

## Presentation Checklist

- Laptop
- Speaker
- Radio
- Recorder
- Headset
- Splitter
- Candy
- Model Sat
- V71, 9700, D72
- Arrow, Elk
- Recordings
- Cheat Sheet
- Copies of presentation.
- AMSAT docs

# **FM SATELLITES THE WHERE-TO'S, HOW FOR'S AND WHAT-NOT'S**

Ron Bondy, AD0DX

[ad0dx@yahoo.com](mailto:ad0dx@yahoo.com)

For W0TLM Monday June 15, 2020 via Zoom

# WHO MADE THESE SLIDES?

Paul Overn

KE0PBR: @KE0PBR

Recent Technician (November 2017), Upgraded to General in March 2018.

Mitch Ahrenstorff

AD0HJ

All around good guy and a great Ham. Extra @AD0HJ

Why satellites?

- Technician Limitation
- Repeaters are not very busy
- Challenge

# WHAT CAN YOU DO ON THEM?

APRS  
SSTV / Pics  
CW Beacons  
Decode Beacons  
ISS Classroom Chats  
CW / SSB – (Linear) Sats  
FM Repeater - Sats



# WHY SATELLITES?

Just like a land based repeater, except

Circling the globe at 17,000MPH

Over 300 Miles Up

1,400 Miles away

Low Transmit Power: 5 Watts to the sat.

Low Power for Return: 250-500 MW back from the sat

Frequency Changes – Doppler / polarization

Transmit and Receive Bands are different

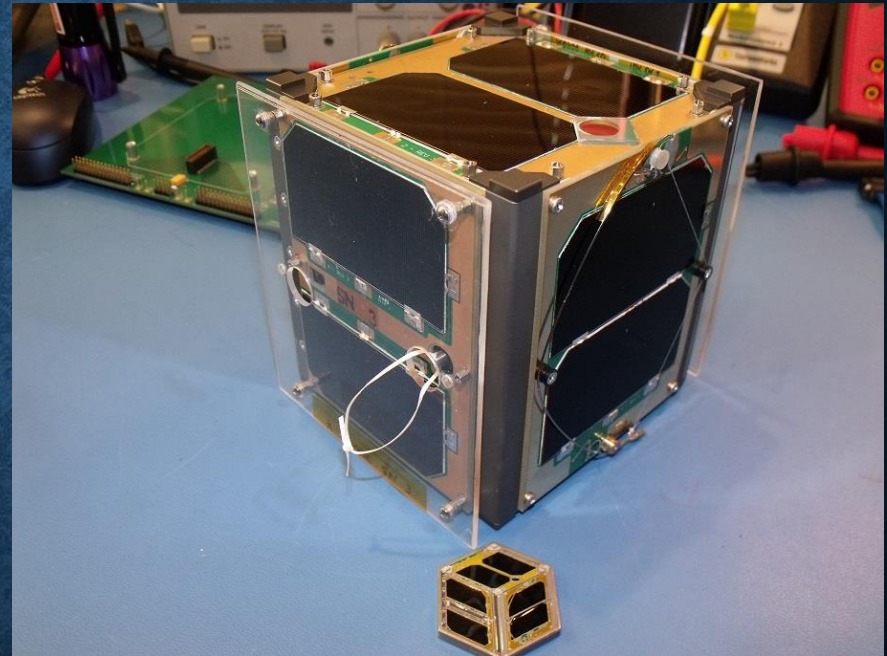
Maybe you can't do this, after all you are using a 5W transmitter, to make a 5200KM round trip, using a 2 pound box, approximately 4" square, in outer space, to repeat the signal to you, on a different band.

# SATELLITES

LEO (Low Earth Orbit), FM repeaters

- SO-50
- AO-91
- AO-92
- PO-101 (Diwata-2 / Schedules)
- Lilacsat (Schedules)

More on the way!



A0-85

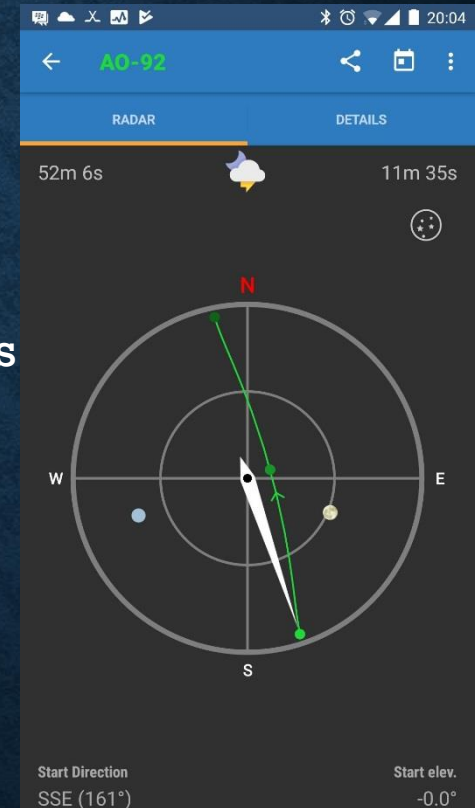
Each Sat is 1U: A "U" = 10CM x 10CM x 10CM 10 CM = 3.97"

# FINDING SATELLITES

How to find them:

Numerous software packages:

- IOS
  - GoSatWatch (\$10.00)
  - TrackSats (Free)
  - Satellite Tracker (\$10.00)
- PC - Mac
  - SatPC32 (\$45.00 / \$80.00) <- Numerous other features
  - Orbitron
  - Predict
  - AMSAT Web Page
  - Mac Doppler <- More Features
- Android
  - Amsat Droid
  - Heavens Above
  - IIS Detector Pro
  - Look4Sat



# FINDING THEM PART II GoSatWatch (iOS)

AO-85 ↑ 1:34:33 11:53:34 AM

Now Passes

	Start	End	Peak	Mg
<b>Thursday, February 1, 2018</b>				
SO-50	11:46:25 AM	11:57:24 AM	39° SW	4.5
AO-91	11:58:24 AM	12:06:43 PM	23° NE	4.3
AO-85	1:28:07 PM	1:32:38 PM	7° N	5.0
AO-91	1:34:35 PM	1:43:18 PM	28° W	4.5
AO-85	3:08:59 PM	3:17:13 PM	13° NE	4.6
LILACSAT-2	4:39:45 PM	4:48:17 PM	26° E	3.3
AO-85	4:48:52 PM	5:00:45 PM	44° NE	3.4
LILACSAT-2	6:13:58 PM	6:22:31 PM	25° W	5.1
AO-85	6:29:24 PM	6:40:54 PM	33° SW	5.1
AO-92	8:42:17 PM	8:51:04 PM	37° E	--
AO-92	10:16:49 PM	10:24:15 PM	17° W	--
<b>Friday, February 2, 2018</b>				

World Sky **Passes** Satellites Settings

AO-85 ↑ 1:32:18 11:55:49 AM

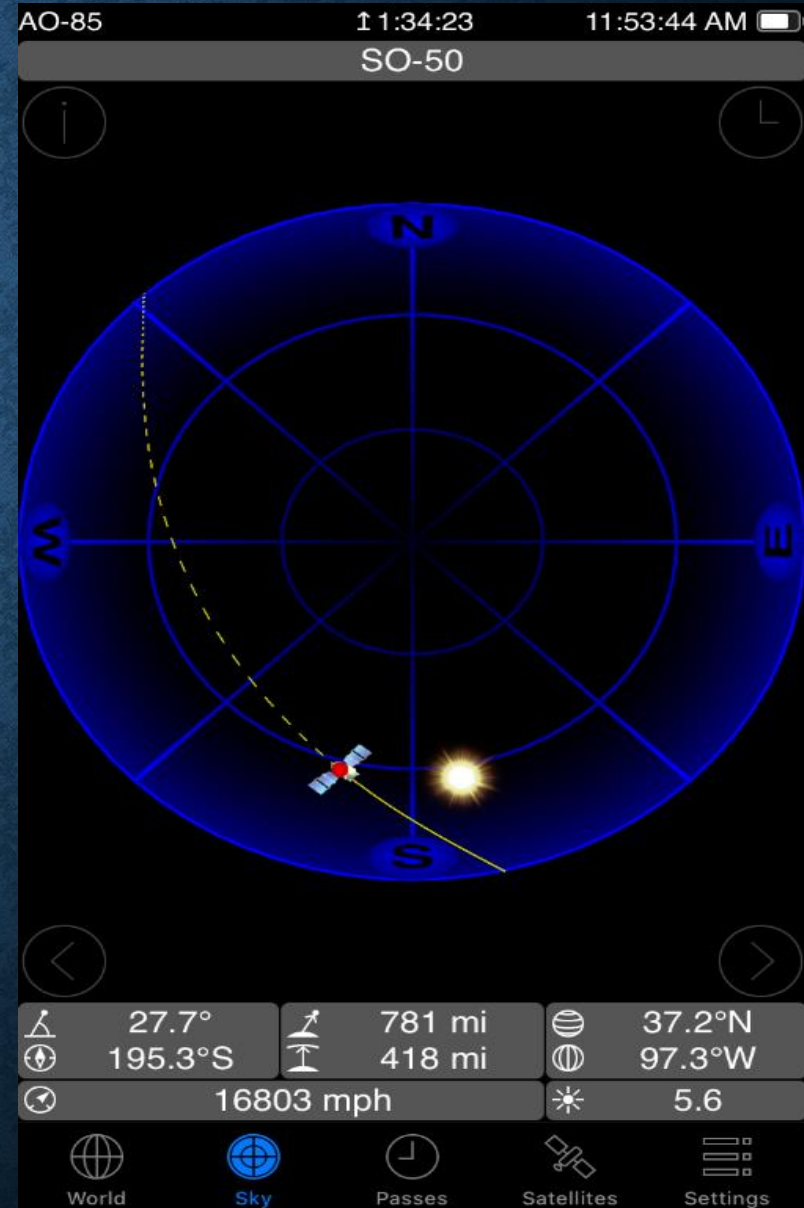
← Passes AO-85

↑ 5° NW 4:48:52 PM    ↗ 44° NE 4:54:38 PM    ↓ 5° SE 5:00:45 PM

World Sky **Passes** Satellites Settings



# FINDING THEM PART III GoSatWatch (iOS)



# FREQUENCIES

There are two issues with frequencies that we have to find solutions too:

- RX and TX are on different bands
- Doppler Shift

Bands:

SO-50:

- V/u
- Up = VHF
- Down = UHF
- Uplink Tone = 67 (74 for initialization)

Others:

- U/v
- See Frequency Chart
- Uplink Tone = 67

What's the solution: Full Duplex Radios!! Being able to hear yourself is a huge advantage!

# DOPPLER

As the satellite travels across the sky, the frequency changes. Think of how a train whistle pitch changes as it gets closer and then goes away.

Although both UHF and VHF are affected, it is safe to only adjust the UHF frequency

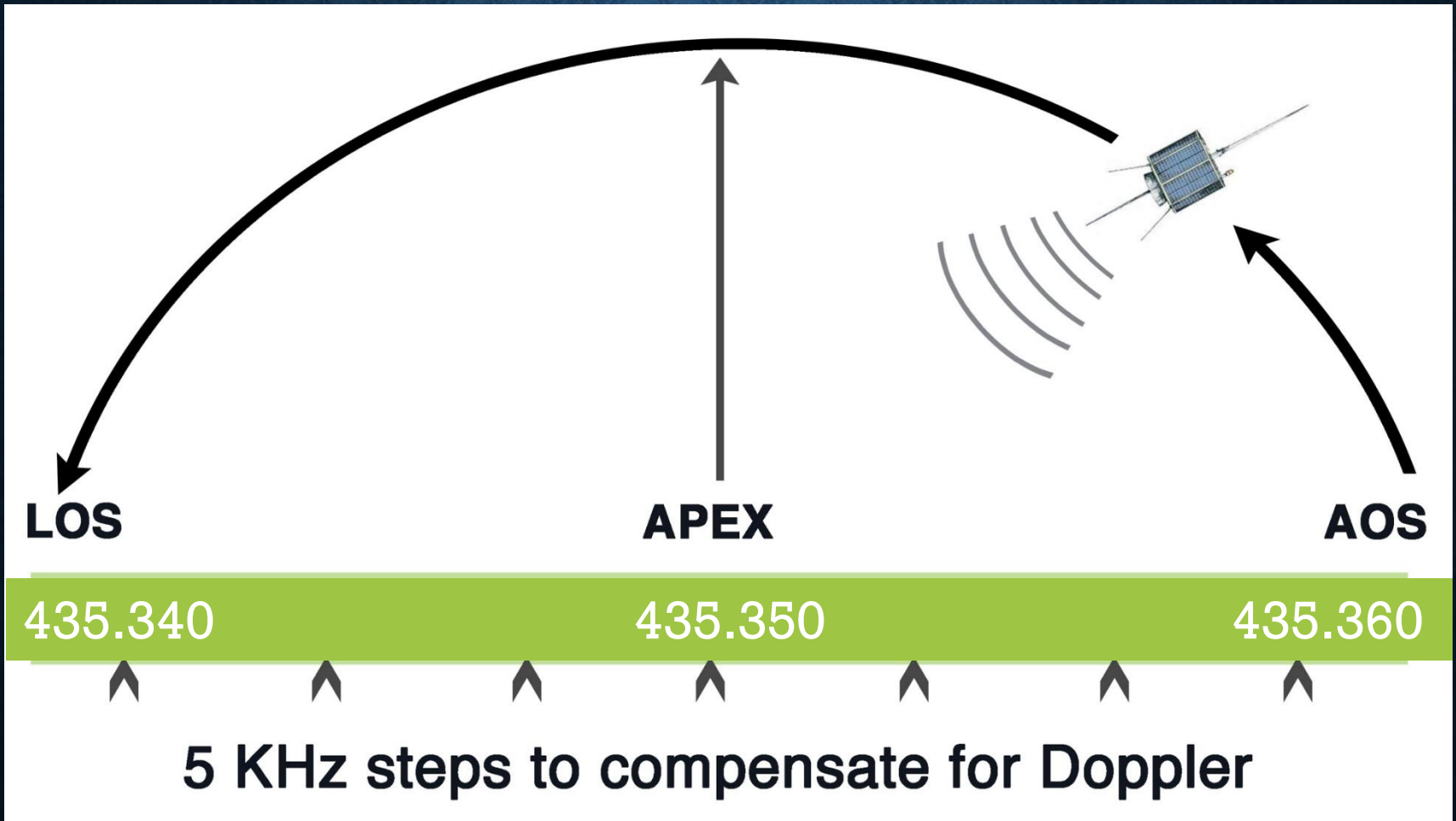
On AO-92 UHF is Up. VHF is Down.

- AO-92 for you to transmit, you adjust the uplink freq,

We adjust for Doppler in 5khz increments. Start 10 khz above (or below) the listed frequency and work to 10 khz below (or above) the listed frequency. Sat frequencies are listed "At the Sat". The frequency of the bird doesn't change. The frequency changes on the way to the sat.

\*Start below if RX, start above if TX

# DOPPLER





# POLARIZATION

The sats are tumbling through space. As they “roll” you need to turn the antennae compensating for the change in orientation. This is called the “Wrist Twist”

Satellites have personality:

AO-91 is a dance – Tumbles

AO-92 Easiest – Easy to get into the repeater, not much of a tumble, but busy.

SO-50 Easy, stable, but not many people.

# SQUELCH

The satellites do not have enough power to open the squelch, you need to open it manually.

# EQUIPMENT

Build your  
rig for  
reception.



# EQUIPMENT

Build your setup for the best RECEIVE system you can.

## Antennae:

- Elk or Arrow: \$100-\$200 (Homemade Tape Measure Antennae)
- Some stationary for the shack, but seem to be home made
- Whip antennae
- Homemade stationary with elevator and azimuth rotators.

## Radio UHF / VHF:

- Must be full duplex or two radios. Split does not allow you to hear yourself.
  - HT: Kenwood TH-D72a (APRS Built in)
  - Mobile: Kenwood TM-V71A
  - Mobile: Kenwood TM-D710
  - Yaesu 1634: This is really 2 x 817s
  - 2 Beufungs
  - SDR for receive and single radio to transmit.
  - ICOM 910H or 9700.

# EQUIPMENT

## Recorder:

- Used to record a pass
  - Must have a "Line In"
  - Some radios have a record function. But most pass recordings are 10-12 minutes long.
  - Best to record off the headphone jack, not just hanging off your neck.

## Headset:

- Need to prevent feedback. This is for full duplex ops

## Optional:

- Phone or PC showing where the sat is.
- Compass – Can use the one on your phone

**SO-50 w/HT**

**More stuff:**

**Headsets**

**Compass**

**Splitter + digital recorder (logging)**

**More hands?**



# HOW TO START

Determine when and where a sat will be: *Starting in the north, moving to South East, with 45 degrees in the middle.*

Get your radio ready: *Preprogram the frequencies, tones, etc. Set it up for the start.*

Turn on your recorder. *This is going to happen fast. Hams will talk very fast.*

Hook up your antennae. *Seriously. I have forgotten this.*

When the sat is at 5 degrees, point the antennae where the satellite will appear. *You can work lower passes when you get more comfortable.*

Listen for quite

Listen. Listen. Listen

Find a call and call them: *AD0HJ this is KE0PBR at EN34. Then enjoy the fun.*

# QSO

How does it go

Ways to start:

- Listen for an active person then call them
  - **WY7AA KE0PBR EN26**

Next is a reply, from WY7AA

- **KE0PBR WY7AA DN71**

Comes your reply:

- **WY7AA QSL,73**

And their reply

- **QSL, 73**

Or if you are available, you can throw your call out.

- **KE0PBR EN26 <- Do this Rarely, just call someone**

Very similar to a HF Contest QSO.

# QSO – DON'TS

Keep in mind on the FM sats, the pass is 8-10 minutes long (each orbit is 90 minutes long) and only one person can use the repeater at a time. This means keep the amount of time your talking low.

- Do not call CQ or Whistle
- Do not rag chew (unless only 2-3 people are on the bird). This can happen on northern (Polar Bear) passes.
- Limit conversation of bare minimum. Calls, grids, salutation.
- Do not blind call your call sign excessively.

On FM sats, do not call CQ – No Rag chews either.

# PLAY RECORDING

N6UA -> 

# ROVING

Many ops chase grid squares. Get out of your shack and go activate them!!! Use Twitter to announce when you are roving.

People are very appreciative of “Rovers”

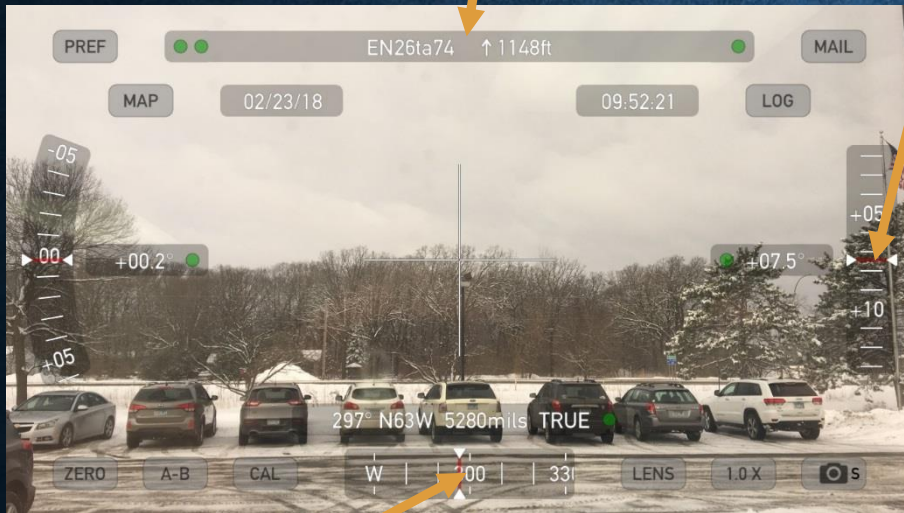


# HELPFUL APPS

Theodolite

Grid Location

Elevation



True Heading

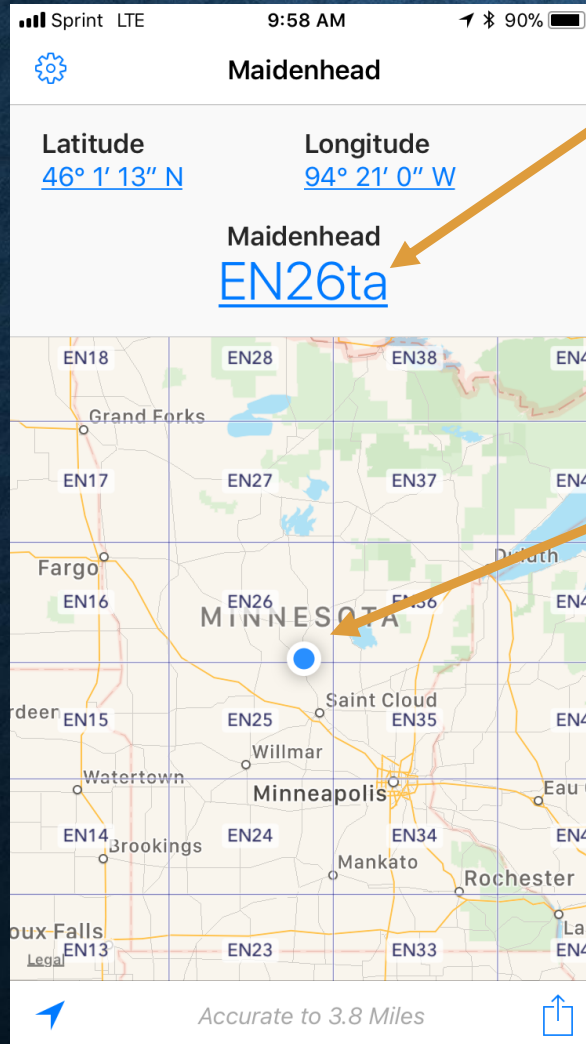
Diaptra - Android



# HELPFUL APPS

## Maidenhead

Grid Location



Your Location

# AWARDS

Rover Award: Activate a number of grid squares away from your QTH.

Satellite Communication Award: Just have a QSO on a bird.

Oscar Satellite Communications Achievement Award: Have 20 confirmed QSOs

Oscar Sexagesimal Award: Have 60 confirmed QSOs

Oscar Century Award: Have 100 confirmed QSOs

W4AMI Satellite Achievement Award: Have 1000 confirmed QSOs

488: have a confirmed QSO with someone from each of the 488 grids in the continental USA.

VHF/UHF Century award, SATPX (50 different prefixes worked), WAS, WAC, DXCC....

# EVENTS

The Big one on sats:

Started on Twitter and is called #WMPLOTA “Walmart Parking Lot on the Air”

WMPLOTA.ORG

Rules are simple:

Walmart Parking Lots on the Air is in July. To participate in this scheme you do not need to register in advance or pay any dues. You simply need to operate an amateur radio satellite station, and then choose to be an WMPLOTA Employee (activator), who operates portable from any Walmart parking lot, or a Shopper (chaser) operating from another location and contacting Employees.

When making amateur radio contacts, it is common practice to exchange your callsign and grid square during the contact. WMPLOTA Employees are encouraged to announce /wm and also exchange the Walmart Store Number during the contact, which will be used by anyone participating in the awards scheme. The Walmart Store Number can be found on the store receipt or through the [Walmart Store Finder](#) online.

Employees, please take a picture of your operating location, including a branded shopping cart or a recognizable portion of a Walmart (or Sam’s Club) branded store. Selfies are encouraged, and extra points will be awarded for any operating picture that includes a Walmart greeter or security staff member. Big points and notoriety is yours if you operate shopping cart mobile /wm/m/p, but be careful and wear a high-vis vest!

# HAMBADGES



**FORGETFUL**  
Drove off Forgetting Gear



**#WMPLOTA**  
STORE MANAGER



**CRISPY BACON**  
Worked a Pass With Lightning



**CANADIAN BACON**  
Worked a US ham that is using their Canadian call sign.



**AD0HJ/OUI KE0PBR/OUI**  
Every QSO Is a Party!



**THE FAMILY MAN**  
Work the Birds on Family Vacation

# RESOURCES

[AMSAT: Bulletin Board](#)

[AMSAT: ANS \(Amsat News Service\)](#)

[You Tube – Space Comms](#)

[Twitter \(K0FFY, WD9EWK, AMSAT, KE0PBR, N9EAT, AD0JH, KE4AL, The\\_grid\\_life, GridmasterHeat etc\)](#)

[Facebook \(AMSAT Page\)](#)

[Amsat.ORG](#)

[Amsay-UK.com](#)

[Work-sat.com](#) <- Dated

[DMR Talkgroup 98006 \(AMSAT Twitter net at 9:00pm CST Wednesdays\)](#)

[KE0PBR.Wordpress.com](#)

# MY MISTAKES

Transmit on the receive frequency

Didn't start recorder

Didn't hook up antennas

Didn't program the tone / Turn on the tone

Started in the south, with the sat at the north

Choose wrong satellites frequencies

Forgot who I was calling

Forgot my Grid Square

Stomped on people (low power, and I bump them from repeater)

Interrupted QSO

Plugged recorder into the Transmit side of the radio.

Didn't start recorder

Didn't Open Squelch

Did 50khz steps instead of 5khz steps for Doppler

**QUESTIONS?**