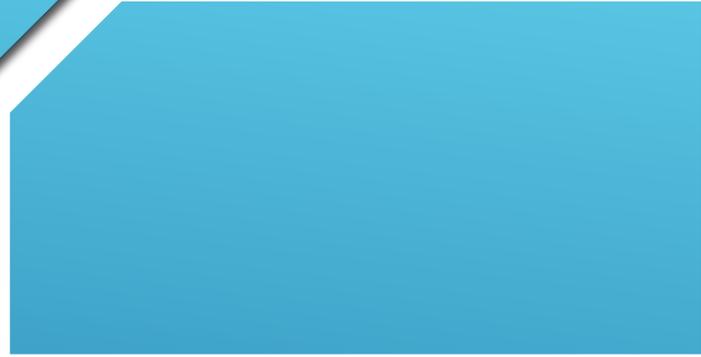




# GETTING STARTED OPERATING FM SATELLITES

Jack Weaver – AA5VZ



GETTING  
STARTED...

MOVING  
FORWARD





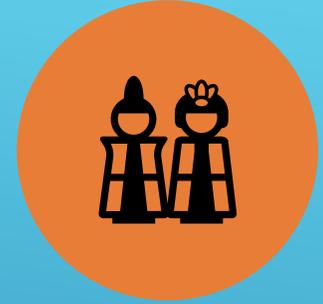
SMALL  
BEGINNINGS



**IMPROVEMENTS**



RIGHT NOW



PERHAPS SOME  
DAY!?

MY JOURNEY





## THE JOURNEY

- ▶ **Small beginnings**
- ▶ Improvements
- ▶ Where I am now
- ▶ Perhaps some day!?



## THE JOURNEY

- ▶ Small beginnings
- ▶ **Improvements**
- ▶ Where I am now
- ▶ Perhaps some day!?



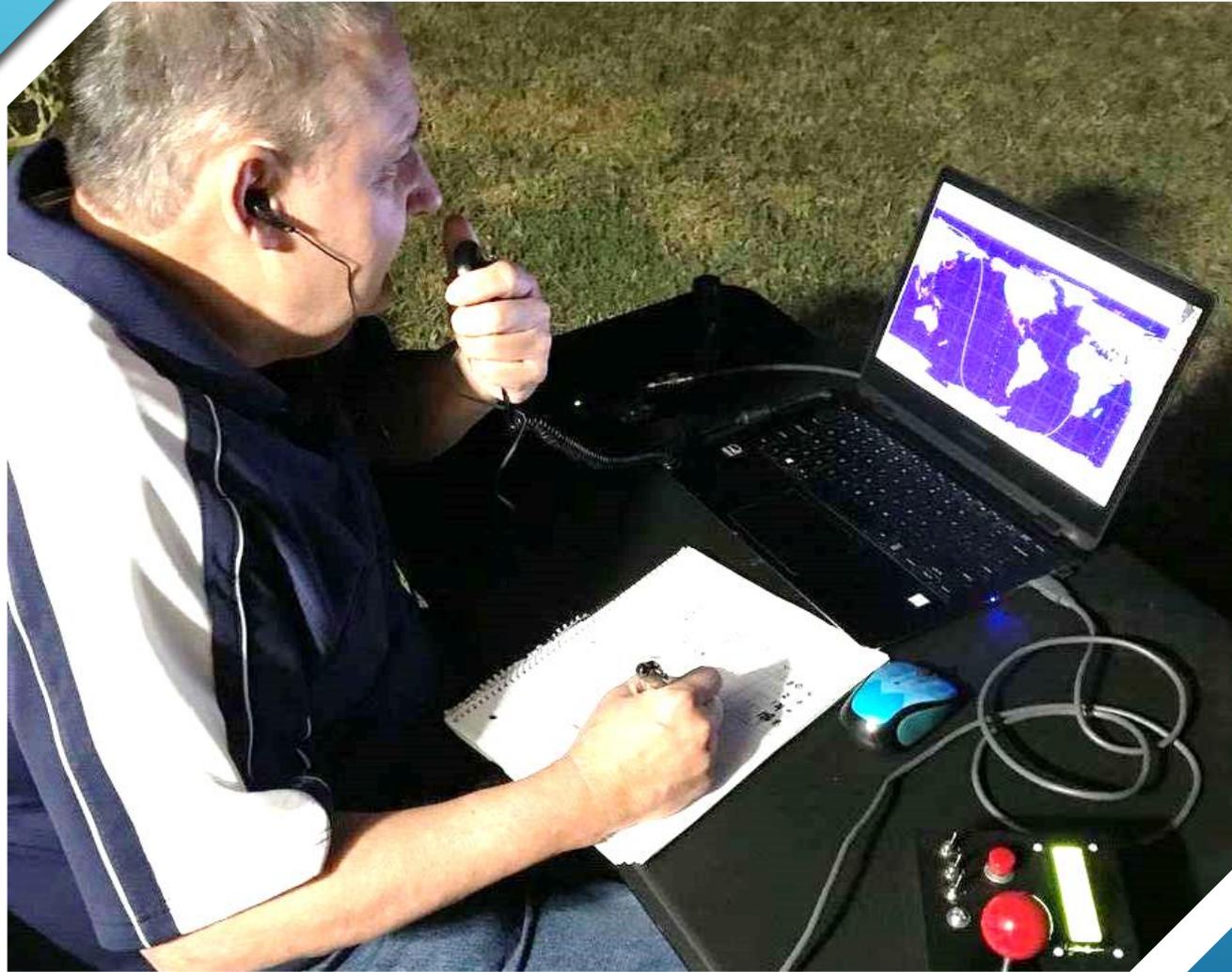
## THE JOURNEY

- ▶ Small beginnings
- ▶ Improvements
- ▶ **Where I am now**
- ▶ Perhaps some day!?



## THE JOURNEY

- ▶ Small beginnings
- ▶ Improvements
- ▶ **Where I am now**
- ▶ Perhaps some day!?



## THE JOURNEY

- ▶ Small beginnings
- ▶ Improvements
- ▶ **Where I am now**
- ▶ Perhaps some day!?



## THE JOURNEY

- ▶ Small beginnings
- ▶ Improvements
- ▶ Where I am now
- ▶ **Perhaps one day!?**

# WHAT DO I NEED?

- ▶ Technician Class License or Higher
- ▶ Dual Band Radio (VHF/UHF)
- ▶ Antenna (Directional/ Dual Band / Hand-Held)
- ▶ Smart Phone with Satellite Tracking App
- ▶ Note Pad or Recorder
- ▶ Satellite



## RADIO

- ▶ HT
- ▶ 5W
- ▶ Dual Band
- ▶ Full-Duplex
  - ▶ TH-D72 (not shown)
  - ▶ Similar featured brands/models
- ▶ Half-Duplex
  - ▶ TH-D74 (shown)
  - ▶ VX-7R (shown)
  - ▶ Similar featured brands/models



## RADIO

- ▶ Mobile
- ▶ 5W min.
- ▶ Dual Band (true)
- ▶ Full Duplex
  - ▶ TM-V71A (shown)
  - ▶ Similar featured brands/models

# ANTENNA

- ▶ **Less Desirable** (But functional)
- ▶ Dual Band GP
- ▶ Discone

# ANTENNA

- ▶ **Dual Band GP**
- ▶ Discone
- ▶ Inherent Limitations
  - ▶ Low Radiation Angles
  - ▶ No Gain
  - ▶ Requires Higher Transmit Power

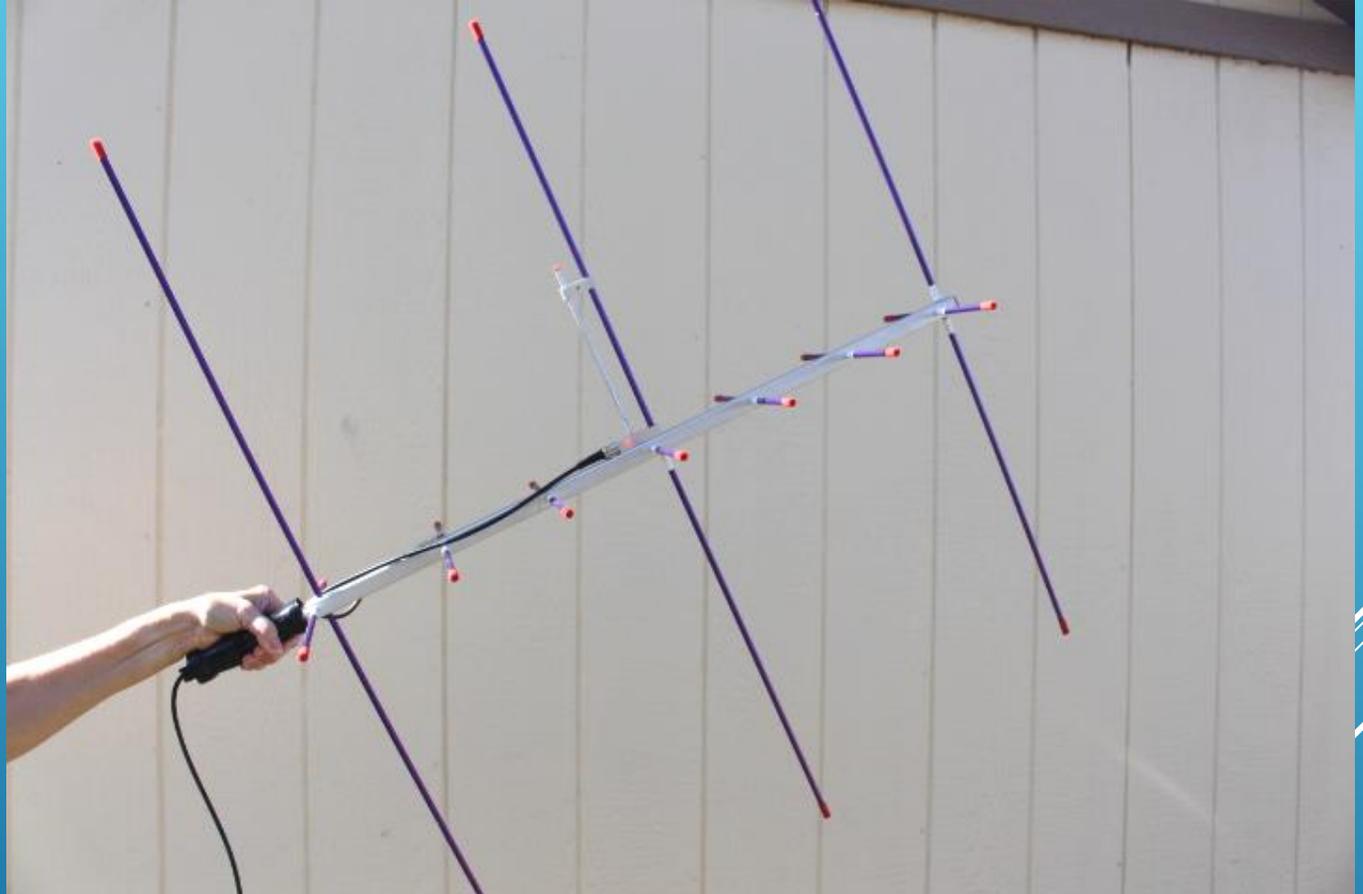




- ▶ Dual Band GP
- ▶ **Discone**
- ▶ Inherent Limitations
  - ▶ Low Radiation Angles
  - ▶ No Signal Gain
  - ▶ Requires Higher Transmit Power
  - ▶ More Rx Noise

ANTENNA

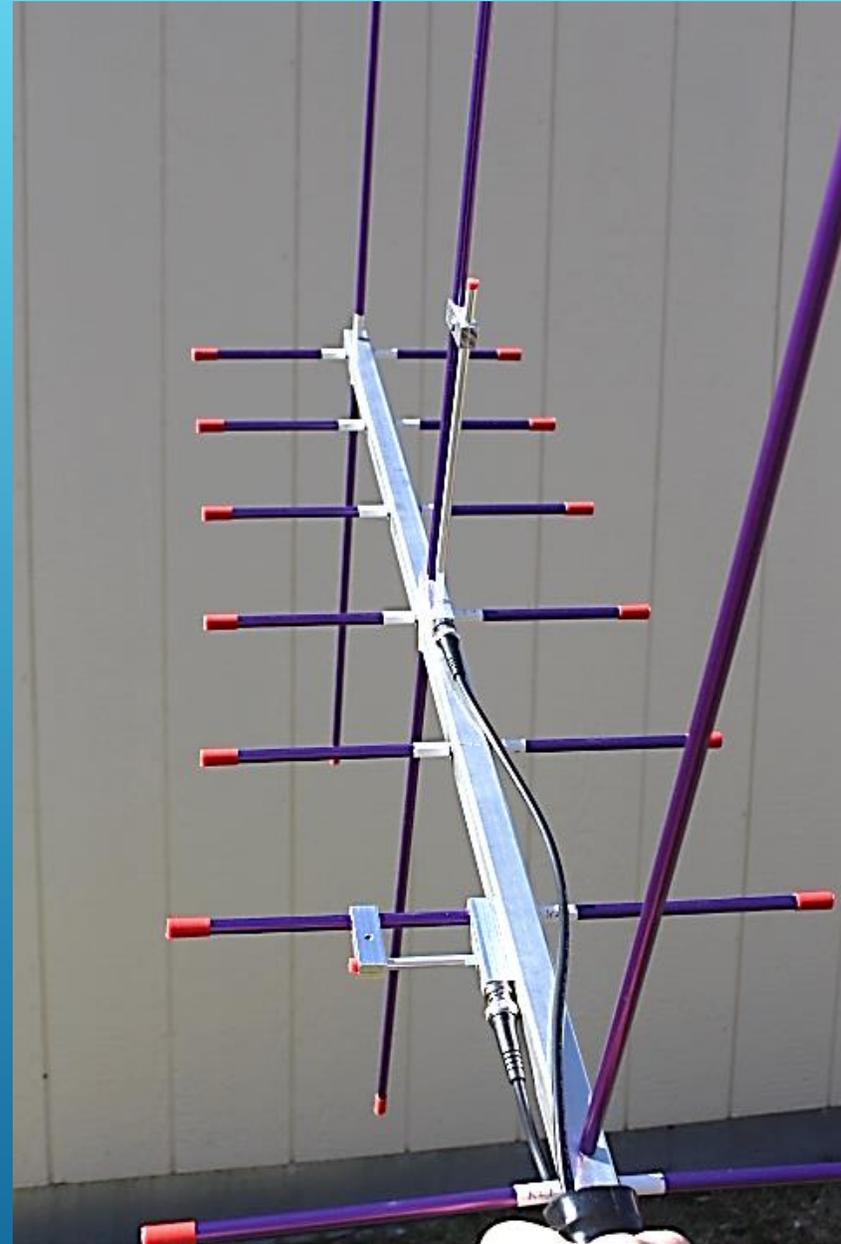
- ▶ **Dual-Band Yagi (preferred)**
- ▶ Arrow
- ▶ Elk (Log Periodic Antenna)
- ▶ Build Your Own



ANTENNA

- ▶ Dual-Band Yagi (preferred)
- ▶ **Arrow**
- ▶ Elk (Log Periodic Antenna)
- ▶ Build Your Own

# ANTENNA



- ▶ Dual-Band Yagi (preferred)
- ▶ **Arrow**
- ▶ Elk (Log Periodic Antenna)
- ▶ Build Your Own

# ANTENNA



- ▶ Dual-Band Yagi (preferred)
- ▶ Arrow
- ▶ Elk (Log Periodic Antenna)
- ▶ Build Your Own

ANTENNA

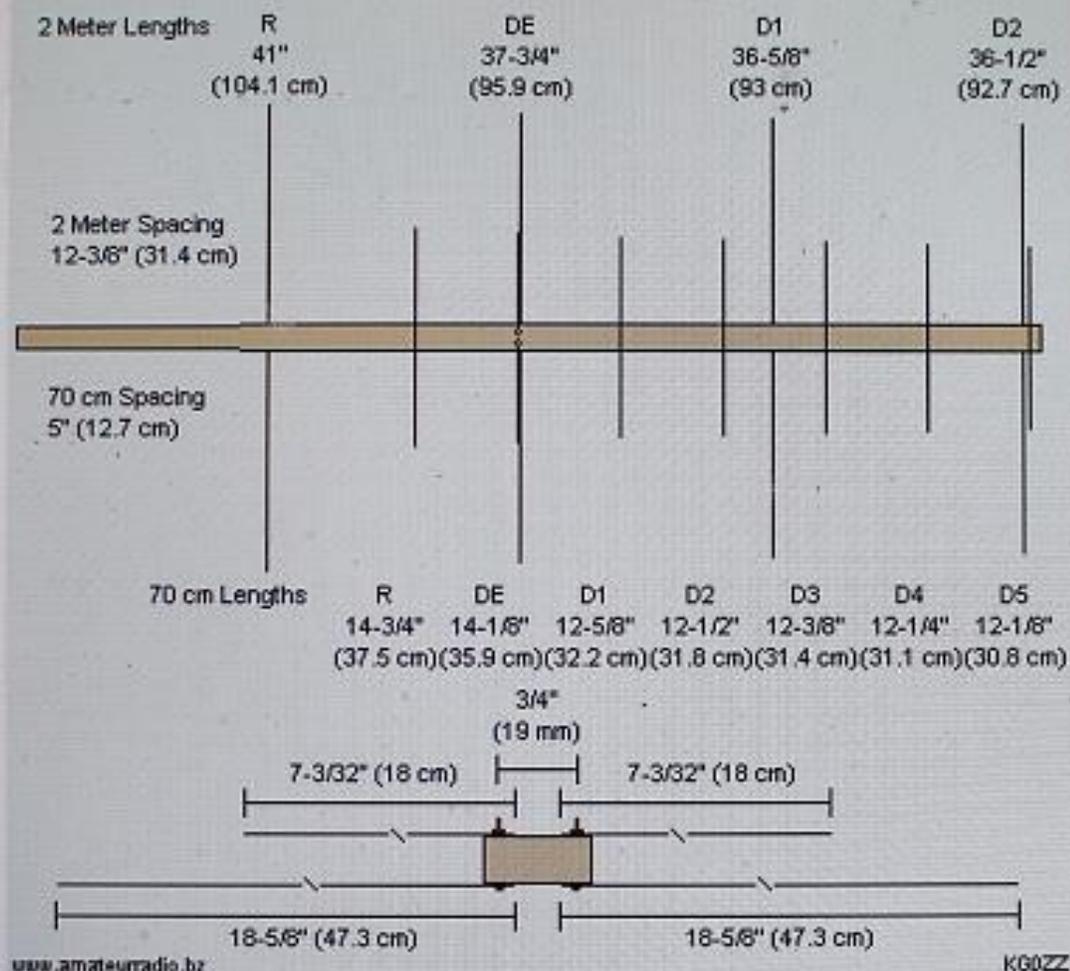
- ▶ Dual-Band Yagi (preferred)
- ▶ Arrow
- ▶ Elk (Log Periodic Antenna)
- ▶ **Build Your Own**

# ANTENNA



### The \$4.00 Ham Radio Satellite Antenna

1x2 Wood Boom & Steel Coat Hangers



www.amateurradio.biz

KG0ZZ

### The \$4.00 Ham Radio Satellite Antenna



# ANTENNA – SINGLE HT RADIO CONFIGURATION



# ANTENNA – DUAL HT RADIO CONFIGURATION



# ANTENNA – MOBILE RADIO CONFIGURATION

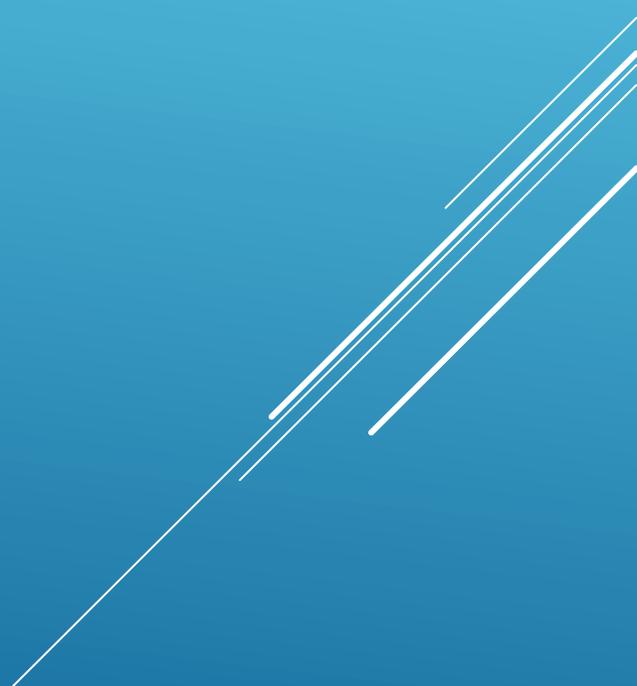


# ANTENNA – MOBILE RADIO CONFIGURATION



- ▶ [AMSAT.org](https://amsat.org)
- ▶ [N2YO.com](https://n2yo.com)

# SATELLITES AND SCHEDULES



## AMSAT Live OSCAR Satellite Status Page

Give a single global reference point for all users in the Amateur Satellite Service to show the most up-to-date status of all satellite users around the world. Please help others and keep it current every time you access a bird.

Name	Responder/Repeater active			Telemetry/Beacon only			No signal			Conflicting reports			ISS Crew (Voice) Active		
	Jan 15	Jan 14	Jan 13	Jan 12	Jan 11	Jan 10	Jan 15	Jan 14	Jan 13	Jan 12	Jan 11	Jan 10	Jan 15	Jan 14	Jan 13
AI SAT-1	11	1	1				1	1	1				1	1	1
BeBel-1													11		1
CUTE-1	1		1	1			1					1	11		1
BY70-2															11
GalSat-2			1	1	2	1			1	1	2	12		11	1
FS-3		1											11		
A] AO-7															
B] AO-7		21		12	12	12	11	2	21	1	12	13	12	211	1
OS-92 U/v	2	21	11	1	2	212	111	2		12	222	12	2	1	111
OS-95 U/v	2	21	11	1	2	212	111	2		12	222	12	2	1	111
NO-103															1
L] UO-11															1
LO-19															1
AO-27	1	111		1	1	11	2	11	1		1	21111	1	1	1
FO-29															34
XW-2A		11	111	1	1	1	1	112	1		1111	1	212	2	11
XW-2B	1														1
XW-2C	1														1
XW-2D	111			2	1	1	1111		1	1311		311		1	12212
XW-2E															1
XW-2F	1	1	1		1	11	1	3	1		11	1	2	1	211
CAS-2T															1
NO-44															1
RS-44	3	1	12		1222	22211	13131	34	11	24342		11	12	13242	12
CAS-4A	1	2		1	1	11		212	11		11111		212		1
CAS-4B	11	1		211	2		232	1		111		322			113
SO-50		1		1	1	21	1	1	21	3	1	1	4	3	3

# SATELLITES AND SCHEDULES

[www.amsat.org](http://www.amsat.org)  
Satellite Status Page

### AMSAT Online Satellite Pass Predictions - AO-92

[View the current location of AO-92](#)

Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS Azimuth	LOS (UTC)
23 Dec 20	16:42:36	00:11:07	20	39	120	178	16:53:43
23 Dec 20	18:17:05	00:08:25	341	9	298	243	18:25:30
24 Dec 20	03:16:26	00:08:27	117	9	74	19	03:24:53
24 Dec 20	04:48:14	00:11:09	182	39	282	340	04:59:23
24 Dec 20	16:20:47	00:10:21	29	20	93	163	16:31:08
24 Dec 20	17:54:23	00:10:03	351	17	287	226	18:04:26
25 Dec 20	02:55:58	00:05:41	95	3	68	34	03:01:39
25 Dec 20	04:25:59	00:11:16	167	88	29	349	04:37:15
25 Dec 20	06:03:08	00:05:07	244	2	257	298	06:08:15
25 Dec 20	15:59:16	00:08:54	41	10	84	146	16:08:10

**Your results are shown above**

Use the form below to request more pass predictions

Show Predictions for:  for Next  Passes

Calculate Latitude and Longitude from Gridsquare:

Or

Enter Decimal Latitude:\*

Enter Decimal Longitude:\*

Elevation in meters AMSL:

Save my location for later use

# SATELLITES AND SCHEDULES

[www.amsat.org](http://www.amsat.org)

Satellite Pass Predictions Page

Start ↑		Max altitude			End ↓		All passes		
Date, Local time	Az	Local time	Az	Ei	Local time	Az	Mag ↑	Info	
4-Jan 23:15	NE 33°	23:20	E 99°	17°	23:25	SSE 159°	-	<a href="#">Map and details</a>	
5-Jan 00:51	N 351°	00:56	WNW 289°	19°	01:01	SW 225°	-	<a href="#">Map and details</a>	
5-Jan 10:08	ESE 119°	10:13	ENE 70°	10°	10:17	NNE 21°	-	<a href="#">Map and details</a>	
5-Jan 11:42	S 179°	11:49	W 261°	49°	11:54	NNW 341°	-	<a href="#">Map and details</a>	
5-Jan 23:35	NNE 24°	23:41	E 100°	33°	23:46	S 174°	-	<a href="#">Map and details</a>	
6-Jan 10:28	SE 133°	10:33	ENE 71°	18°	10:38	N 11°	-	<a href="#">Map and details</a>	
6-Jan 12:03	S 192°	12:10	W 261°	26°	12:15	NNW 332°	-	<a href="#">Map and details</a>	
6-Jan 23:56	N 14°	00:01	E 103°	70°	00:07	S 188°	-	<a href="#">Map and details</a>	
7-Jan 10:48	SE 146°	10:54	E 77°	31°	10:59	N 2°	-	<a href="#">Map and details</a>	
7-Jan 12:25	SSW 206°	12:30	W 262°	14°	12:35	NW 321°	-	<a href="#">Map and details</a>	
8-Jan 00:17	N 6°	00:22	W 281°	56°	00:28	SSW 202°	-	<a href="#">Map and details</a>	
8-Jan 11:09	SSE 159°	11:15	E 80°	59°	11:20	N 354°	-	<a href="#">Map and details</a>	
8-Jan 23:02	NE 39°	23:07	E 95°	12°	23:11	SSE 151°	-	<a href="#">Map and details</a>	
9-Jan 00:38	N	00:43	W	98°	00:48	SW	-	<a href="#">Map and details</a>	

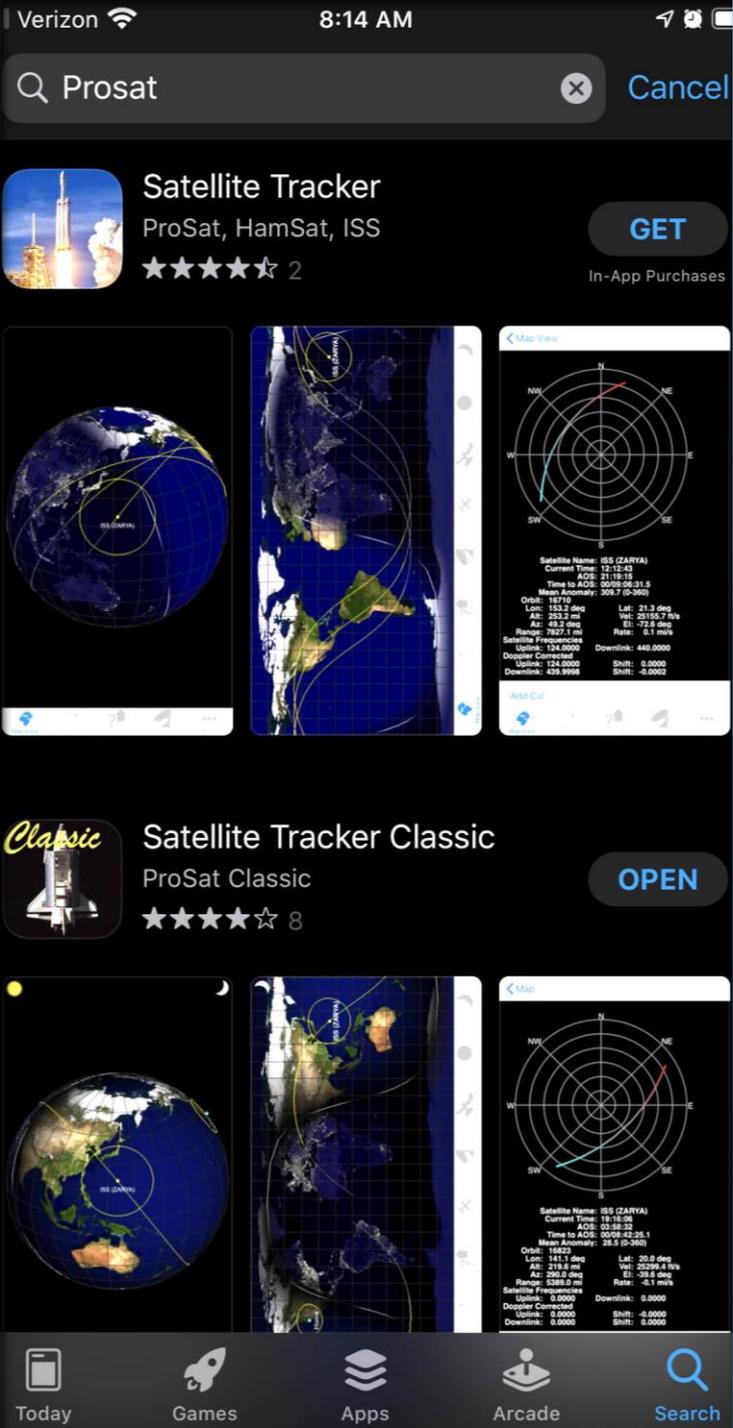
# SATELLITES AND SCHEDULES

N2yo.com  
Satellite Pass Predictions Page



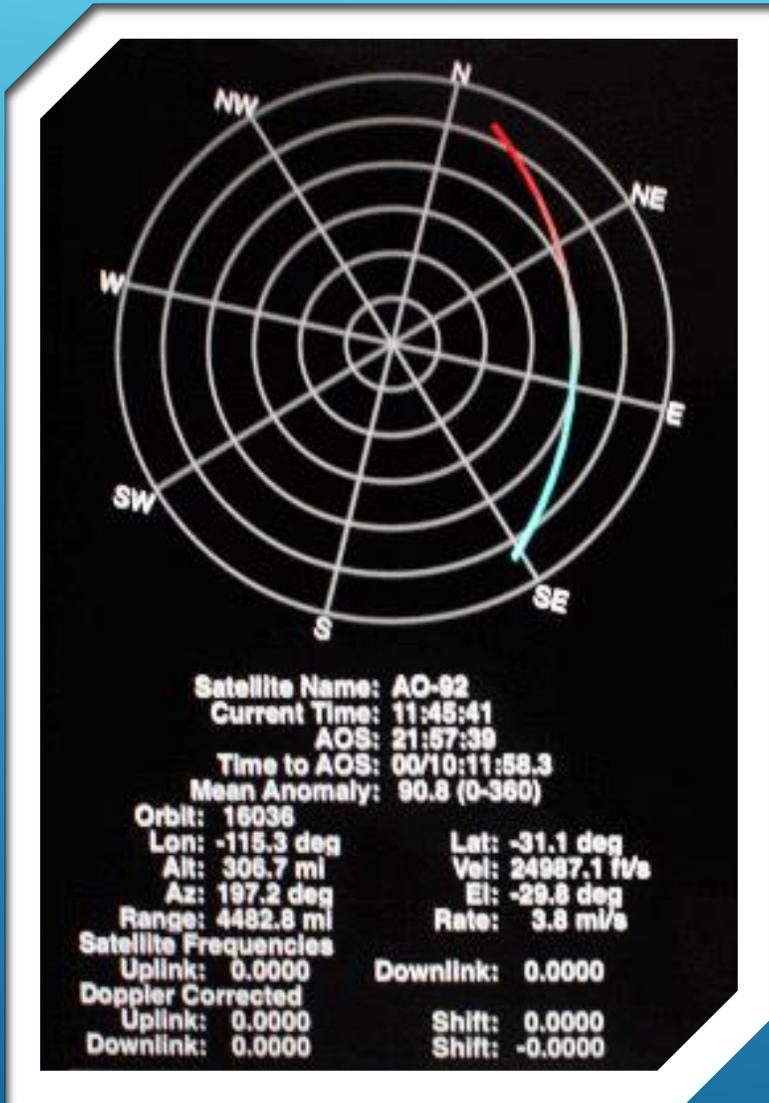
# TRACKING

- ▶ Smart Phone
  - ▶ ProSat (or similar)
  - ▶ Website of choice
- ▶ I-Pad
  - ▶ ProSat (or similar)
  - ▶ Website of choice
- ▶ Laptop with Tracking Software
  - ▶ SatPC32
  - ▶ Orbitron
  - ▶ Ham Radio Deluxe
  - ▶ N2YO.com
  - ▶ Others
- ▶ Visually



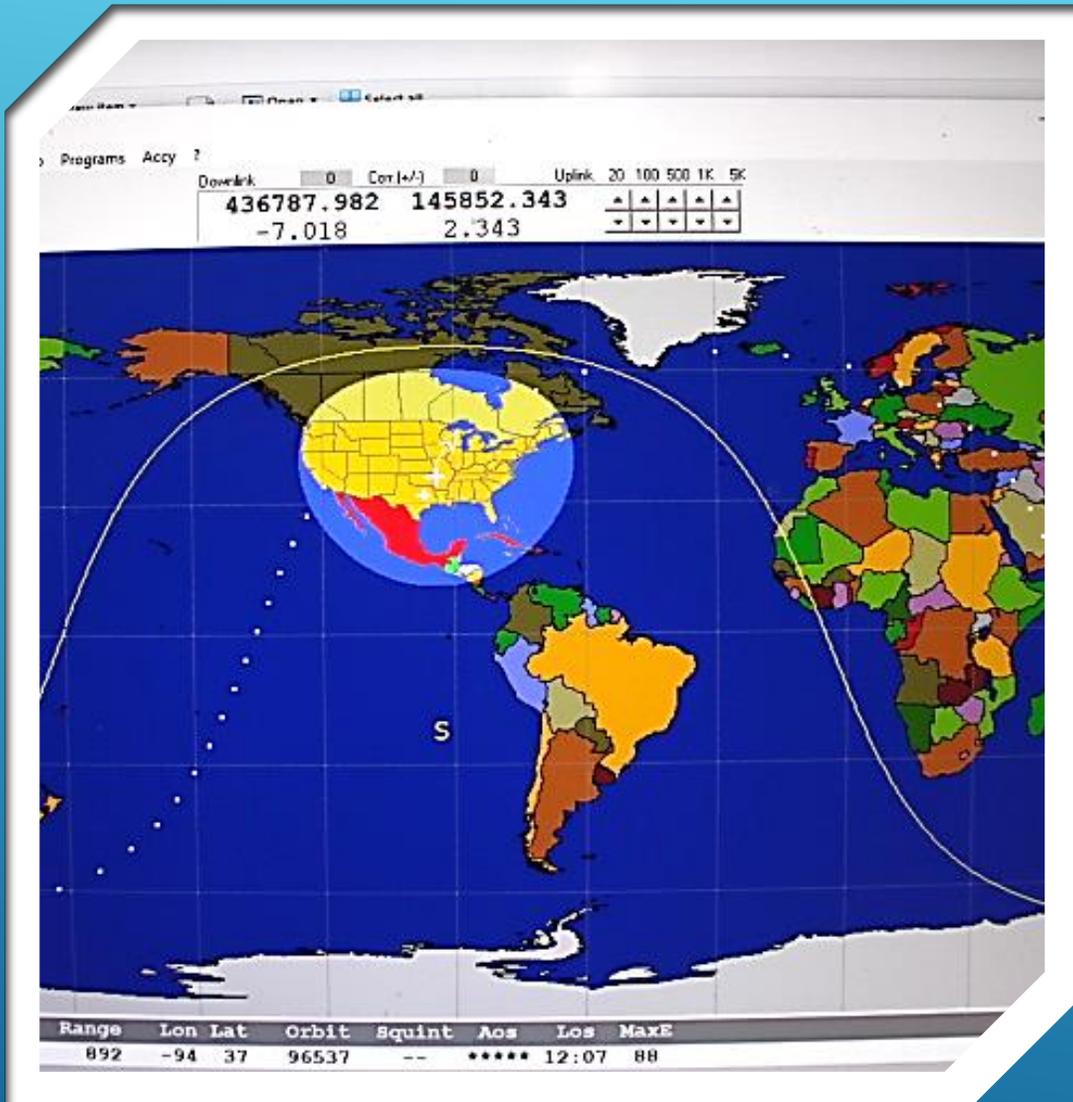
- ▶ Smart Phone
- ▶ I-Pad
- ▶ Laptop with Tracking Software

# TRACKING APP



- ▶ Smart Phone
- ▶ I-Pad
- ▶ Laptop with Tracking Software

# TRACKING APP



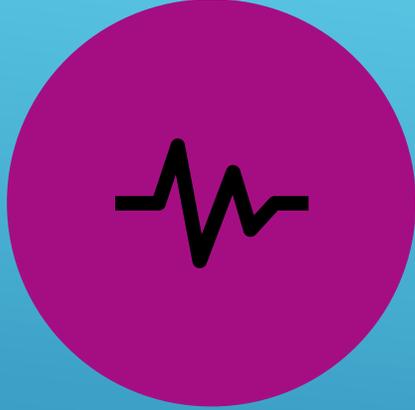
- ▶ Smart Phone
- ▶ I-Pad
- ▶ **Laptop with Tracking Software**

## TRACKING (PC/LAPTOP)



## RECORDING

- ▶ Note Pad
- ▶ Digital Recorder
- ▶ Smart Phone



**DOPPLER SHIFT**

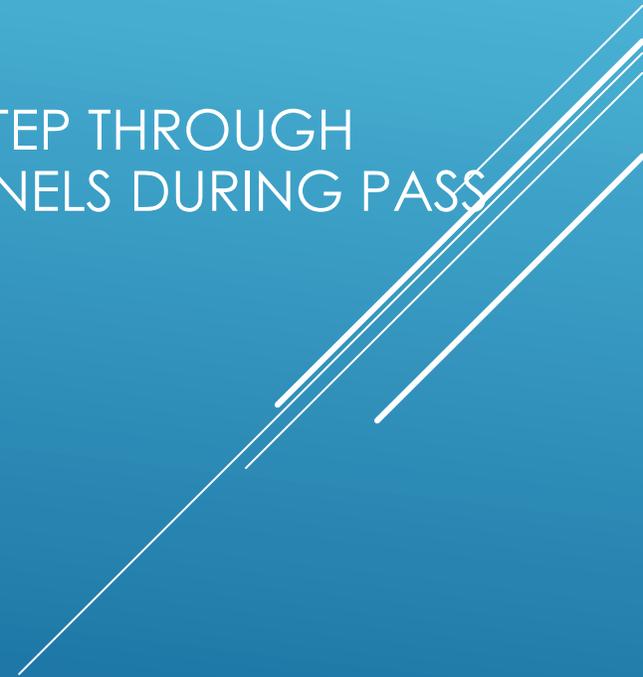


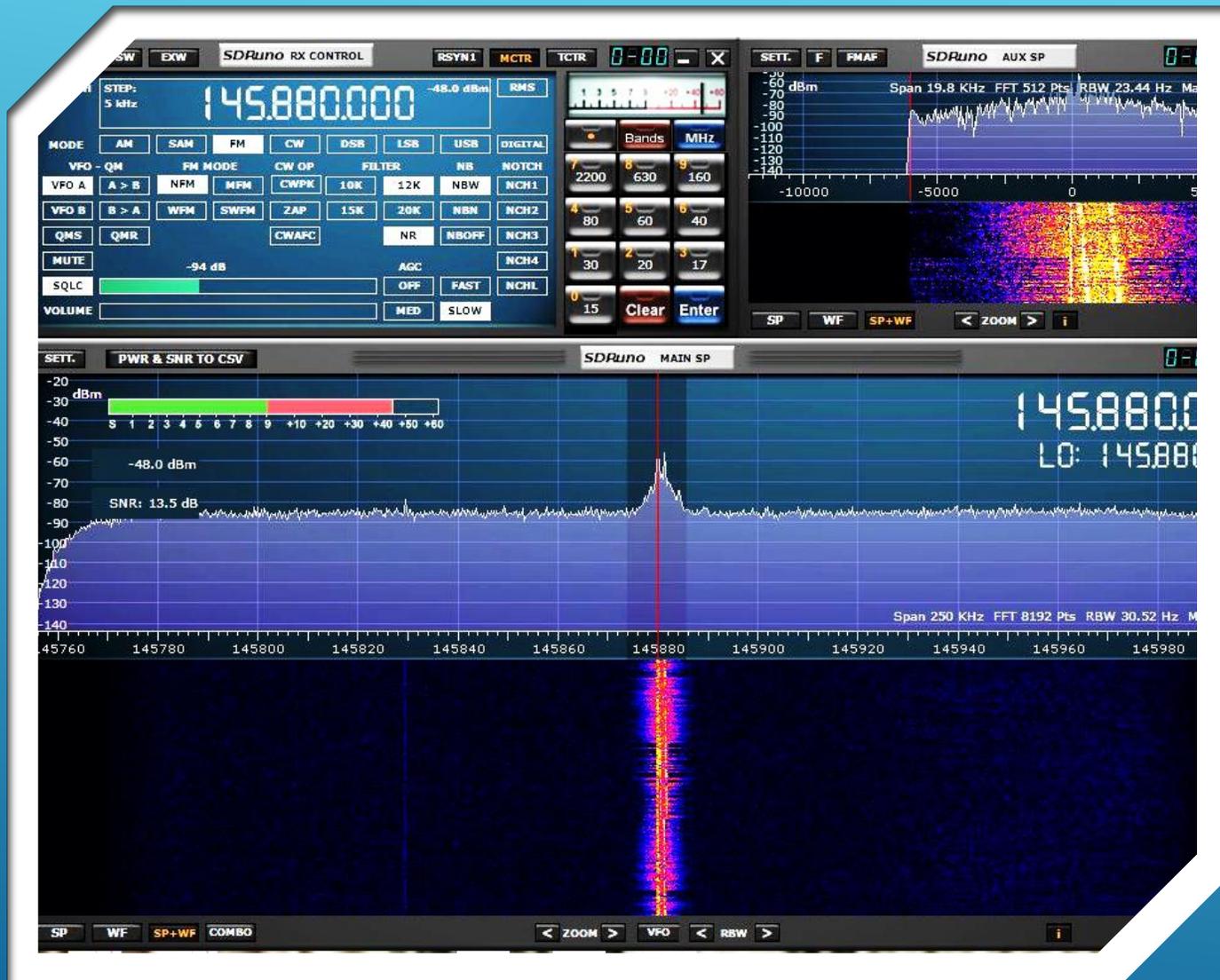
PROGRAM 5  
FREQUENCIES (70CM)



STEP THROUGH  
CHANNELS DURING PASS

TECHNIQUE





# DOPPLER SHIFT

24											<input type="checkbox"/>		
25	145.96000	145.96000		Simplex	FM	A091-R	None	88.5 Hz	88.5 Hz	023	<input type="checkbox"/>	5 kHz	5 kHz
26	435.24000	435.24000		Simplex	FM	A091X1	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
27	435.24500	435.24500		Simplex	FM	A091X2	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
28	435.25000	435.25000		Simplex	FM	A091X3	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
29	435.25500	435.25500		Simplex	FM	A091X4	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
30	435.26000	435.26000		Simplex	FM	A091X5	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
31											<input type="checkbox"/>		
32	145.88000	145.88000		Simplex	FM	A092-R	None	88.5 Hz	88.5 Hz	023	<input type="checkbox"/>	5 kHz	5 kHz
33	435.34000	435.34000		Simplex	FM	A092X1	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
34	435.34500	435.34500		Simplex	FM	A092X2	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
35	435.35000	435.35000		Simplex	FM	A092X3	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
36	435.35500	435.35500		Simplex	FM	A092X4	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
37	435.36000	435.36000		Simplex	FM	A092X5	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
38											<input type="checkbox"/>		
39	145.88000	145.88000		Simplex	FM	S050TX	Tone	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	5 kHz	5 kHz
40	436.80500	436.80500		Simplex	FM	S050R1	None	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
41	436.80000	436.80000		Simplex	FM	S050R2	None	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
42	436.79500	436.79500		Simplex	FM	S050R3	None	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
43	436.79000	436.79000		Simplex	FM	S050R4	None	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
44	436.78500	436.78500		Simplex	FM	S050R5	None	67.0 Hz	67.0 Hz	023	<input type="checkbox"/>	25 kHz	25 kHz
45											<input type="checkbox"/>		

# TECHNIQUE



# TECHNIQUE



# TECHNIQUE



# TECHNIQUE



# TECHNIQUE



# TECHNIQUE



OK,  
LET'S  
DO IT!

# SCHEDULE

## AMSAT Online Satellite Pass Predictions - AO-92

[View the current location of AO-92](#)

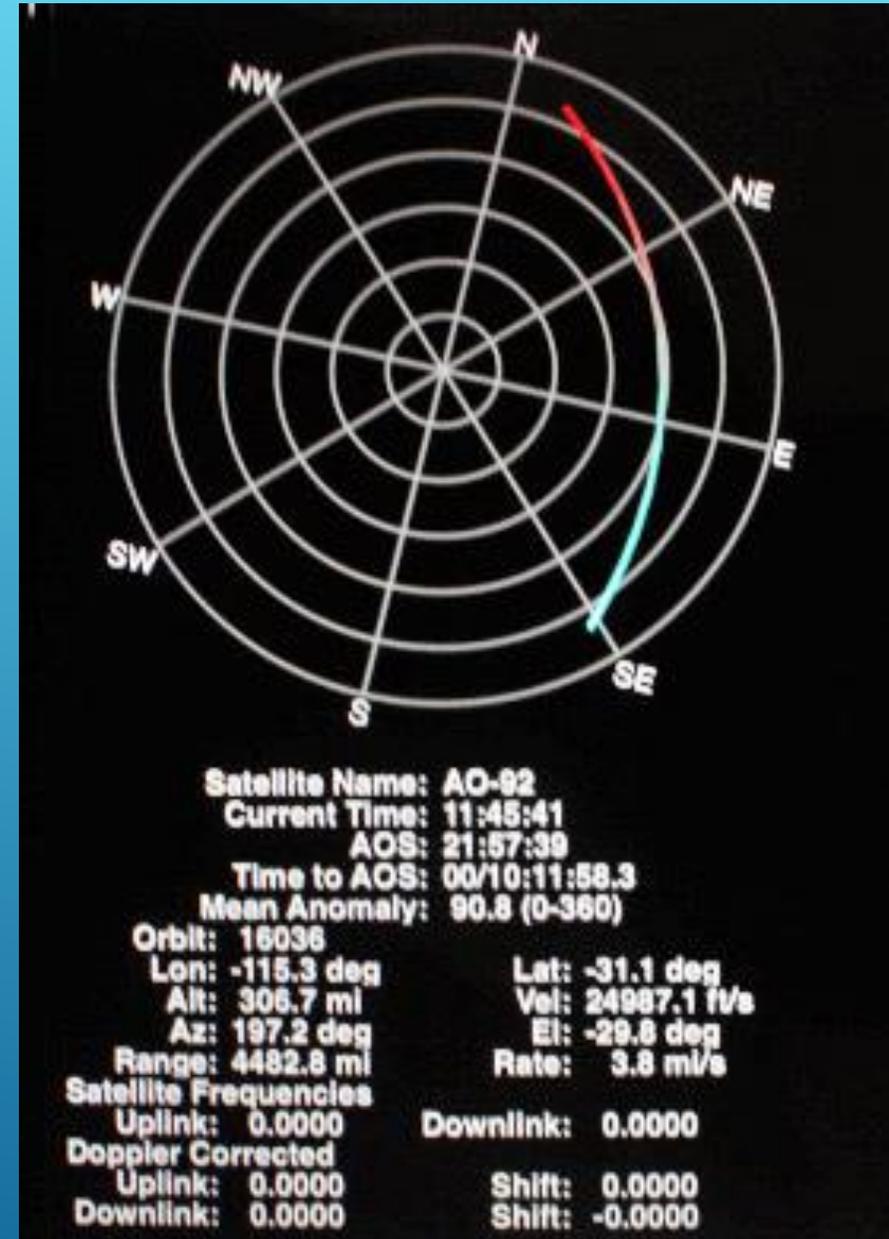
Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max EI Azimuth	LOS Azimuth	LOS (UTC)
23 Dec 20	16:42:36	00:11:07	20	39	120	178	16:53:43
23 Dec 20	18:17:05	00:08:25	341	9	298	243	18:25:30
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### Your results are shown above

Use the form below to request more pass predictions

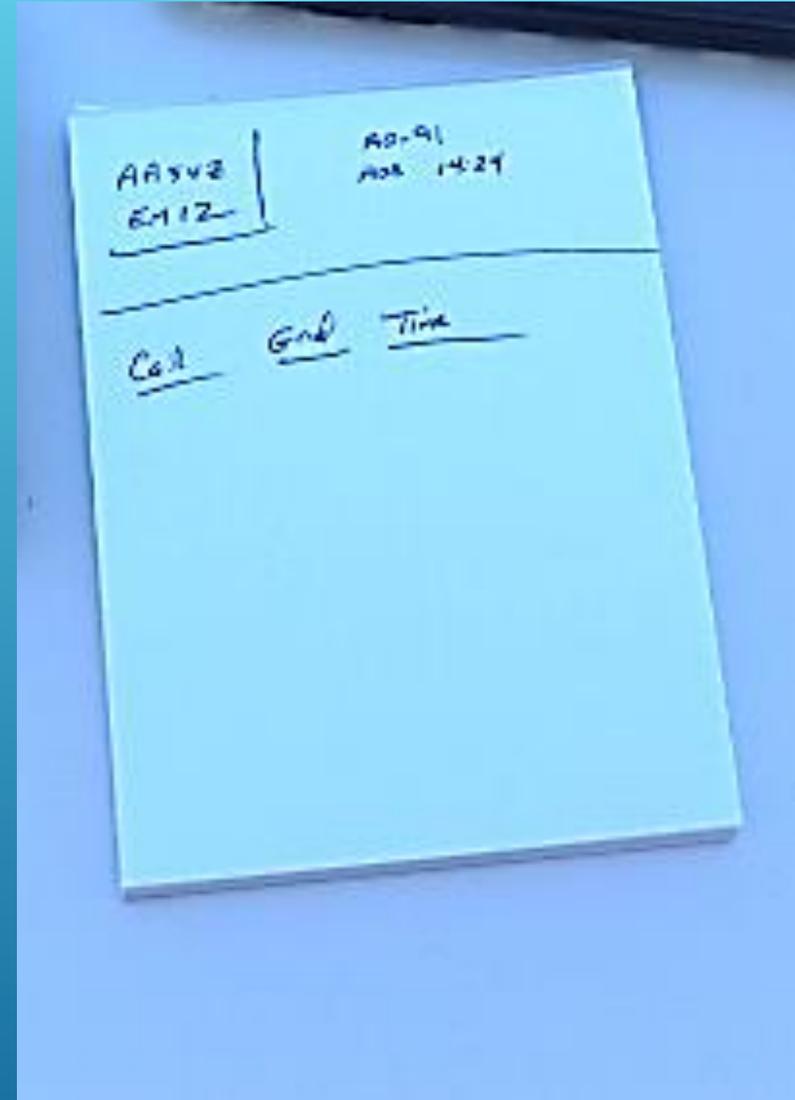
Show Predictions for: <input type="text" value="AO-92"/> ▼ for Next <input type="text" value="10"/> ▼ Passes	
Calculate Latitude and Longitude from Gridsquare:	<input type="text" value="em12"/> <input type="button" value="Calculate Position"/>
<i>Or</i>	
Enter Decimal Latitude:*	<input type="text" value="32.5"/> <input type="text" value="North"/> ▼
Enter Decimal Longitude:*	<input type="text" value="97"/> <input type="text" value="West"/> ▼
Elevation in meters AMSL:	<input type="text" value="0"/>
<input type="button" value="Predict"/>	
<input type="checkbox"/> Save my location for later use	

- ▶ Smart Phone
- ▶ I-Pad
- ▶ Laptop with Tracking Software



# TRACKER

- ▶ **Note Pad**
- ▶ Pen/Pencil
- ▶ Audio Recorder



# RECORDING



- ❑ Remember your Grid Location
  - ❑ “EM-12” for DFW area
- ❑ Listen for Activity
- ❑ Call Station Direct
  - ❑ Say His Call, Your Call (phonetically), and Your Grid Location
  - ❑ Listen for his acknowledgement and information
  - ❑ Give an acknowledgement back (or get clarification), Thank You, 73, Sign Off
- ❑ Or; Invite a Call .....Never Call “CQ”. Simply:
  - ❑ Announce Your Call Sign (phonetically), and Grid Location
  - ❑ Listen (and reply accordingly)
- ❑ Keep it Brief, Don’t hog the frequency
- ❑ Be happy with one to three contacts per pass
- ❑ Share the opportunity...Others want to enjoy making contacts
- ❑ Be Patient, Learn from the experience, Apply LL next time

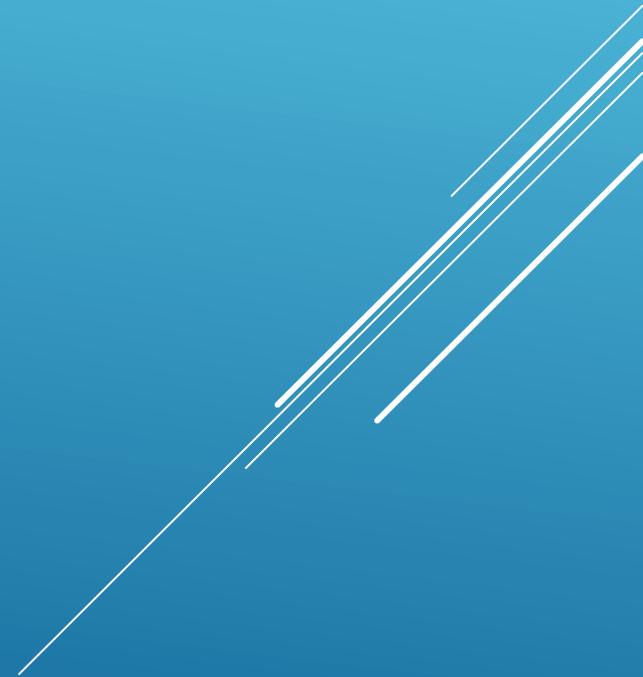
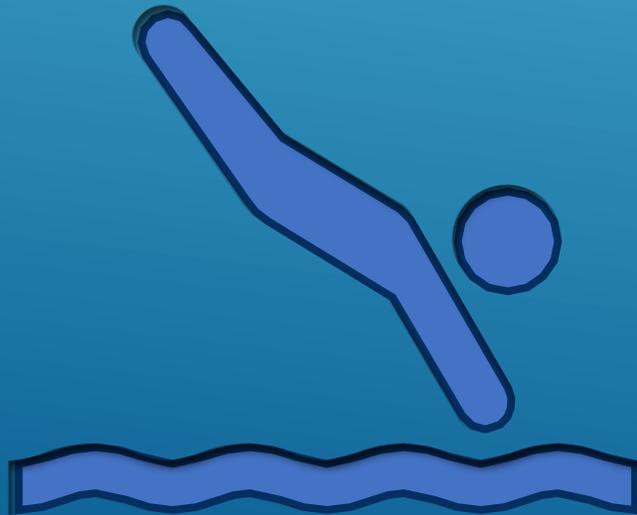
## MAKING THE CONTACT

**TRY IT**

**DIVE IN**

**HAVE FUN**

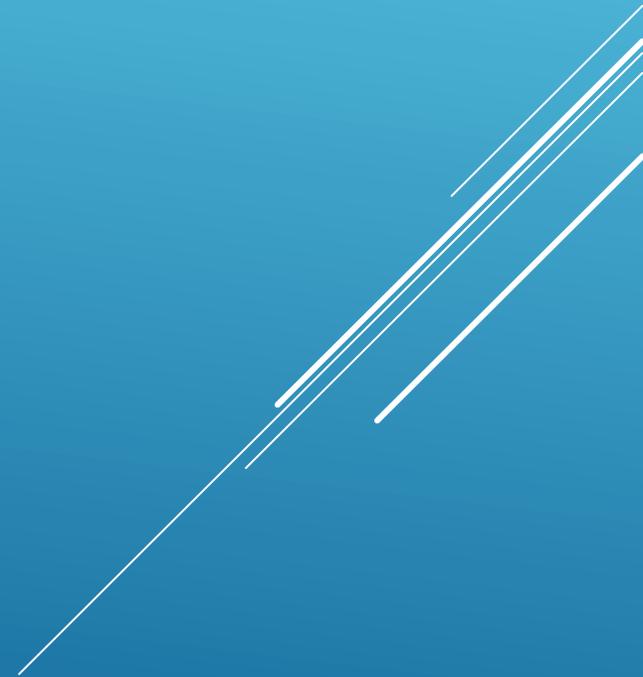
**IT ONLY GETS BETTER!**



- ▶ [AMSAT.org](http://AMSAT.org)
- ▶ [N2YO.com](http://N2YO.com)
- ▶ K5SLD – Weekly AMSAT Net
- ▶ ARRL Satellite Handbook (or others)
- ▶ YOUTUBE videos
- ▶ GOOGLE (etc.)
- ▶ <http://www.amateurradio.bz> KG0ZZ Antenna Projects
- ▶ <http://www.youtube.com/user/zerozedzed> KG0ZZ Project Videos

## RESOURCES

QUESTIONS OR TESTIMONIALS



The background of the slide features a dynamic pattern of light trails. These trails are composed of numerous thin, parallel lines that curve and swirl together, creating a sense of motion and depth. The color palette is primarily dark blue and black, with vibrant green and light blue highlights that give the trails a glowing, ethereal appearance. The overall effect is reminiscent of a star trail or a visualization of orbital paths in space.

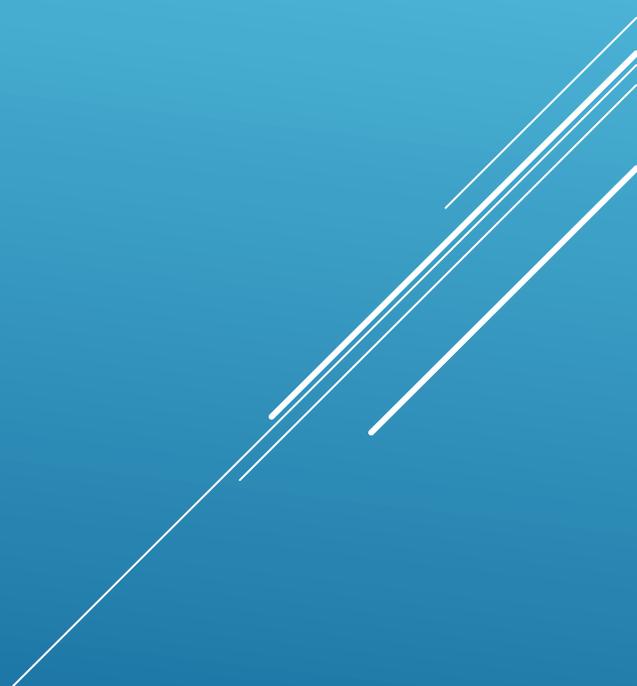
# GETTING STARTED WITH FM SATELLITES

Jack Weaver – AA5VZ

LOGGING



TESTIMONIALS



CONCLUSION

