Knocking my neighbor's kid's drone offline.

michael robinson

First a shout out…

Alan Mitchell
Ron McGuire
Chris Taylor

My neighbor.

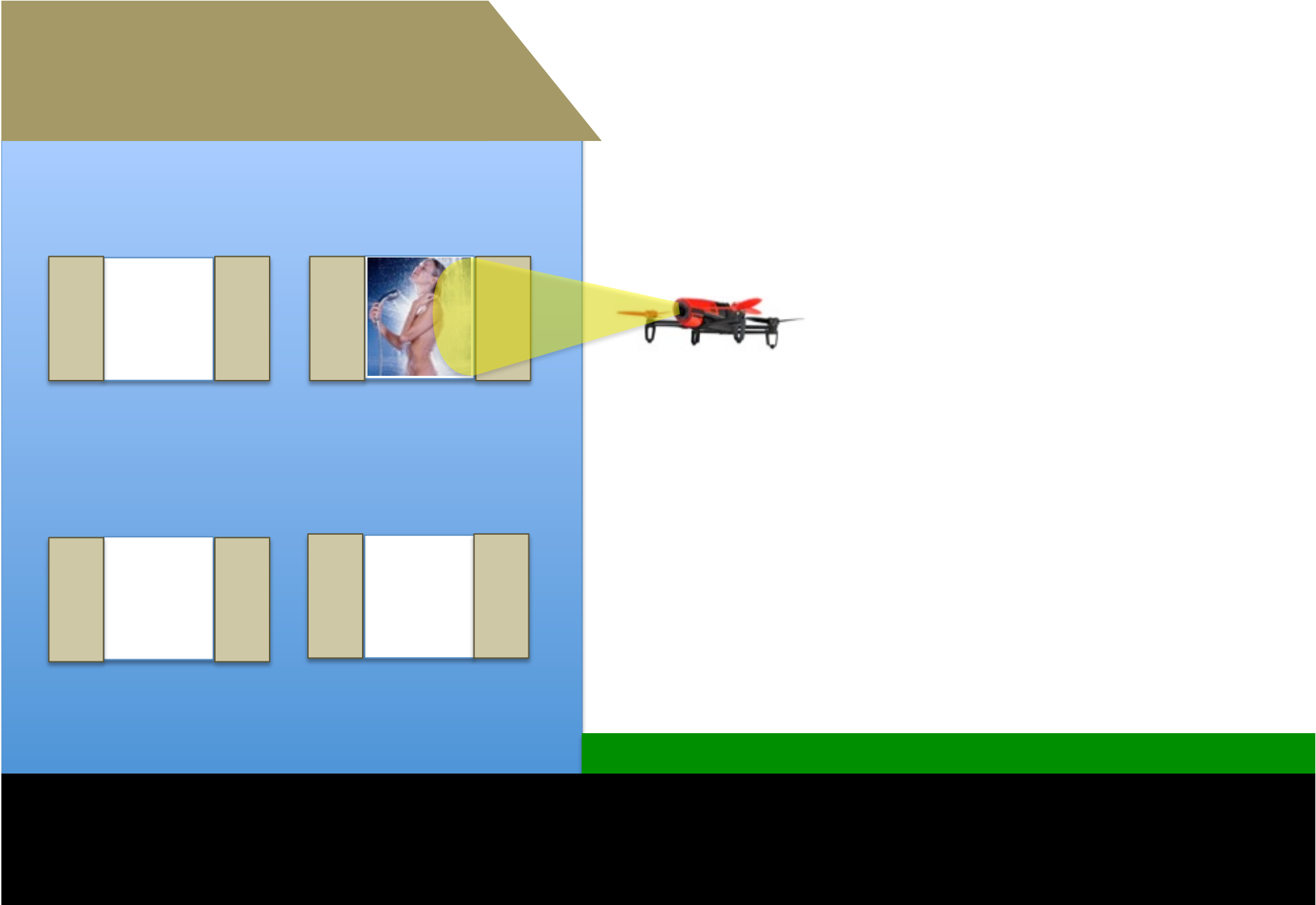Sigh.

My neighbor's kid.

Double sigh.

My neighbor.

Sigh.

My neighbor's kid.

Double sigh.

Way too much discretionary spending.

But that got me thinking…

What if this showed up?

Or if this showed up?

Now there are LOTS of regulations
governing the flying of Unmanned Aircraft Systems.

Most laws restrict:

1. Government/law enforcement's use
2. Commercial use (FAA needs to authorize.)

Non-commercial, private (hobbyist) use largely not regulated *YET*.

Some current regulations on UAS:

1. No fly zone around Washington, DC (15 mi)
2. No fly zone in New York City
3. No fly zone around airports (5 mi)
4. Cannot launch, land, or crash in a national park. Air space is not NPS' to regulate; however, NPS can get you for safety and noise issues.
5. Cannot mount a gun on a drone/UAV – it becomes a weapon system.
6. 400 foot ceiling
7. Line of site

**Requirements to Qualify as a Model Aircraft under
the FAA Modernization and Reform Act of 2012 (P.L. 112-95, section 336)**

Section 336 also prohibits the FAA from promulgating "any rule or regulation regarding a model aircraft, or an aircraft being developed as a model aircraft" if the following statutory requirements are met:

- the aircraft is flown strictly for hobby or recreational use;
- the aircraft is operated in accordance with a community-based set of safety guidelines and within the programming of a nationwide community-based organization;
- the aircraft is limited to not more than 55 pounds unless otherwise certified through a design, construction, inspection, flight test, and operational safety program administered by a community-based organization;
- the aircraft is operated in a manner that does not interfere with and gives way to any manned aircraft; and
- when flown within 5 miles of an airport, the operator of the aircraft provides the airport operator and the airport air traffic control tower ... with prior notice of the operation....

No Fly Zones in the Eastern U.S.
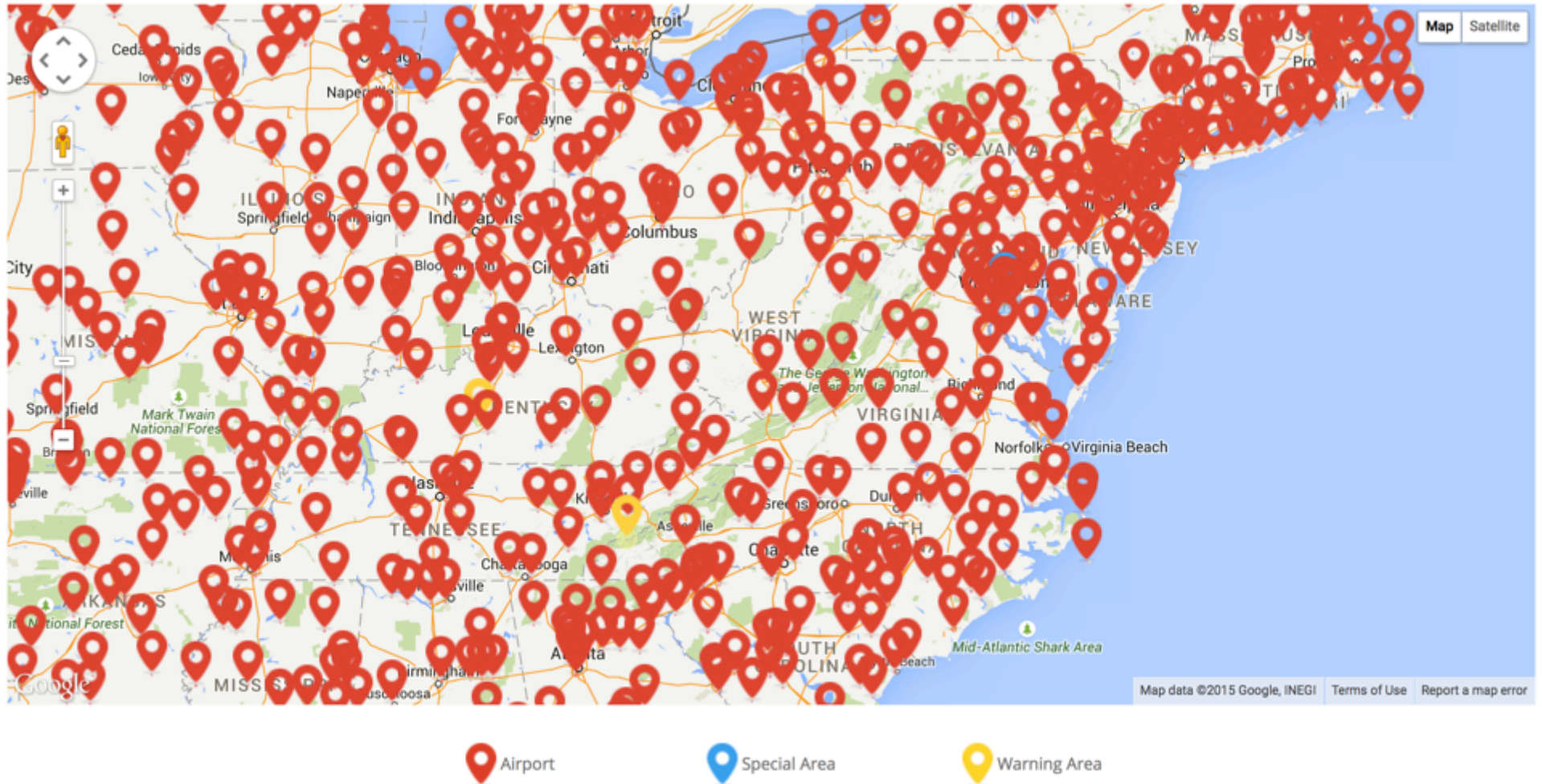
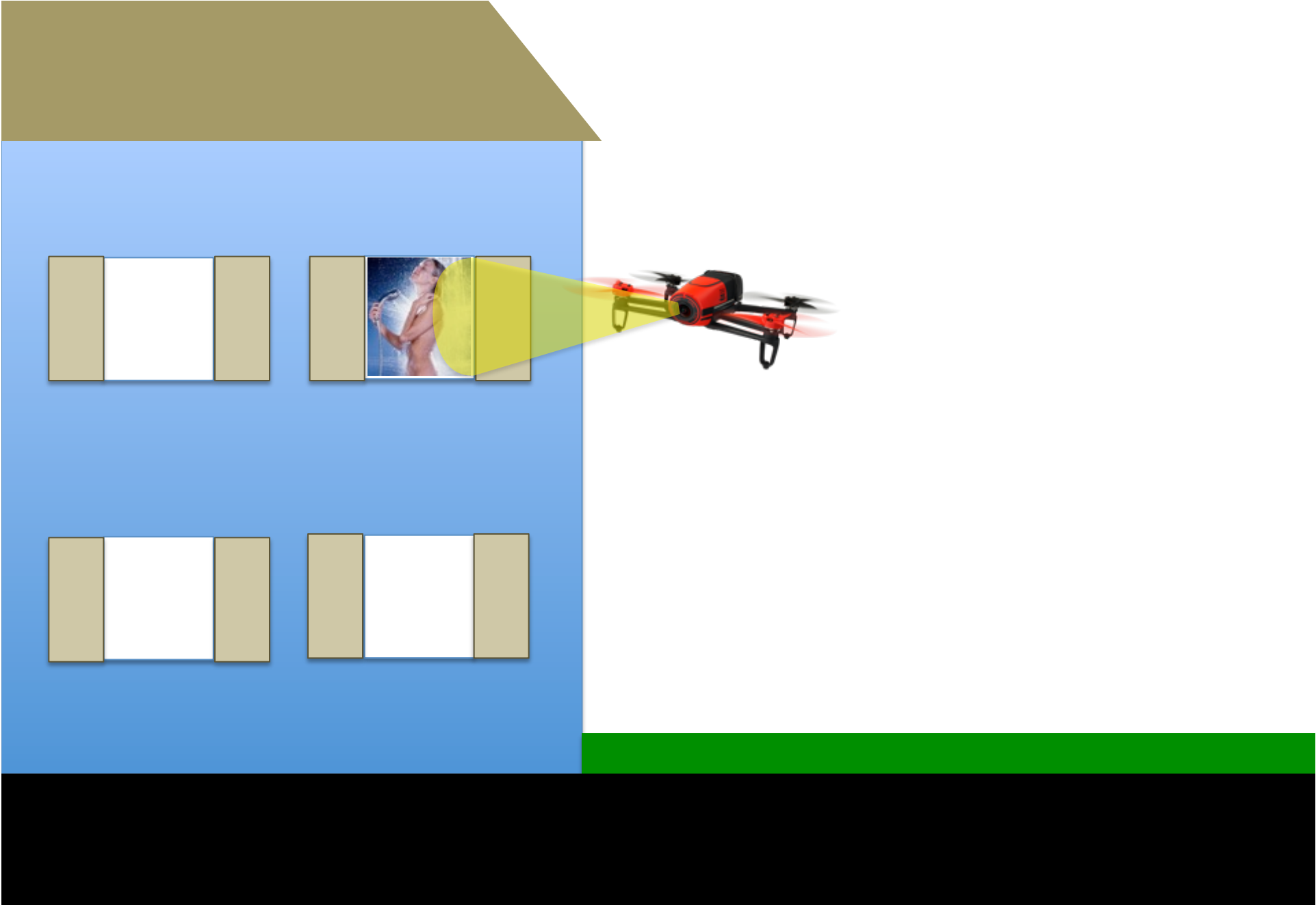# Recordings automatically uploaded via Bepop controller apps.
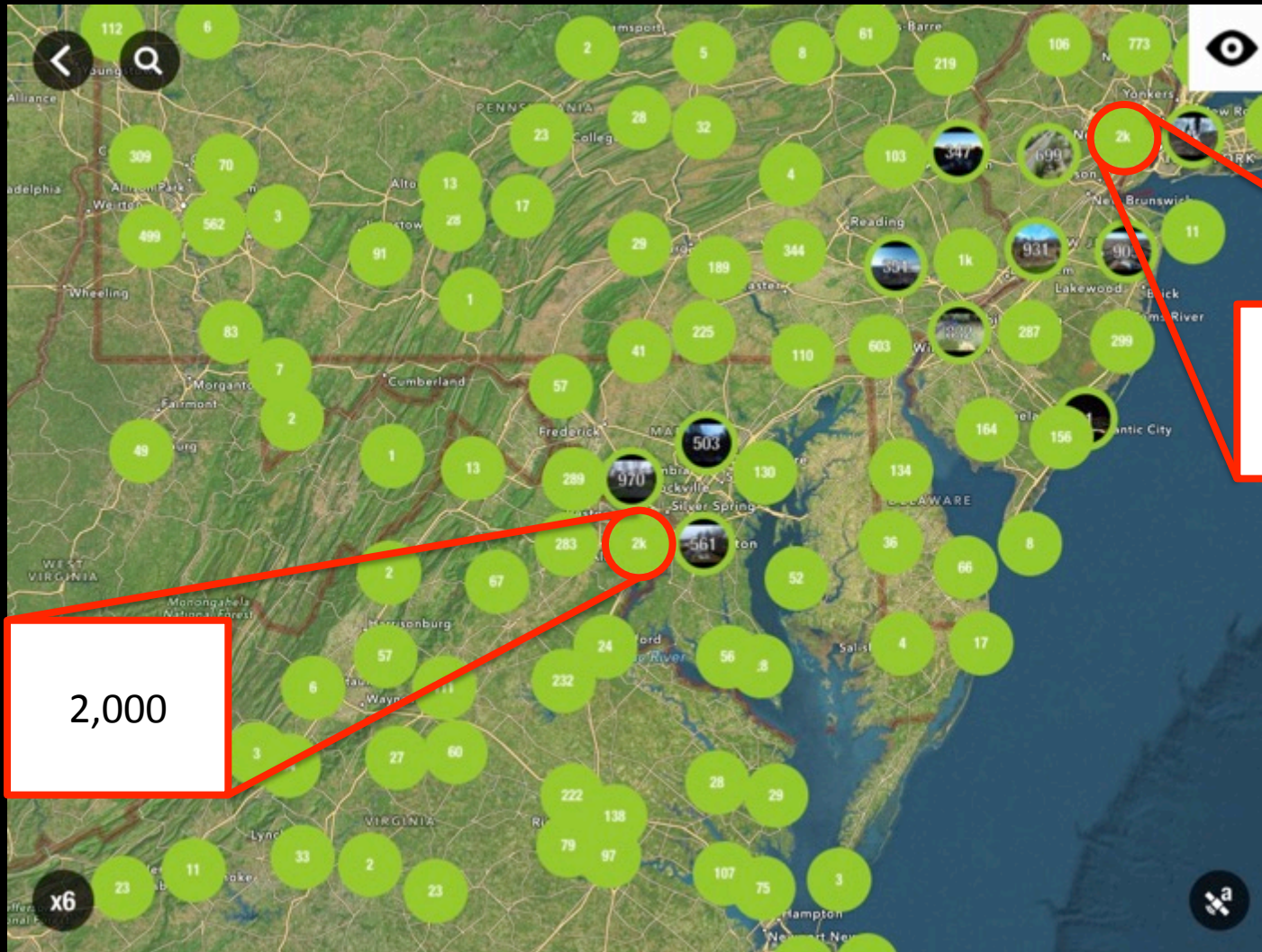
That's nice and all, but...

My neighbor's kid is STILL annoying,
and I want to know...

Is there a way to force
a drone/quadcopter to land?

Let's take a look.

Parrot Bebop Drone Specifications

Parrot P7 dual-core CPU

Quad-core GPU

8 GB of Flash Memory

Magnesium shelf that acts as a radiator and electromagnetic shielding.

OS: Runs on Linux with SDK

2 dual-band Wi-Fi antennas

Operates on both 2.4 GHz and 5 GHz MIMO frequencies.

Generates its own Wi-Fi 802.11 network

Optional Skycontroller (2 km range)

Parrot Bebop Drone Specifications

Parrot P7 dual-core CPU

Quad-core GPU

8 GB of Flash Me...

Magnesium shelf t...cts as a radiator and electromagnetic sh...ing.

OS: Runs on Linux with SDK

2 dual-band Wi-Fi ...nas

Operates on both 2.4 GHz and 5 GHz MIMO frequencies.

Generates its own Wi-Fi 802.11 network

Optional Skycontroller (2 km range)

Parrot Bebop Drone Specifications

Return Home Feature

Altitude: >10 meters
Bebop Drone returns directly to its starting position.

Altitude: =< 10 meters
It will rise and stabilize itself at 10 meters before returning to its take-off position in a straight line.

Once it has reached its take-off position, it will stop and hover 2 meters above the ground.

Parrot Bebop Drone Specifications

Lost Connectivity:

If the connection between the smartphone and the Parrot Bebop Drone is lost, the Parrot Bebop Drone will return to its starting point automatically after 1 min of disconnection.

Parrot Bebop Drone Specifications
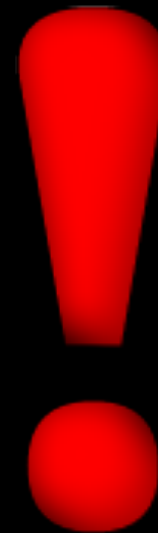
Lost Connectivity:

If the connection between the smartphone and the Parrot Bebop Drone is lost, the Parrot Bebop Drone will **return to its starting point automatically after 1 min of disconnection**.

Hmmm....

What happens if we:
1. "Disrupt" Wi-Fi signal from controller
2. "Disrupt" GPS signal
3. Introduce a magnetic field

Disrupting the Wi-Fi signal.

Flying Wireless Access Point

Default Name: BebopDrone-#######

IP Address: 192.168.42.1
Subnet Mask: 255.255.255.0
DHCP Enabled

Security: Open
MAC address: a0:14:3d:##:##:##

Wi-Fi Channel: 9
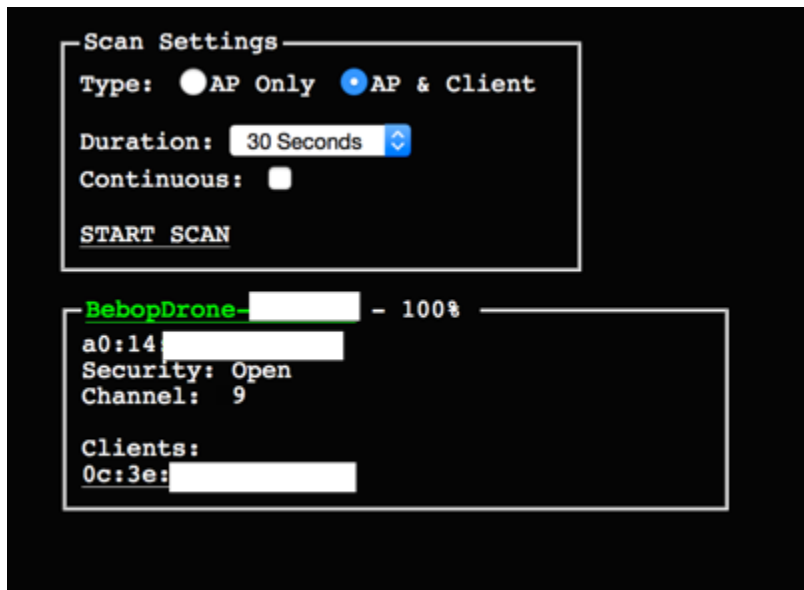
As seen by a Pineapple router

Paired connections:
1. Wi-Fi
2. App to app

```
┌─Scan Settings────────────────────────┐
│ Type:  ○AP Only  ●AP & Client         │
│                                       │
│ Duration: [30 Seconds ▲▼]             │
│ Continuous: ☐                         │
│                                       │
│ START SCAN                            │
└───────────────────────────────────────┘


┌─BebopDrone-▓▓▓▓▓ - 100%──────────────┐
│ a0:14▓▓▓▓▓▓▓▓                         │
│ Security: Open                        │
│ Channel:  9                           │
│                                       │
│ Clients:                              │
│ 0c:3e▓▓▓▓▓▓▓▓                         │
└───────────────────────────────────────┘
```

Paired connections:
1. Wi-Fi
2. App to app

Paired connection:
1. Wi-Fi

```
BebopDrone-          - 100%
a0:14:3d:
Security: Open
Channel:   9

Clients:
0c:3e:
a8:66:
```

Paired connections:
1. Wi-Fi
2. App to app

Paired connection:
1. Wi-Fi

Disrupt signal for 1 minute.

Establish a race condition.
Who will reconnect faster?

A. The pilot
B. You, who has your finger on the re-connect button

Paired connection:
1. Wi-Fi

Paired connections:
1. Wi-Fi
2. App to app

More to follow

Disrupting the GPS signal.

Frequencies used by GPS

Band	Frequency (MHz)	Use
L1	1,575.42	Course/Acquisition L1 Civilian (L1C) Military (M) code
L2	1,227.60	L2 Civilian (L2C) Military (M) code
L3	1,381.05	Nuclear/research
L4	1,379.913	Research
L5	1,176.45	Safety-of-Life (SoL) Data and Pilot
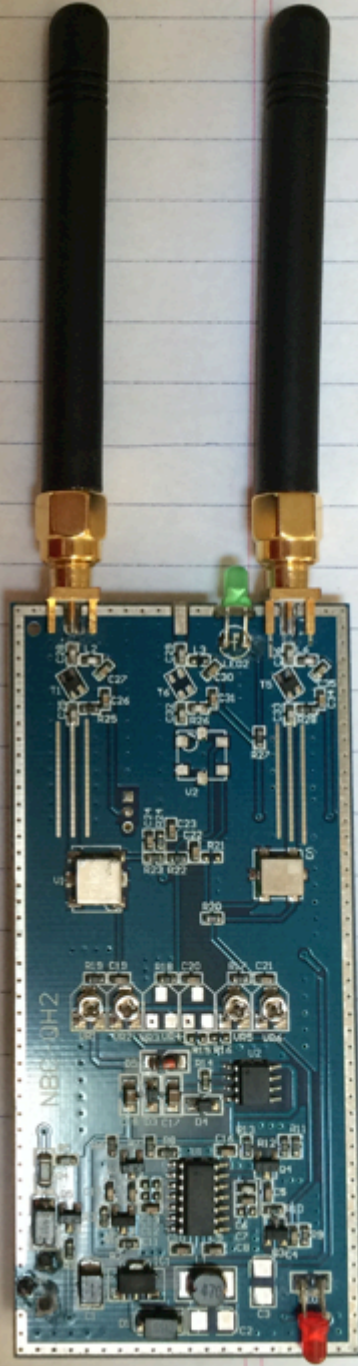
More to follow

Introducing a magnetic field.

More to follow

What about something bigger?

Not that big.

DJI Phantom 3 Specifications

The signal transmission distance will vary depending on environmental conditions, but the Phantom 3 series can reach distances of up to 1.2 miles (2 kilometers) away from the pilot.

When operating in P-mode, height limits, distance limits, and No-Fly Zones function concurrently to manage flight safety.

In A-mode, only height limits are in effect, which by default prevent the aircraft altitude from exceeding 1640 feet (500 m).

DJI Phantom 3 Specifications

If the aircraft enters the restricted area in A-mode, but is switched to P-mode, the aircraft will automatically descend, land, and stop its motors.

DJI App Pilot Prompt:
Warning: You are in a no-fly zone.

Action:
Automatic landing has begun.

DJI Phantom 3 Specifications

The compass is very sensitive to electromagnetic interference, which can produce abnormal compass data and lead to poor flight performance or flight failure.

Regular calibration is required for optimal performance.

Disrupting the Wi-Fi signal.

More to follow

Disrupt GPS signal

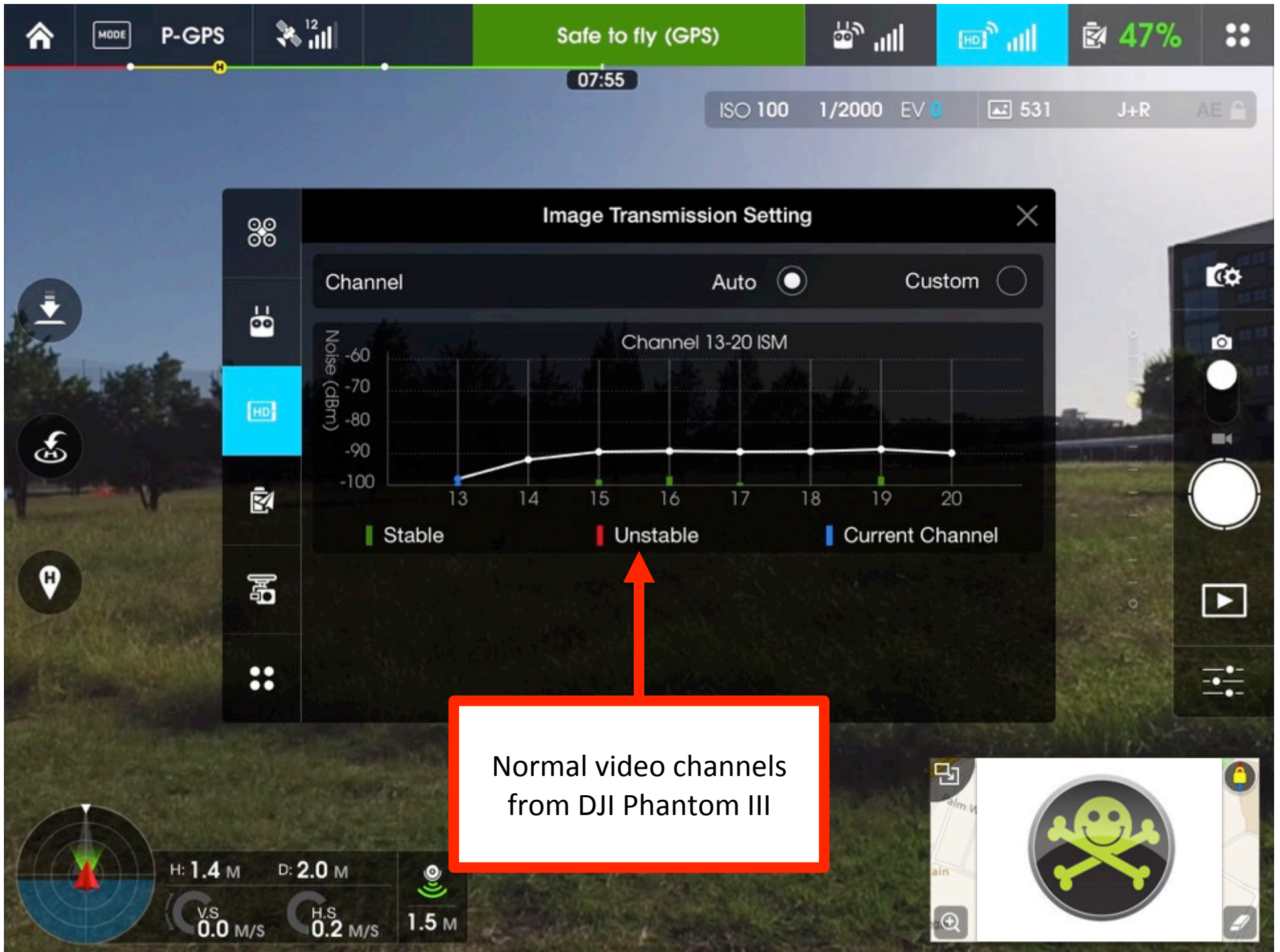Normal signal
from DJI Phantom III
regarding GPS signal

GPS signal lost nearly instantly.
Device starts to drift!

MODE   P-OPTI

Safe to Fly (Non-GPS)

08:21

49%

ISO 100   1/2000   EV 0   🖼 531   J+R   AE 🔒

H: 1.5 M   D: 2.7 M
V.S 0.0 M/S   H.S 0.0 M/S   1.6 M

Normal video channels from DJI Phantom III

Videos channels are listed as "unstable."
Video still comes through by there is jitter.
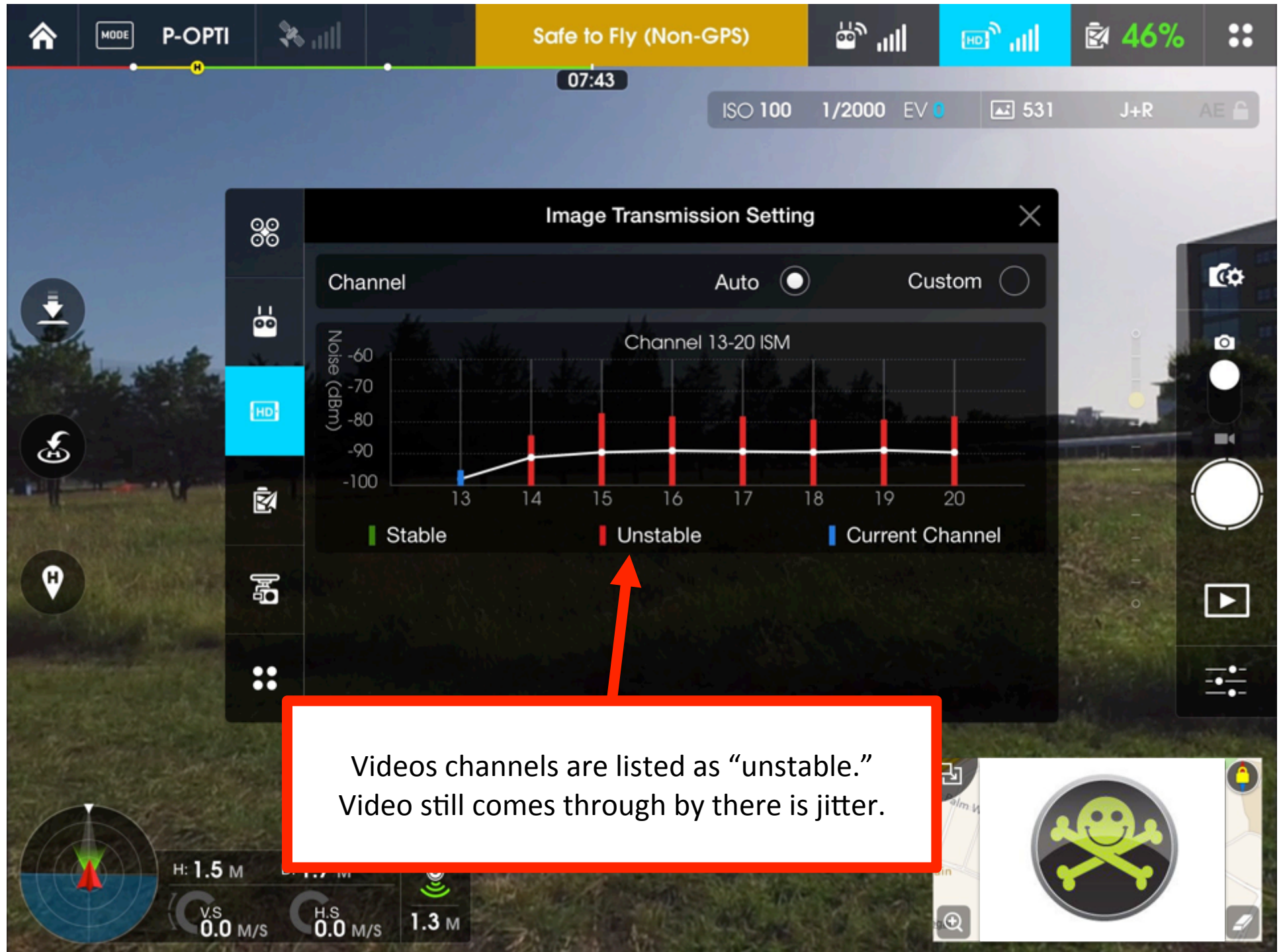
Introduce a magnetic field.

More to follow

ed

Knocking my neighbor's kid's drone offline.
^

gimmethepresentation@gmail.com

Backup Material

		Indoor use			Outdoor use		
	Channels	**2G4-band** 6	**5G-band1** 36-40-44-48	**5G-band3** 149-153-157-161	**2G4-band** 6	**5G-band1** 36-40-44-48	**5G-band3** 149-153-157-161
	Frequency (Mhz)	2432	5150-5250	5725-5825	2432	5150-5250	5725-5825
	US	4W	1W	4W	4W	1W	4W
	Europe	100mW	200mW	Forbbiden	100mW	Forbbiden	Forbbiden
	China	100mW	200mW	2W	100mW	Forbbiden	2W
	Canada	4W	200mW	4W	4W	Forbbiden	4W
	Japan	100mW	200mW	Forbbiden	100mW	Forbbiden	Forbbiden
	HK	4W	200mW	4W	4W	Forbbiden	4W
	Singapore	200mW	100mW	1W License required	200mW	100mW	1W License required
	Korea	100mW	10mW	200mW	100mW	Forbbiden	200mW
	India	200mW	1W	1W	200mW	1W	1W
	Venezuela	200mW	4W	4W	200mW	4W	4W
	Taiwan	1W	Forbbiden	1W	1W	Forbbiden	1W
	Indonesia	100mW	Forbbiden	200mW	100mW	Forbbiden	2W
	Australia + NZ	4W	Forbbiden	200mW	4W	Forbbiden	200mW
	Russia	100mW	200mW	100mW	100mW	Forbbiden	100mW
	South Africa	100mW	Forbbiden	25mW	100mW	Forbbiden	25mW
	Argentina	100mW	Forbbiden	1W	100mW	Forbbiden	1W
	Mexico	100mW	4W	4W	100mW	4W	4W
	Brazil	100mW	200mW	1W	100mW	200mW	1W

http://blog.parrot.com/wp-content/uploads/2014/11/bebop_drone_wifi_channels_countries_l.jpg

References

http://www.faa.gov/uas/media/model_aircraft_spec_rule.pdf

http://www.dji.com/product/phantom-3/download

http://www.drone-laws.com/federal-laws/