

# Major Infrastructure Power and Communications Cyber Risks

IUP GENCYBER 2019 CAMP

ADJUNCT PROF JOE JESSON  
jessonj@tcnj.edu  
jejesson4@gmail.com

## **COMMUNICATIONS WORKSHOP OUTLINE**

### **1) POWER GRID RISKS**

Terrorist Attacks on the Grid/Transformers

Hacking Supervisory Control and Data acquisition (SCADA)

Nuclear-Induced Electromagnetic Pulse (EMP)

Corona Mass Ejection – The Carrington Event

### **2) COMMUNICATIONS DURING A DISASTER**

Amateur Radio

Military / FEMA Communication

UAS AT&T Base Station

Google Balloon LTE Base Station

### **3) HANDS-ON FCC LICENSE & DISASTER MANAGEMENT**

Getting Started - Online FCC License Learning Module

### **4) HANDS-ON SPECTRUM MONITORING**

Monitor International Spectrum!

### **5) WHY IS DATA ENCRYPTION CRITICAL TODAY?**

Aircraft Communications

Man-in-The-Middle Attack

# A POWER GRID DIRECT PHYSICAL TERRORIST ATTACK



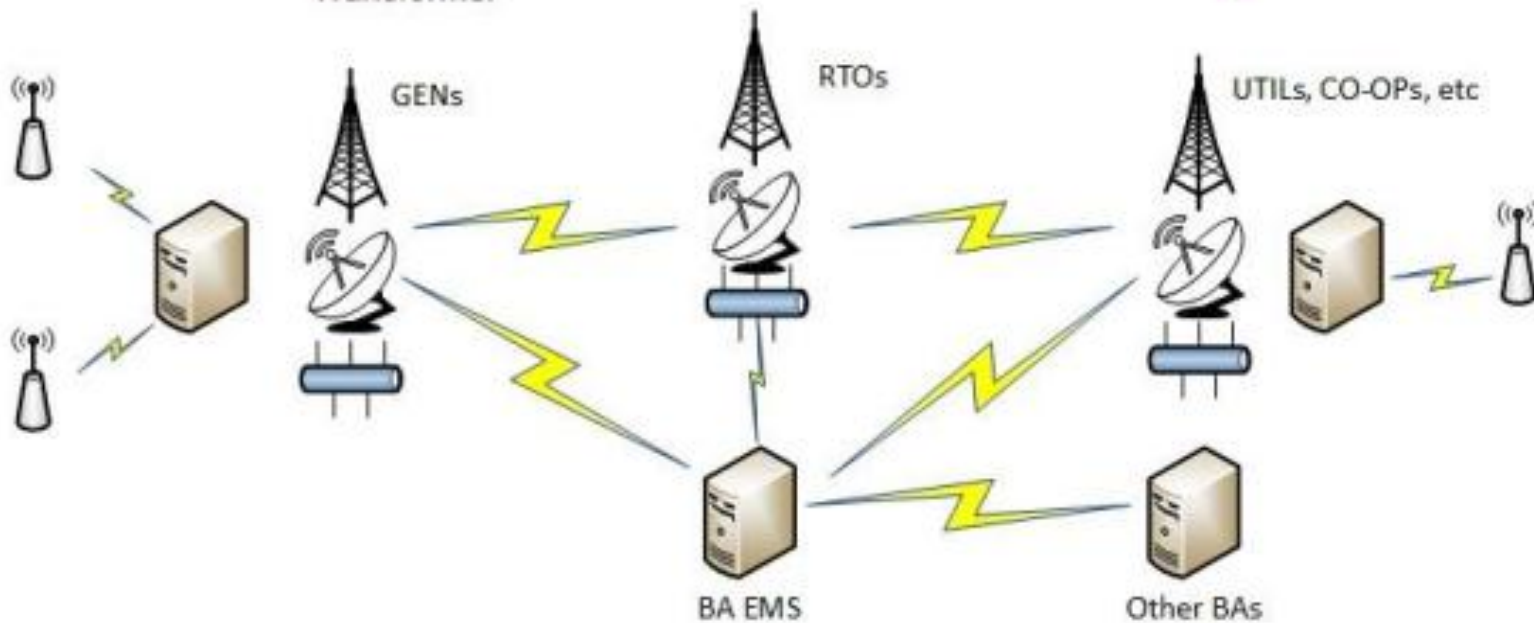
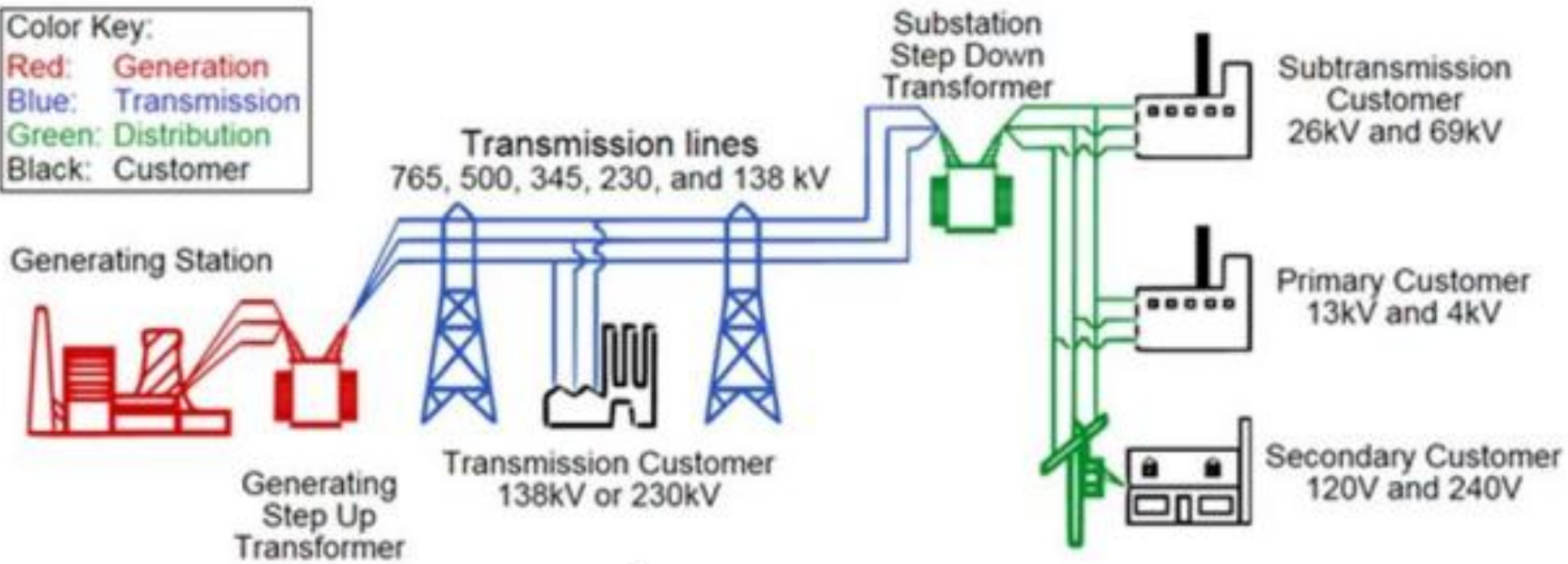
# A POWER GRID DIRECT PHYSICAL TERRORIST ATTACK



Gunfire from semiautomatic weapons did extensive damage to 17 transformers 2013 attack on an electric substation near San Jose that nearly knocked out Silicon Valley. power supply that sent grid operators scrambling to avoid a blackout

# A POWER GRID CONTROL NETWORK SCADA ATTACK

Color Key:  
Red: Generation  
Blue: Transmission  
Green: Distribution  
Black: Customer

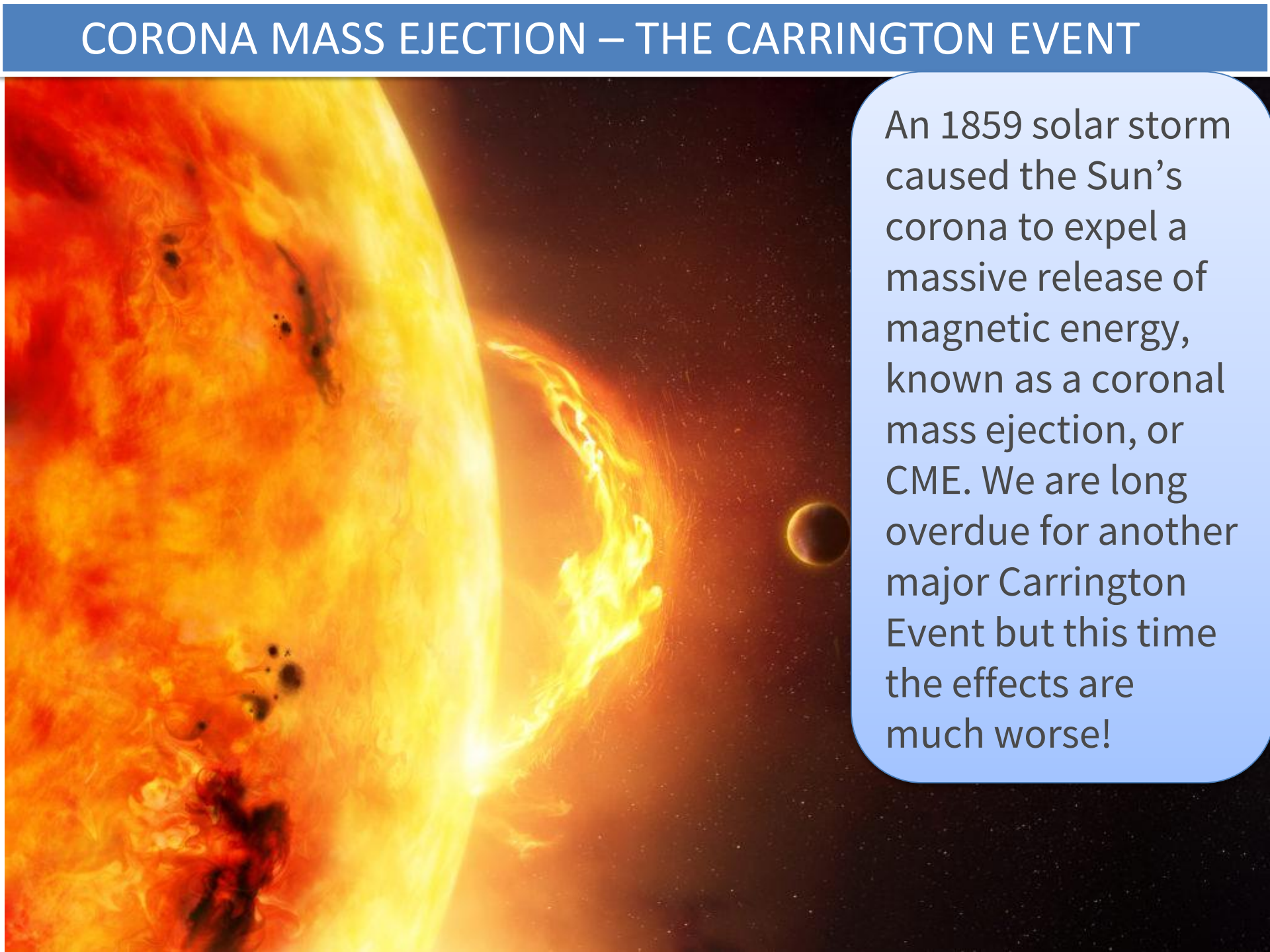


Supervisory control and data acquisition (SCADA)

# NUCLEAR BOMB – ELECTROMAGNETIC PULSE (EMP)



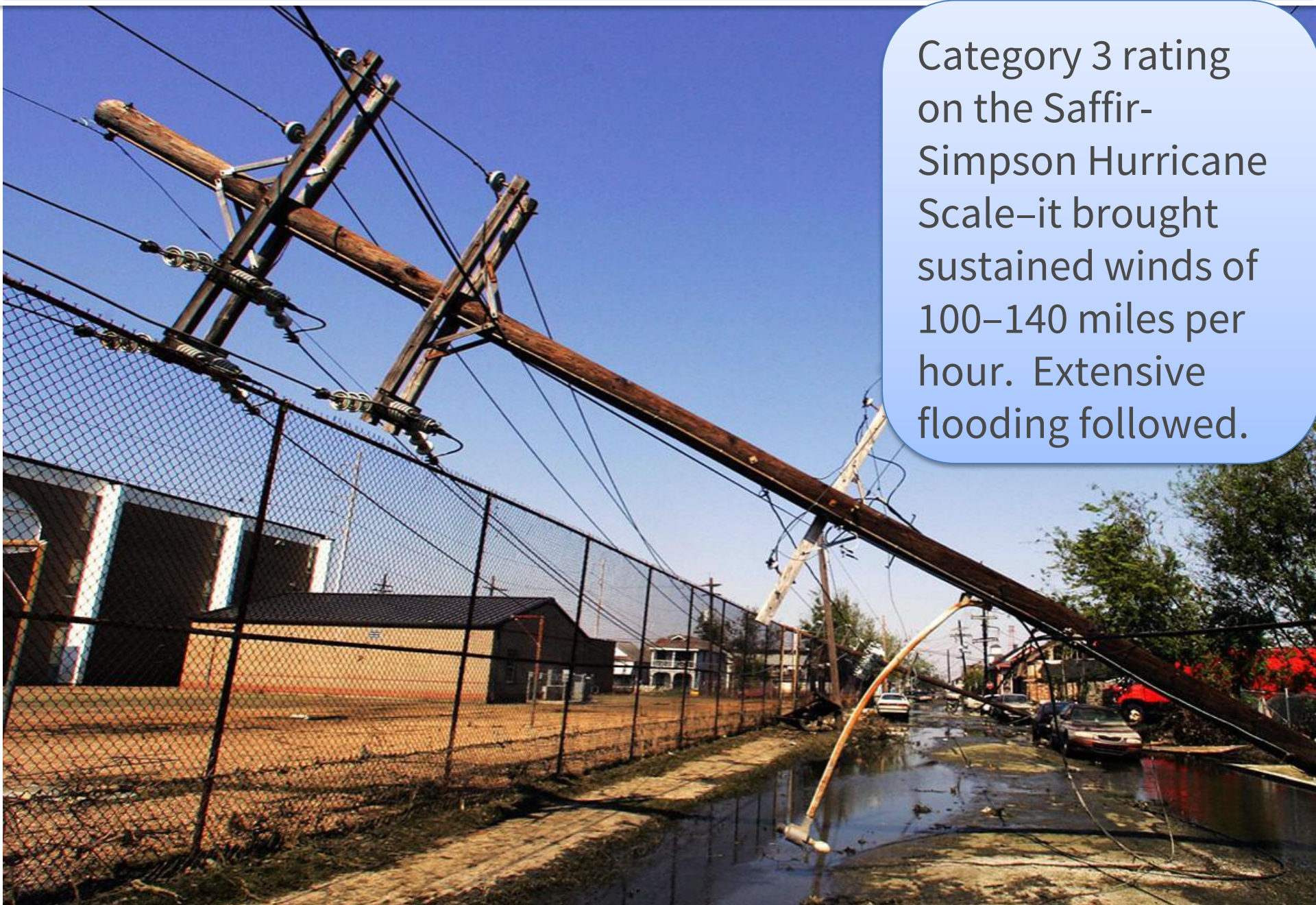
# CORONA MASS EJECTION – THE CARRINGTON EVENT



An 1859 solar storm caused the Sun's corona to expel a massive release of magnetic energy, known as a coronal mass ejection, or CME. We are long overdue for another major Carrington Event but this time the effects are much worse!

# HURRICANE KATRINA – 2005 CATEGORY 3 & FLOODING

Category 3 rating on the Saffir-Simpson Hurricane Scale—it brought sustained winds of 100–140 miles per hour. Extensive flooding followed.

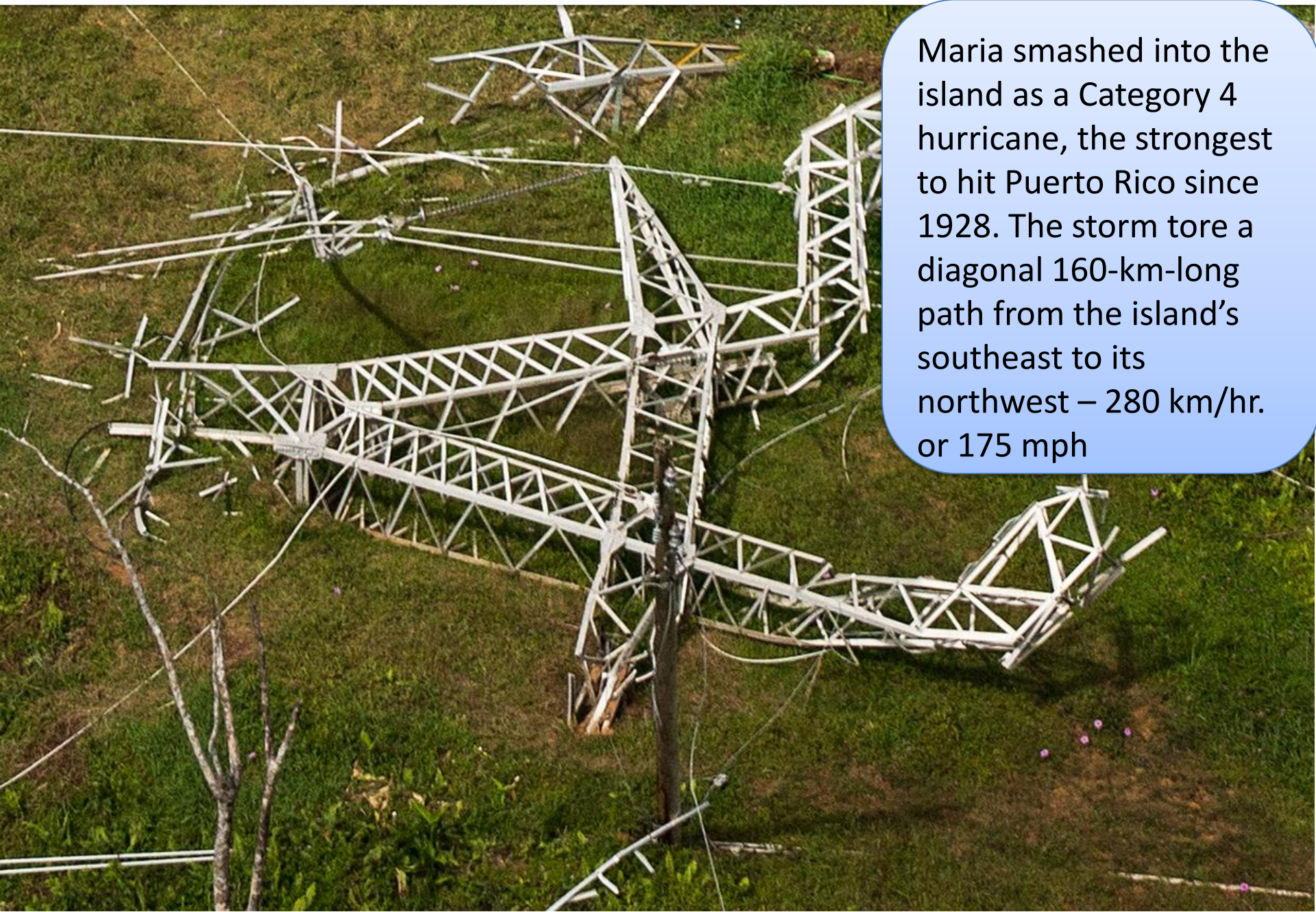




# HURRICANE MARIA – 2017 CATEGORY 4 & AGING GRID



# HURRICANE MARIA – 2017 CATEGORY 4 & AGING GRID



Maria smashed into the island as a Category 4 hurricane, the strongest to hit Puerto Rico since 1928. The storm tore a diagonal 160-km-long path from the island's southeast to its northwest – 280 km/hr. or 175 mph

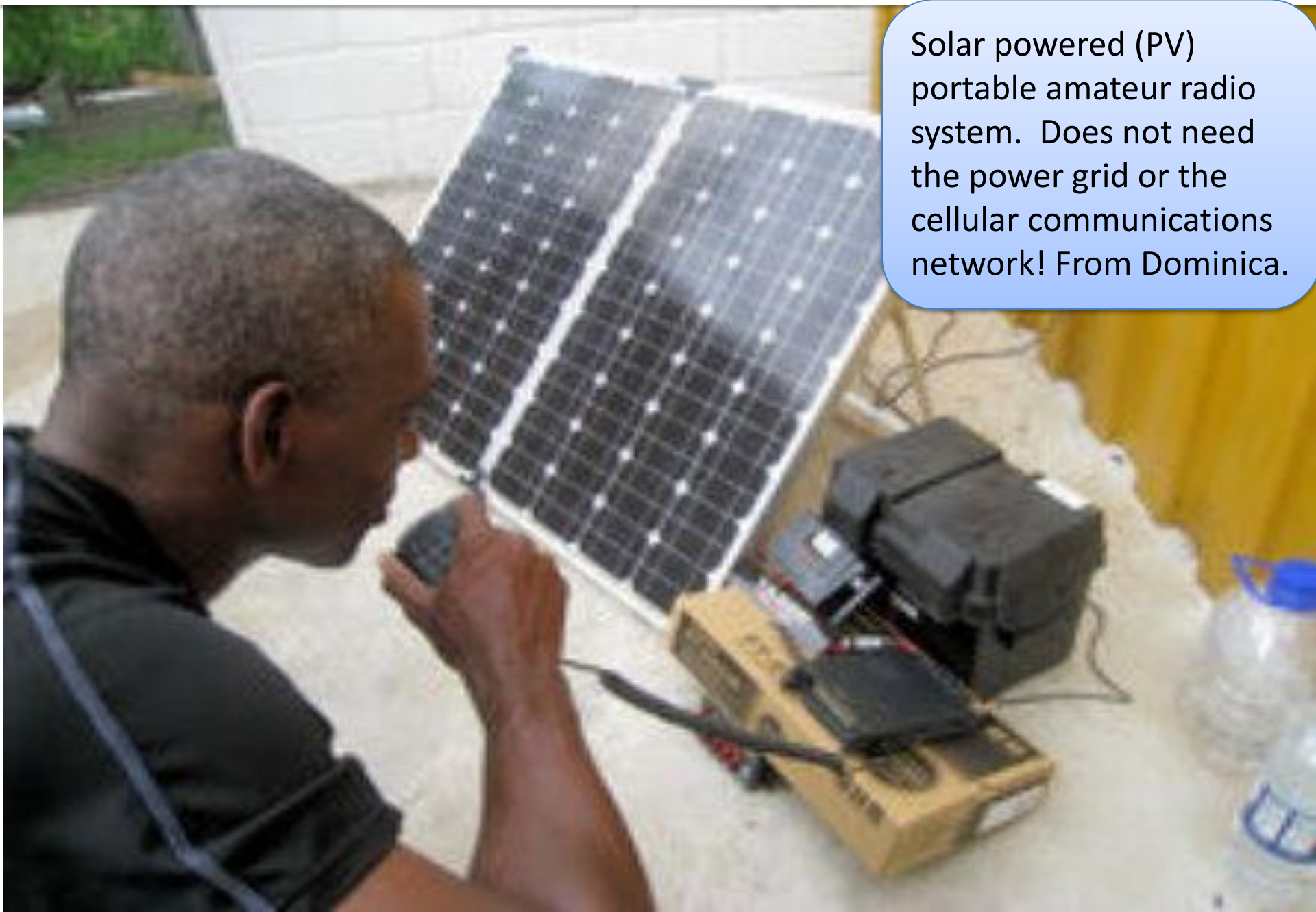
# HURRICANE MARIA – AMATEUR RADIO COMMUNICATIONS

Direct HF Amateur Radio  
Global Communications



# HURRICANE MARIA – AMATEUR RADIO COMMUNICATIONS

Solar powered (PV) portable amateur radio system. Does not need the power grid or the cellular communications network! From Dominica.



# HURRICANE MARIA – AMATEUR RADIO COMMUNICATIONS

OFF-GRID, OFF-NETWORK SOLAR or GENERATOR-POWERED SYSTEM

COOPER HOSPITAL, WORLD-WIDE REACH!

Readiness | Response | Recovery

## Command-Runner™

Portable Communication & Command System

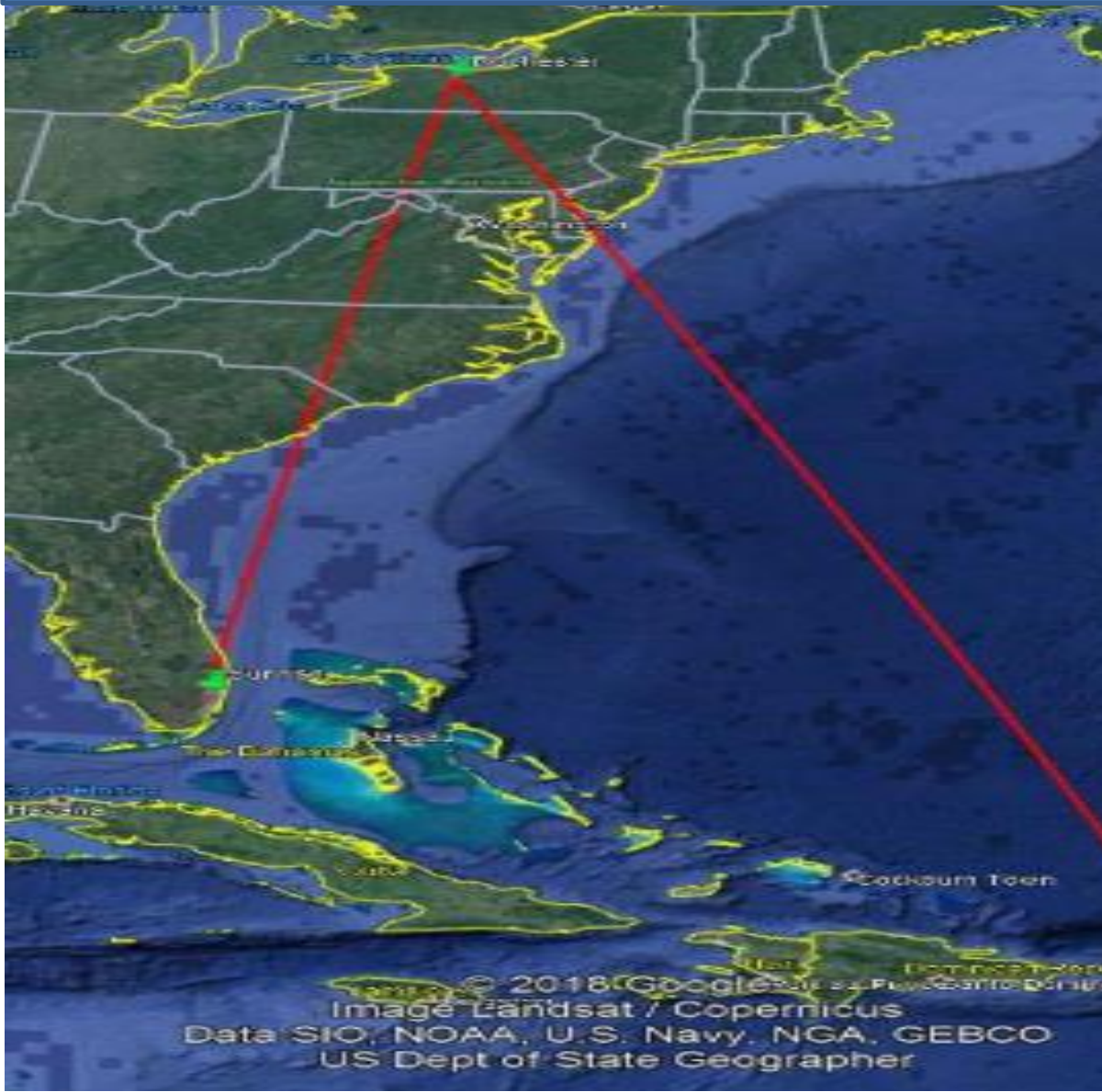


The Command-Runner™ provides a customizable, mobile platform for command, communications, data and incident management. The secure, weather resistant enclosure can be configured with radios, VoIP, Wi-Fi, computers, monitors, cameras, printers, drawers and charging ports to support nearly any type of field operation.

The unit rolls like a cart, then easily mounts to any vehicle's 2" trailer hitch where it rides, wheels up, like a cargo carrier. A single person can transport and deploy an all-in-one command center in minutes.



# EMERGENCY COMMUNICATIONS – HURRICANE MARIA STRUCK DOMINICA @ 175 mph, CAT 5



Amateur radio operators were in touch with other amateur radio operators from the very first day, 9/20, and continues to this day.

When cellphones and all forms of standard communication fails, amateur radio will get through. Coverage of several thousand miles is not unusual and can provide a resilient and effective mean of two-way communications

# INDIANA COUNTY EMERGENCY MANAGEMENT RADIO CLUB: <https://www.qsl.net/w3bmd/>



Find your local  
Amateur Radio  
Club and attend  
their informative  
and free meetings.

## ICARC, W3BMD

*Indiana County Amateur Radio Club, Inc.*  
*Pennsylvania, USA*



[Home](#) [Club Info](#) [Public Service](#) [Other Info](#) [Links](#)

### VE Test Dates

**October 5, 2019 @ 1:00 pm**

Indiana County Emergency Management  
85 Haven Dr  
Indiana, PA 15701

#### Contact:

N3QM, Bill McMillen 724-397-2702  
[wkmcmillen \(at\) gmail dot com](mailto:wkmcmillen@gmail.com)

**\*\* 24 hour Pre-Registration Requested \*\***

Please like us on our  
Facebook page



Software-Defined-Radio  
On the Internet

*Click Below*

[WebSDR.org](http://WebSDR.org)

# INDIANA COUNTY EMERGENCY MANAGEMENT RADIO CLUB: <https://www.qsl.net/w3bmd/>

https://www.qsl.net/w3bmd/default.html



scope Inbox (15,355) Suggested Sites Sign out Web Slice Gallery Imported From IE EB5AGV Amateur R... Search Bookmark Manager New folder

## Upcoming Events

**Airshow - June 8-9**

**Field Day - June 22-23**

## Next ICARC Meeting

**July 2, 2019**

**Board Meeting**

**At: 7:00PM**

**Regular Meeting**

**At: 7:30PM**

Meetings are held first Tuesday of every month.

At the Indiana **Eat-N-Park** on the corner of Route 286 and Indian Springs Road.

[Click Here For Map](#)

## Club Breakfast

At **Eat-N-Park** Saturday mornings @ 8:30 AM - ????

## Repeater System Information

146.910 - PL ( 131.8 )

146.745 - PL ( 131.8 )

444.975 + PL ( 110.9 )

Fellow Amateur Radio club attendees are happy to help you obtain your FCC License and get trained in emergency management!

## Board Members

Craig Bigler AB3XA

Terry Carnahan KB3JOD

Harry Dushac K3FSE

Dave Dzelsky N3DZ

Chris Edwards N3VFK

Doug Fitzsimmons K3LAB

Larry Freeman N3LT

Jerry Kiehl WB3DUD



# HANDS-ON: ONLINE FCC LEARNING MODULE



Choose an exam to study for:

Technician (Expires Jul 1, 2018)

Technician (Begins Jul 1, 2018)

General (2015-2019)

Amateur Extra (2016-2020)

Other... ▾

 [What is ham radio?](#)

For those new to the hobby, what is amateur radio?

 [How do I get licensed?](#)

What it takes, where to go, and how to get started with your amateur radio license.

 [Why use ham radio?](#)

In a the day of the Internet and cell phones, is amateur

 [Study tips](#)

You've decided to take an exam, how to prepare?

Select link:

<https://hamstudy.org>

And select “Technician”.  
**This is a completely free (no fees) tutorial site.**

Facebook Page 

 Sponsored by ICOM

Blog

a month ago

[New HamStudy.org mobile apps are here!](#)

It's been a long road, but after almost two and a half long years of work, the next generation of HamStudy.org is finally here! That's right, we just released the new mobile apps that so many people have been asking ...

# HANDS-ON: ONLINE FCC LEARNING MODULE





Select **“Study Flash Cards”**

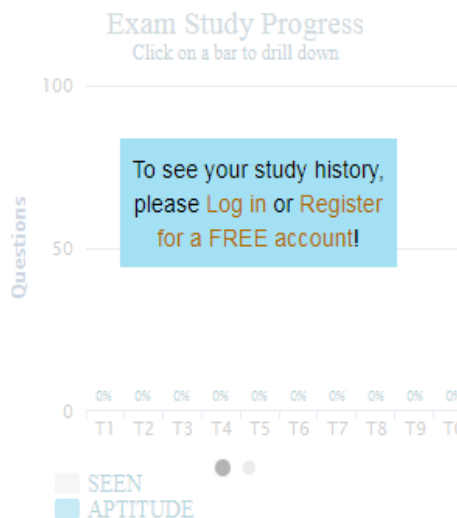
[Login or Register for FREE!](#)

## Technician Class (Begins Jul 1, 2018) ▾

 Study Flash Cards

 Read Questions

 Practice Test



[Find a Session](#)

[Blog](#)

[Buy the App](#)

[Facebook Page](#)



[Sponsored by ICOM](#)

[Blog](#)

a month ago

[New HamStudy.org mobile apps are here!](#)

It's been a long road, but after almost two and a half long years of work, the next generation of HamStudy.org is finally here! That's right, we just released the new mobile apps that so many people have been asking ...

[Continue reading →](#)

# HANDS-ON: ONLINE FCC LEARNING MODULE

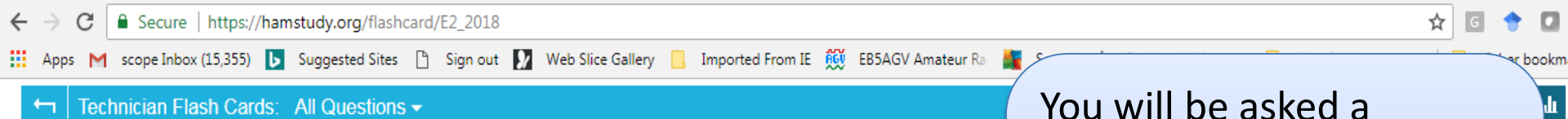
Optionally, you may setup your name & password. **This is a completely free (no fees) tutorial site.**

The screenshot shows a web browser window with the URL <https://hamstudy.org/tech2018>. The page features the "HAMSTUDY" logo with the tagline "by SignalStuff". The main heading is "Technician". A sidebar on the left contains navigation options: "Study Flashcards", "Read Questions", and "Practice Tests". The central focus is a "Log in" form with the following elements:

- Two social login buttons: "Log in with Facebook" (blue) and "Sign in with Google" (red).
- A "Username" input field.
- A "Password" input field.
- A blue "Log in" button.
- A checkbox for "Stay logged in" and a link for "Forgot password?".
- A separator "- or -".
- A grey "CONTINUE AS GUEST" button.

At the bottom of the page, there is a progress bar with 12 segments, each labeled "0%".

# HANDS-ON: ONLINE FCC LEARNING MODULE



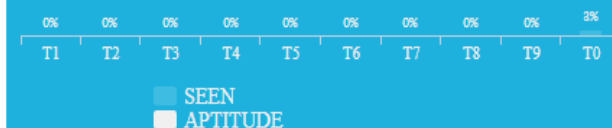
T2  
C09

**Are amateur station control operators ever permitted to operate outside the frequency privileges of their license class?**

- A. No
- B. Yes, but only when part of a FEMA emergency plan
- C. Yes, but only when part of a RACES emergency plan
- D. Yes, but only if necessary in situations involving the immediate safety of human life or protection of property

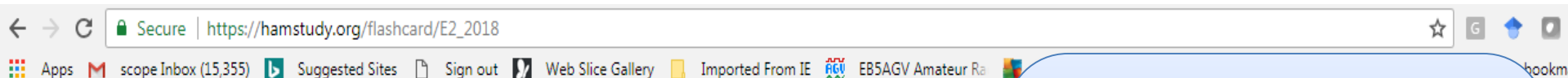
*type or click response*

You will be asked a question and you answer as A, B, C, or D. Don't worry if you don't know the answer as you will be given the answer.



 Sponsored by ICOM

# HANDS-ON: ONLINE FCC LEARNING MODULE



Technician Flash Cards: All Questions ▾

T2  
C09

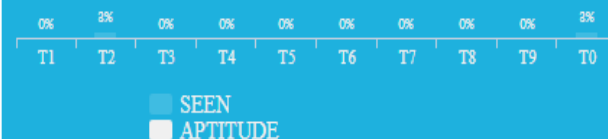
Are amateur station control operators ever permitted to operate outside the frequency privileges of their license class?

- A. No
- B. Yes, but only when part of a FEMA emergency plan
- C. Yes, but only when part of a RACES emergency plan
- D. Yes, but only if **necessary** in **situations involving the immediate safety of human life or protection of property**

*click the corner for explanation*

Next

You will see the correct answer to your response. Again, Don't worry if you don't know the answer as you will be given the answer.



»»» Sponsored by ICOM

# HANDS-ON: ONLINE FCC LEARNING MODULE

HamStudy.org: Cutting e... X

Secure | [https://hamstudy.org/flashcard/E2\\_2018](https://hamstudy.org/flashcard/E2_2018)

Apps | scope Inbox (15,355) | Suggested Sites | Sign out | Web Slice Gallery | Imported From IE | EBSAGV Amateur Ra | Search | Bookmark Manager | New folder | Other bookmarks

Technician Flash Cards: All Questions ▾

T2  
**C09**

This is a bit of a trick question; emergency plans will never take into account transmitting out of band, since if you're planning it you can always plan to not need to transmit out of band.

The rule is this: Always do whatever it takes to keep people safe. If someone is going to die unless you transmit on a police (or other) frequency, transmit first and ask forgiveness later.

Just make sure that whatever action you're taking isn't interfering with something and causing more danger than you are trying to protect against!

Last edited by kd7bbc. [Click here to edit.](#)

*click the corner for explanation*

Next

If you click on the upper right, you will see a complete technical explanation. If you would like a book as a reference, you can ask, or search, in your local library for the “ARRL Technician License Guide” or a book with a similar title.

T1	T2	T3	T4	T5	T6	T7	T8	T9	T10
0%	2%	0%	0%	0%	0%	0%	0%	0%	2%

SEEN  
APTITUDE

Sponsored by ICOM

# HURRICANE MARIA – HARRIS MILITARY HF PHONE & DATA



The Harris Falcon series of HF MIL radios, including the RF-5800H, RF7800H and RF-300H manpack HF radios, are designed for confident operation in emergent conditions

Harris planned for establishment of a basic HF network supporting voice and e-mail • Provide several RF-5800H manpacks for use in Puerto Rico • Utilize Harris' Rochester test site with an RF-7835 1kW power amplifier and 10MHz log periodic antenna

# HURRICANE MARIA – FEMA SATELLITE PHONE & INTERNET

FEMA Satellite  
communications





# HURRICANE MARIA – AT&T SATELLITE PHONE & INTERNET

11/06/2017

AT&T is using an LTE cell payload UAV to offer connectivity to Puerto Ricans who lost wireless service after Hurricane Maria and live in a 40-mile (max) area under the UAV CELL ON WINGS.

This photo was taken over a month after hurricane Maria devastated Puerto Rico where 48 percent of cell sites remain inoperative.



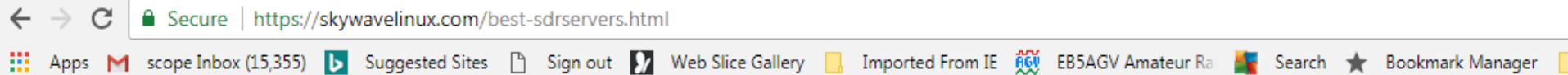
# HURRICANE MARIA – ALPHABET'S (GOOGLE) LTE BALLOON



Project Loon, which belongs to Alphabet's company X, floats 2 balloons up to 20 kilometers (12 miles) and offers to 200,000 people service in Puerto Rico after hurricane Maria.

Alphabet's X indicated "basic Internet communications" including email, text messaging (but not voice service), and limited web access to more than 200,000 people.

# HANDS-ON: REMOTE SPECTRUM MONITORING



## Skywave Linux

- 1 | **Motorola XPR 3500e Radio - Lowest Price Guaranteed** We offer the best price radio. amerizonwireless.com
- 2 | **Verizon Connect GPS Tracking - Verizon Connect Smart Solution** Improve your fleet. Learn more.
- 3 | **Bitcoin Mining Hardware** Order your miners today! gigawatt.sg

### HOME

#### Downloads

- Skywave Linux Hard Drive Installation
- Skywave Linux USB Installation
- Fixing Audio: Dell, HP, Compaq

Go to this Link:

<https://skywavelinux.com>

Click on:

Best Internet SDR Servers

Click on:

Any Listed Server below

## Best Internet SDR Servers, 01/20/2018

The software defined radio servers listed below have been selected for geographical coverage and quality of reception. It is not an exhaustive list, as there are more servers going online daily! Be sure to visit the live online lists shown directly below.

### WebSDR.org - Online List

- WebSDR, Itajai, Santa Catarina, Brazil
- WebSDR, DJ3LE, Silberstedt, Germany
- WebSDR, University of Twente, Netherlands (WIDEBAND ADC)
- WebSDR, SV1RVL, Athens, Greece
- WebSDR, Silec, Poland
- WebSDR, SP3PGX, Zielona Gora, Poland
- WebSDR, Johannesburg, South Africa
- WebSDR, Farnham, UK
- WebSDR, Grimsby, UK
- WebSDR, Peterborough, UK
- WebSDR, G4FPH, Stafford, UK
- WebSDR, N4DKD, Birmingham, Alabama, USA
- WebSDR, K3FEF, Milford, Pennsylvania, USA
- WebSDR, KF5JMD, Waller County, Texas, USA
- WebSDR, NA5B, Washington, DC, USA
- WebSDR, Montevideo, Uruguay

### SDR.hu - Online List

- OpenWebRX, Freemans Reach, Australia
- OpenWebRX, VK3TLW, Melbourne, Australia
- OpenWebRX, Tasmania, Australia
- OpenWebRX, OE4XLC, Allhau, Austria
- OpenWebRX, VE6SLP, Lamont, AB, Canada
- OpenWebRX, VE7AB, Victoria, BC, Canada
- OpenWebRX, CA3PBR, Santiago, Chile
- OpenWebRX, Shenzhen, China
- OpenWebRX, TF3ARI, Reykjavik, Iceland
- OpenWebRX, JA1GJD/2, Aichi, Japan
- OpenWebRX, JA/EK0JA, Chiba, Japan
- OpenWebRX, Kanuma City, Japan
- OpenWebRX, Mangawhai, New Zealand
- OpenWebRX, ZL/KF6VO, New Zealand
- OpenWebRX, Muscat, Oman
- OpenWebRX, 4F1BYN, Antipolo City, Philippines
- OpenWebRX, Canary Islands, Spain
- OpenWebRX, SK3W, Sweden

# HANDS-ON: REMOTE SPECTRUM MONITORING

The screenshot displays a web browser window with the URL `szsdr.ddns.net:8073`. The page header identifies the station as "0-30 MHz SDR@Shenzhen, China" with a grid location of `OL72an` and an antenna of "Active loop/Mini-whip". The main display is a spectrum plot with a frequency axis from 0 to 2.0 MHz. A yellow cursor is positioned at approximately 782.59 MHz. Above the plot, a band plan shows "NDB Utility" and "MW Broadcast" bands. A callout box on the right provides instructions: "Select MW in Band window (Below) and then click on any RF Signal (bright line). Turn up the Audio and enjoy international RF Spectrum monitoring!". The bottom right corner features a control panel with various settings: frequency (782.59 MHz), mode (MW), and a list of modulation types (AM, AMN, LSB, USB, CW, CWN, NBFM, IQ). The "Audio" tab is active, showing volume and gain sliders, and a dBm scale at the bottom.

Select MW in Band window (Below) and then click on any RF Signal (bright line). Turn up the Audio and **enjoy international RF Spectrum monitoring!**

782.59 MW extension

779.81 9 Spec

AM AMN LSB USB CW CWN NBFM IQ

WF4 Audio AGC Users Stats Off

WF max -25 dB Auto Scale

WF min -117 dB

WF rate fast Slow Dev

colormap contrast spec filter

S1 S3 S5 S7 S9 +10 +20 +40 +60 -55 dBm

# REMOTE SPECTRUM SERVER AT HOME (OPTIONAL FUN & LEARN LINUX AND RF)

If you would like to setup your own RF Spectrum server at home, acquire a hardware USB-based software defined radio (SDR):

Low-cost SDR dongle:  
RTL2831U (Amazon) ~\$25



Complete SDR Development System:  
ADALM-PLUTO (Mouser Electronics) ~\$145



# REMOTE SPECTRUM SERVER AT HOME (OPTIONAL FUN & LEARN LINUX AND RF)

If you would like to setup your own RF Spectrum server at home, obtain a Linux server and follow the Linux software server directions at <https://sdr.hu/openwebbrx> and links provided by the hardware provider and the ADALM-PLUTO offers advanced educational material (books, labs) for engineers designing SDR transmitters and complete cellular femtocells.

Low-cost SDR dongle:  
RTL2831U (Amazon)



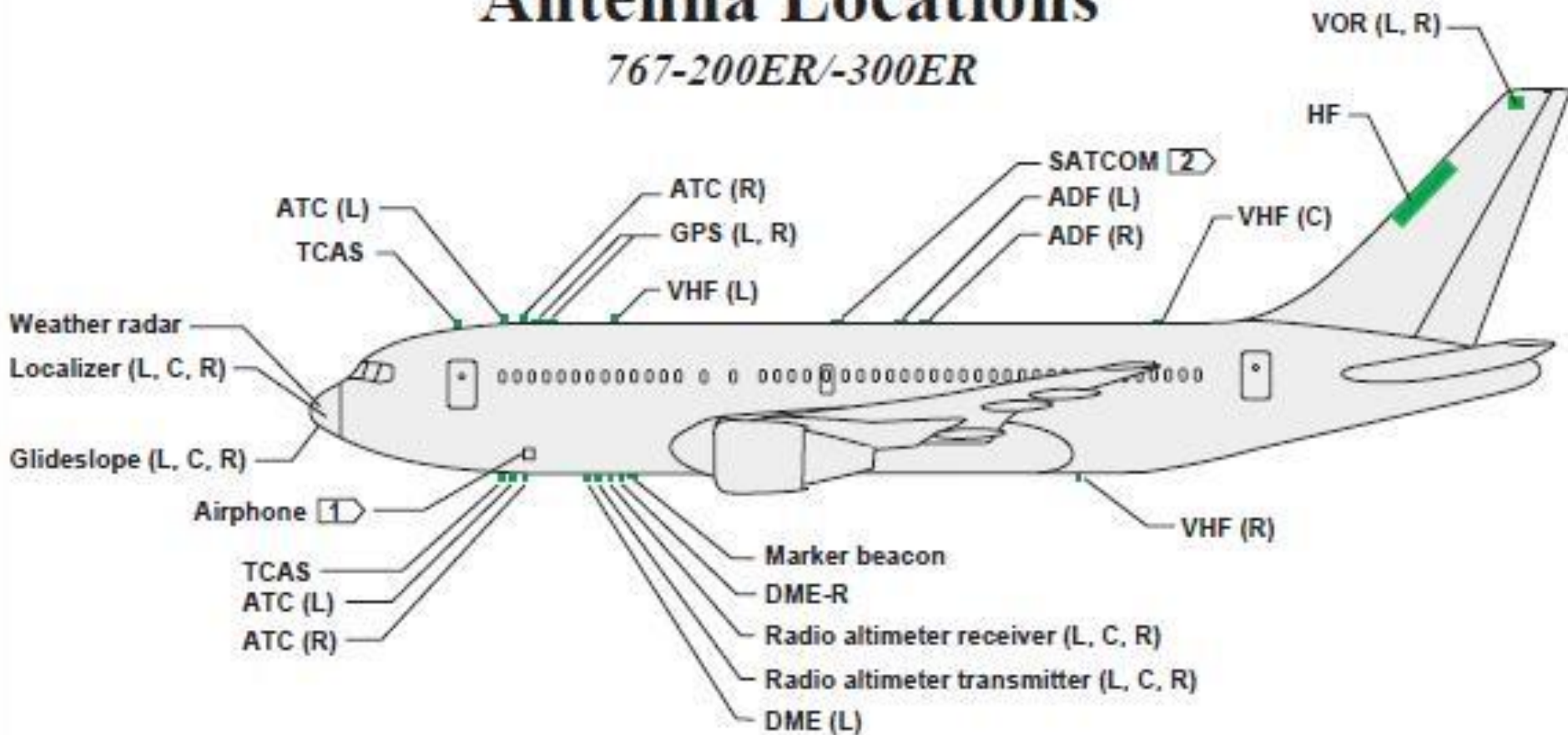
Complete SDR Development System:  
ADALM-PLUTO (Mouser Electronics)



# RISKS OF MINIMAL OR NO ENCRYPTION

## Antenna Locations

767-200ER/-300ER



# AIRCRAFT TRANSPONDERS

← → ↻ <https://www.flightradar24.com/40.64,-73.78/8>

Apps Suggested Sites Web Slice Gallery Imported From IE RCA SECURITY EB5AG Search ★ Bookmark Manager New folder Imported Imported (1)

**flightradar24** LIVE AIR TRAFFIC

Apps Add coverage Data / History Social Press About

✈️ AIRCRAFT ? 233 / 12,728 >

📍 AIRPORT DELAYS ? ▾

AIRPORT	ARR	DEP
Barcelona (BCN)	3.8	3.8
Brussels (BRU)	3.8	3.6
Sapporo (CTS)	2.7	2.3
Malaga (AGP)	1.3	2.9
Tenerife (TFS)	0.4	3.3


[Full list](#)

🐦 TWEETS ▾

#BA59, London-Cape Town, is returning to London with a mechanical issue. <https://t...>  
14 hours ago

Download on the App Store | ANDROID APP ON Google Play

Like 487K | Follow | G+



Google



# RISKS - UNENCRYPTED AIRCRAFT ACARS

AIRCRAFT ACARS IS VHF, HF, AND SATELLITE

The screenshot displays a software interface for receiving and displaying ACARS (Aircraft Communications Addressing and Reporting System) messages. The interface is split into several panes:

- Radio Control (Left):** Shows settings for the radio interface, including frequency (131.739,153), center frequency (131.349,468), filter type (Hann-Poisson), and filter bandwidth (10890). It also includes a spectrum display showing signal strength across a frequency range from 131.070MHz to 131.700MHz.
- Message List (Right):** Displays a list of received ACARS messages. Each message entry includes:
  - ACARS mode (E or X)
  - Aircraft registration (e.g., G-TAWA, N1NC, FZ-TCP, G-EUKI, LX-UCV)
  - Message label, Block id, and Msg no.
  - Flight id
  - Message content (e.g., POAD1GS0000/12121434CYTLKPR/W51 55.7/W 4 3.9/222/19/429/ 48/AUTOR PY15)
  - Coordinates (North, West)
  - Timestamp (e.g., 12/10/2012 15:32)
- Database (Bottom Right):** Shows a log of aircraft added to the database:
  - 12 Oct 2012 - 15:31:57 Document contains no data
  - 12 Oct 2012 - 15:32:58 Document contains no data
  - 12 Oct 2012 - 15:32:43 Aircraft 'FZ-TCP' was added to your database
  - 12 Oct 2012 - 15:33:07 Aircraft 'G-EUKI' was added to your database
  - 12 Oct 2012 - 15:34:53 Aircraft 'LX-UCV' was added to your database

# MAN-IN-THE-MIDDLE CELLULAR INTERCEPTION

\$400k BOX ACTS AS A BASE STATION (BTS) OR 2G TOWER

OPEN BTS UNIT ALSO WORKS WELL, APPLIED TO UNLOCKING SIMS



LOOKS LIKE A BTS (BASE STATION) TO A HANDSET

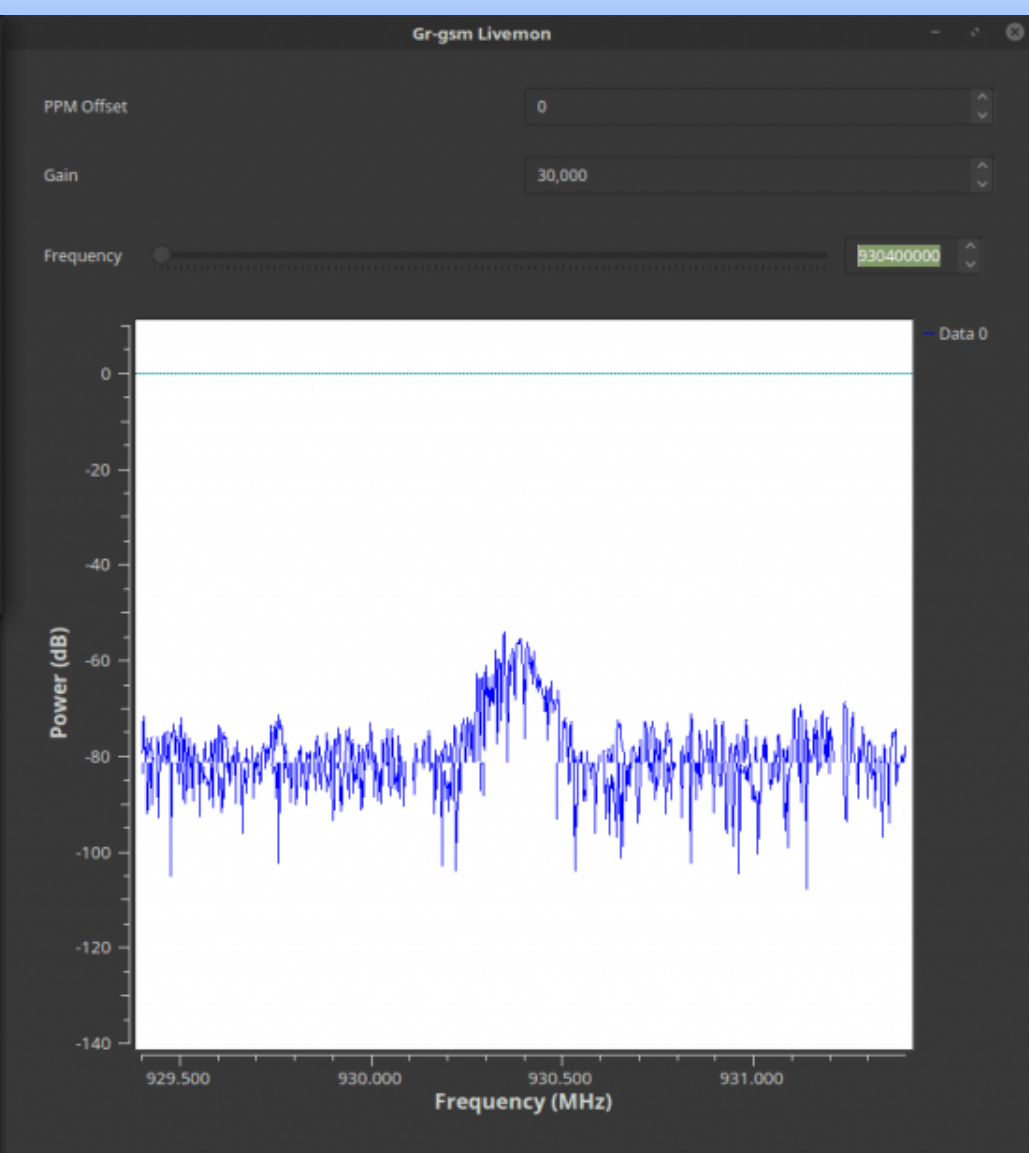
Handset is told to switch to 2G (RC5) if in LTE Region

# RISKS -SDR CELLULAR IMSI INTERCEPTION

\$7 SDR PASSIVE INTERNATIONAL MOBILE SUBSCRIBER IDENTITY (IMSI) SUBSCRIBER (PYTHON)

```
Terminal 1
Fichier Édition Affichage Rechercher Terminal Aide
$ sudo python simple_imsi-catcher.py
WARNING: No route found for IPv6 destination :: (no default route?)
cpt : IMSI : country : brand ; operator
1 ; 234 20 730143 ; Guernsey (United Kingdom) ; 3 ; Hutchison 3G UK Ltd
2 ; 208 20 154508 ; France ; Bouygues ; Bouygues Telecom
3 ; 208 20 079566 ; France ; Bouygues ; Bouygues Telecom
4 ; 208 20 085162 ; France ; Bouygues ; Bouygues Telecom
5 ; 208 20 031381 ; France ; Bouygues ; Bouygues Telecom
6 ; 208 20 031233 ; France ; Bouygues ; Bouygues Telecom
7 ; 208 20 031343 ; France ; Bouygues ; Bouygues Telecom
8 ; 208 20 171286 ; France ; Bouygues ; Bouygues Telecom
9 ; 208 20 090096 ; France ; Bouygues ; Bouygues Telecom
10 ; 208 20 100817 ; France ; Bouygues ; Bouygues Telecom
11 ; 208 20 144546 ; France ; Bouygues ; Bouygues Telecom
12 ; 208 20 220088 ; France ; Bouygues ; Bouygues Telecom
13 ; 208 20 171268 ; France ; Bouygues ; Bouygues Telecom
14 ; 208 20 154457 ; France ; Bouygues ; Bouygues Telecom
15 ; 208 20 144758 ; France ; Bouygues ; Bouygues Telecom
16 ; 208 20 031231 ; France ; Bouygues ; Bouygues Telecom
17 ; 208 25 001134 ; France ; LycaMobile ; LycaMobile
18 ; 208 20 171275 ; France ; Bouygues ; Bouygues Telecom
19 ; 208 20 031317 ; France ; Bouygues ; Bouygues Telecom
20 ; 208 20 154456 ; France ; Bouygues ; Bouygues Telecom
21 ; 208 20 144857 ; France ; Bouygues ; Bouygues Telecom
22 ; 208 20 031261 ; France ; Bouygues ; Bouygues Telecom
23 ; 208 20 144819 ; France ; Bouygues ; Bouygues Telecom
24 ; 208 20 100230 ; France ; Bouygues ; Bouygues Telecom
```

```
Terminal 2
Fichier Édition Affichage Rechercher Terminal Aide
$ airprobe_rtlsdr.py
linux; GNU C++ version 5.3.1 20151219; Boost_105800; UHD_003.009.002-0-unknown
gr-osmosdr 0.1.4 (0.1.4) gnuradio 3.7.9
built-in source types: file osmosdr fcd rtl rtl_tcp uhd miri hackrf bladerf rfspace
ace airspy redpitaya
Using device #0 Realtek RTL2838UHDIR SN: 00000001
Found Rafael Micro R820T tuner
[R82XX] PLL not locked!
Exact sample rate is: 2000000,052982 Hz
[R82XX] PLL not locked!
Using Volk machine: sse3_64_orc
2d 06 22 00 d8 58 3a 30 a0 0d 25 b8 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
31 06 21 00 08 29 43 02 37 10 34 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
15 06 21 00 01 f0 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
2d 06 22 00 ec 58 13 18 80 06 e3 b9 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
15 06 21 00 01 f0 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
15 06 21 00 01 f0 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
59 06 1a 8f e7 90 80 ad 1c 60 49 00 00 00 00 00 00 00 00 00 00 00 00 00 00
01 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
2d 06 22 00 90 0e 47 fa cf 58 e5 08 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
59 06 21 00 08 29 80 02 51 34 80 17 08 29 80 02 20 69 66 2b 2b 2b 2b 2b 2b 2b
25 06 21 00 05 f4 d1 68 9f 28 23 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
25 06 21 00 05 f4 ff 68 0f 60 23 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b 2b
```



[https://www.youtube.com/channel/UC4cMTOPIf\\_ixWyGW1u48yrw](https://www.youtube.com/channel/UC4cMTOPIf_ixWyGW1u48yrw)

# WIRELESS SECURITY RISKS CONCLUSIONS

- ✓ **MIDDLE- & HIGH-SCHOOL STUDENTS CAN HELP DURING DISASTERS!**
- ✓ **EXISTING WIRELESS STANDARDS ARE NOT SECURE**
- ✓ **CYBER SECURITY REQUIRES YOU TO BE A LIFE-LONG LEARNER**
- ✓ **PURSUE A CAREER YOU LOVE AND YOU WILL HAVE FUN IN YOUR CAREER**
- ✓ **MIDDLE- & HIGH-SCHOOL STUDENTS MUST EMBRACE STEM TO SOLVE:**
  - ✓ **MINIMAL WL ENCRYPTION STANDARD – TODAY - IS AES256**
  - ✓ **AIRPLANE ACARS AND TRANSPONDER WIRELESS SYSTEMS MAY BE COMPROMISED AND SPOOFED**
  - ✓ **GSM RC5 ENCRYPTION STANDARDS ARE COMPROMISED**
  - ✓ **POLICE DIGITIZED VOICE TRAFFIC IS OFTEN IN THE CLEAR**
  - ✓ **FUTURE IoT IMPLEMENTATIONS REQUIRE IMPROVED ENCRYPTION STANDARDS**