of both men. According to the article, Heki "knew that changes in the ionosphere can affect GPS and GNSS receivers on the ground, and with Japan's vast network of receivers to keep track of the smallest of movements of the Earth's

crust, he was able to spot [an anomalous buildup of electrons](#) directly above the devastating 2011 Tohoku-Oki earthquake that preceded the earthquake by 40 minutes."

Heki's theory is along these lines: Chemical bonds in the rock -- specifically peroxy bonds between two oxygen atoms -- are broken by microfractures, leaving one side of the peroxy bond with excess electrons and the other with a positive hole. "These holes tend to migrate from high stress to unstressed areas of the rock, which leads them to eventually reach the surface, leaving it with a net positive charge," the *Hackaday* piece says. "As stress in the rock below increases, the number of positive holes reaching the surface rapidly multiplies, drawing electrons from the atmosphere to balance the charge. The moving charges generate an enormous electromagnetic field that can reach all the way up to the ionosphere, creating just the kind of anomalies that Professor Heki observed."

This week, Schwarz reported that the US Geological Survey recorded nine "significant earthquakes" on November 11, eight of which also were recorded by his RF-Seismograph. According to Schwarz, several small quakes early in the morning "opened the 40-meter band slightly, but the precursor of the quake [in Neiafu, Tonga] created a disturbance starting 4 hours prior to the quake and a total radio blackout between 0330 UTC and 0550 UTC. The quakes in late morning did not have a great effect on the local propagation. The one from Vanuatu created 80-meter propagation for 10 minutes only. At 2340 UTC, another quake from Indonesia opened the 30-meter band again," Schwarz said.



Alex Schwarz, VE7DXW, spoke at the 2015 ARRL-TAPR Digital Communications Conference. [Photo courtesy of HamRadioNow]

The *Hackaday* article concludes, "Clearly, the RF-Seismograph is not yet ready to claim to have a solid predictive ability for earthquakes. For that matter, Dr. Heki's space-based observations aren't ready to stake that claim either. But it certainly looks like ionospheric changes can be correlated to earthquakes, both in time and space..."

Source: The ARRL Letter for November 14, 2019

From the Skies over Mt. Essex

SKY Events for July 2020

July 1st - – USA's Cassini space probe, first to orbit Saturn in 2004.

July 4th - – Happy Birthday U.S.A. 244th, Crab Nebula, a Super Nova 1st seen in 1054 A.D. And, Earth is at aphelion 94,507,635 miles from the Sun.

July 5th - Full Moon, "Buck Moon" for Traditional "Blackberry Moon" and the for the Shawnee American Indian. And Penumbral Lunar Eclipse

July 10th – Venus greatest illumination extent mag -4.7

July 12th - Last Quarter Moon

July 14th – Jupiter at opposition magnitude -2.7

July 20th – New Moon, Saturn is at opposition.

July 22nd - Mercury at greatest elongation 20° west of the Sun.

July 27th - First Quarter Moon

July 28th – S δ-Aquariid meteor peak approx. 20 meteors/hr

Planet Lookout at mid-Month EDT

Sunrise 05:55 EDT and Sunset 20:21 EDT

Mercury -- Morning Rise 04:44 Set 18:54 Mag 1.4; Size 9.2 arc seconds

Venus -- Morning Rise 03:11, Sets 17:09 Mag -4.7 and 34.2 arc seconds.

Mars -- Morning Rises 00:02, Sets 12:13, Mag -0.8 and 12.8 arc seconds.

Jupiter -- Evening, 20:04, Sets 05:51; Mag-2.8 size 47.6 arc seconds.

Saturn -- Evening, rises 20:28, Sets 06:25; Mag 0.2 size 18.5 arc seconds.

Uranus-- Morning 01:08, Sets 14:42; Mag 5.8 size 3.5 arc seconds.

Neptune -- Evening Rises 22:59 Sets 10:39; Mag +7.9 size 2.4 arc seconds.

Lights in the Sky - A Meteor Shower

On any given clear moonless night, you should be able to look skyward and see a streak of light. What you just saw was what some people call a shooting star. It's not really a shooting star, stars are too big. What you saw was a Meteoroid hitting the upper atmosphere.

But, on at least 11 time a year, we get a meteor shower. A meteor shower is an annual event, when the Earth passes through a region having a great concentration of debris, such as particles left by a comet. From Earth, it looks meteors radiate from the same point in the sky. (*This is called the Meteor Radiant Point*). Rather than appearing from any part of the sky, they appear to come from a localized area.

All but 1 of the 11 meteor radiant point constellations have a familiar name! The unique shower name is Quadrantid, taken from a Mural Quadrant created by French Astronomer Jerome Lalande in 1795. This now-obsolete constellation was located between Boötes, the Herdsman and Draco the Dragon.

The Meteor shower are:

Shower Name	Date	Rate
1. Quadrantids	Jan 4 th	110
2. April Lyrids	Apr 22 nd	18
3. H Aquariids	May 5 th	50
4. S δ Aquariids	July 29 th	25
5. Perseids	Aug 12 th	100
6. Draconids	Oct 8 th	10
7. Orionids	Oct 24 th	20
8. N Taurids	Nov 12 th	5
9. Leonids	Nov 17 th	15
10. Geminids	Dec 14 th	150
11. Ursids	Dec 23 rd	10

Notes: The attached chart shows the meteor radiant points in the sky. The numbers correspond to the shower numbers.

The Moon should be less than a Full Moon (Bright Sky).

Clouds and Rain Bad News!

Look towards the Radiant Point after 11 PM local Time, after 11 PM the Earth is rotating into the meteor stream direction. All you need is a blanket or jacket, chair, something to drink. No binoculars or telescopes are needed.