



RF-based Detection and Localization of a Drone and Its Controller

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Drone accidents are increased

The Washington Post

National Security

FAA records detail hundreds of close calls between airplanes and drones


Los Angeles Times

MOST POPULAR LOCAL SPORTS ENTERTAINMENT POLITICS 82°

LOCAL / L.A. Now

f t

Lufthansa jet and drone nearly collide near LAX



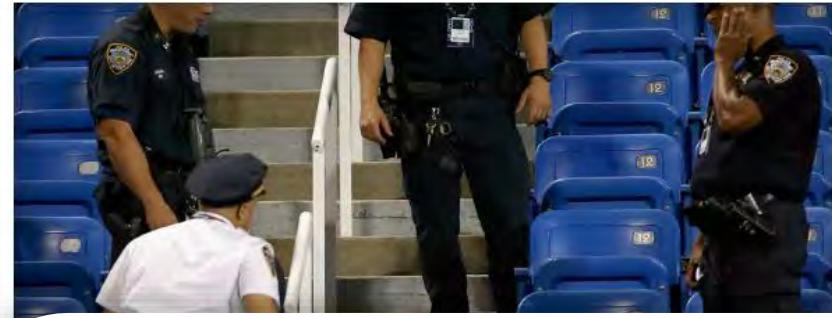
THE VERGE

TECH US & WORLD DRONES 17 NEW ARTICLES

Drone crash interrupts US Open tennis match

NYPD opens investigation into unauthorized UAV

By Amar Toor on September 4, 2015 02:31 am



USA TODAY

NEWS SPORTS LIFE MONEY TECH TRAVEL OPINION 76° CROSSWORDS ELECTIONS 2016 OLYMPICS MORE

Small drone crashes near White House despite ban against flights in D.C.

Bart Jansen, USA TODAY 5:12 p.m. EDT October 9, 2015

WASHINGTON — U.S. Park Police confiscated a drone that crashed on the Ellipse near the White House on Friday and issued a citation to the operator involved.

Howard Solomon III of Washington, D.C., was cited with launching, landing or operating an unmanned

GREAT OFFERS ON PRE-OWNED VEHICLES! AutoNal

Drone incidents are increased

Drones can do serious damage to airplanes, video shows

USA TODAY NETWORK Ashley May, USA TODAY Published 5:19 p.m. ET Oct. 17, 2016 Updated 1:55 p.m. ET Oct. 17, 2016

Commercial pilot John Marking tells his story of a small drone while working at an off-road desert race in Mexico. USA TODAY



(Photo: University of Dayton)

CONNECT TWEET LINKEDIN

Even a small drone crash can cause major damage, a test video shows.

Kevin Poormon, a University of Dayton student, has performed numerous tests with drones. He has mimicked a midair collision between a 2.1-pound Mooney M20 airplane and a drone. The drone bore into the plane.

The New York Times

Gatwick Airport Shut Down by 'Deliberate' Drone Incursions



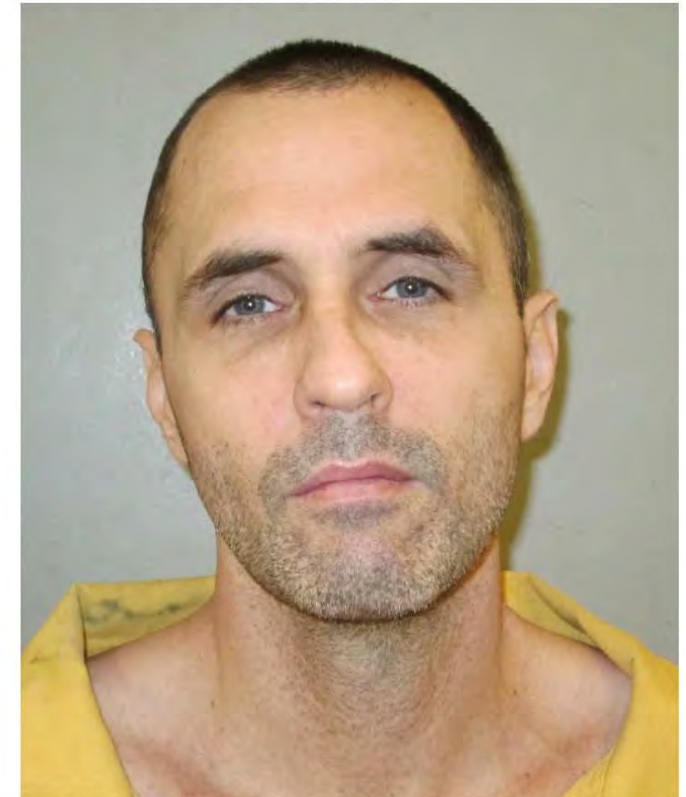
LONDON

ILLEGAL DRONE CLOSES AIRPORT

Gatwick Airport shut down after a drone appeared in what authorities are calling "a deliberate act" to disrupt air travel. Peter Nicholls/Reuters

The New York Times

South Carolina Inmate May Have Used Drone in Prison Escape, Officials Say



Jimmy Causey escaped from Lieber Correctional Institution in Ridgeville, S.C., this week. He was captured in Texas. South Carolina Department of Corrections

Drone accidents have increased

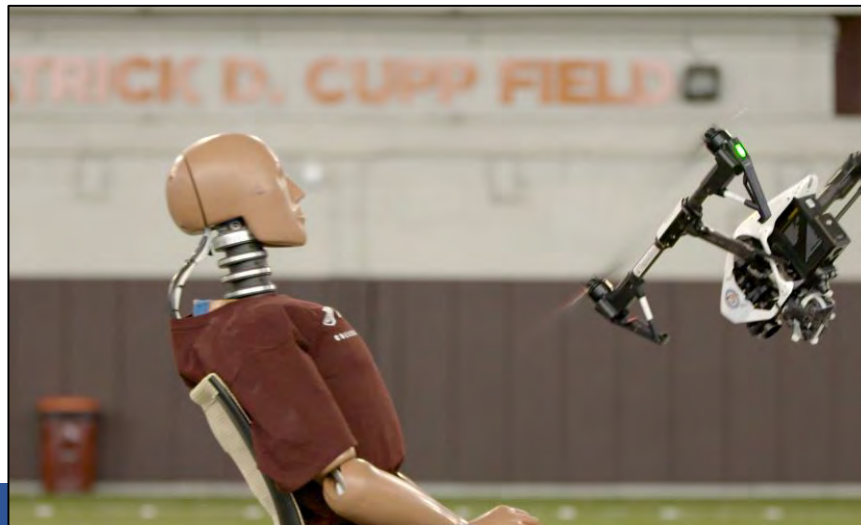
Drone Hits an Airplane



Drone Crashes Through Window



Drone Hits Man's Head



Ways to take down illegal drones



Battelle Drone Defender



Skywall 100 Drone Defense System



Excipio Anti Drone System



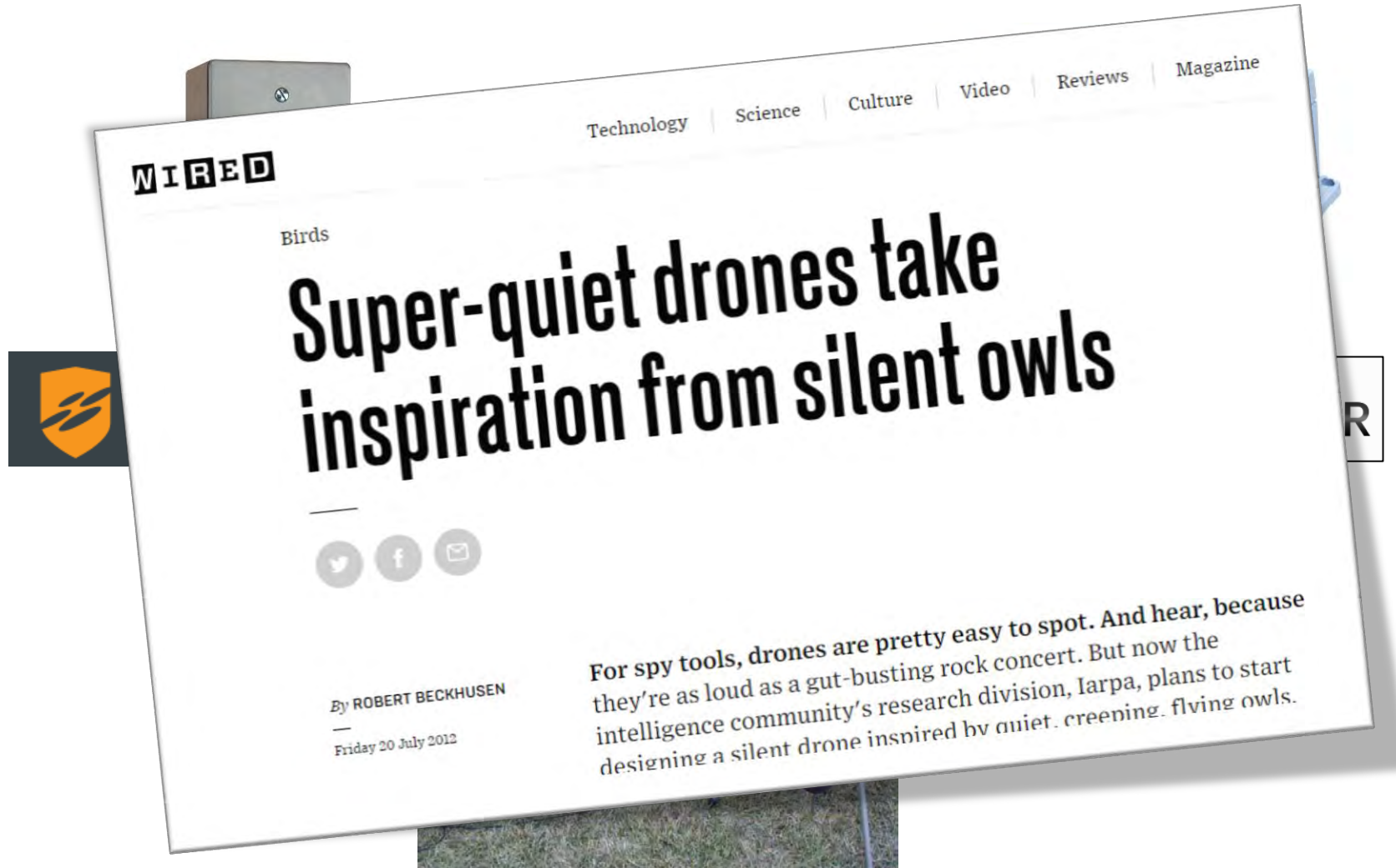
Drone Catching Eagles

Assuming the drone is accurately detected



Existing Technologies

- Acoustic signature-based



Tien Pham et. al., U.S. Army Research Laboratory

Existing Technologies

- Video-based

mUAVs Aircrafts

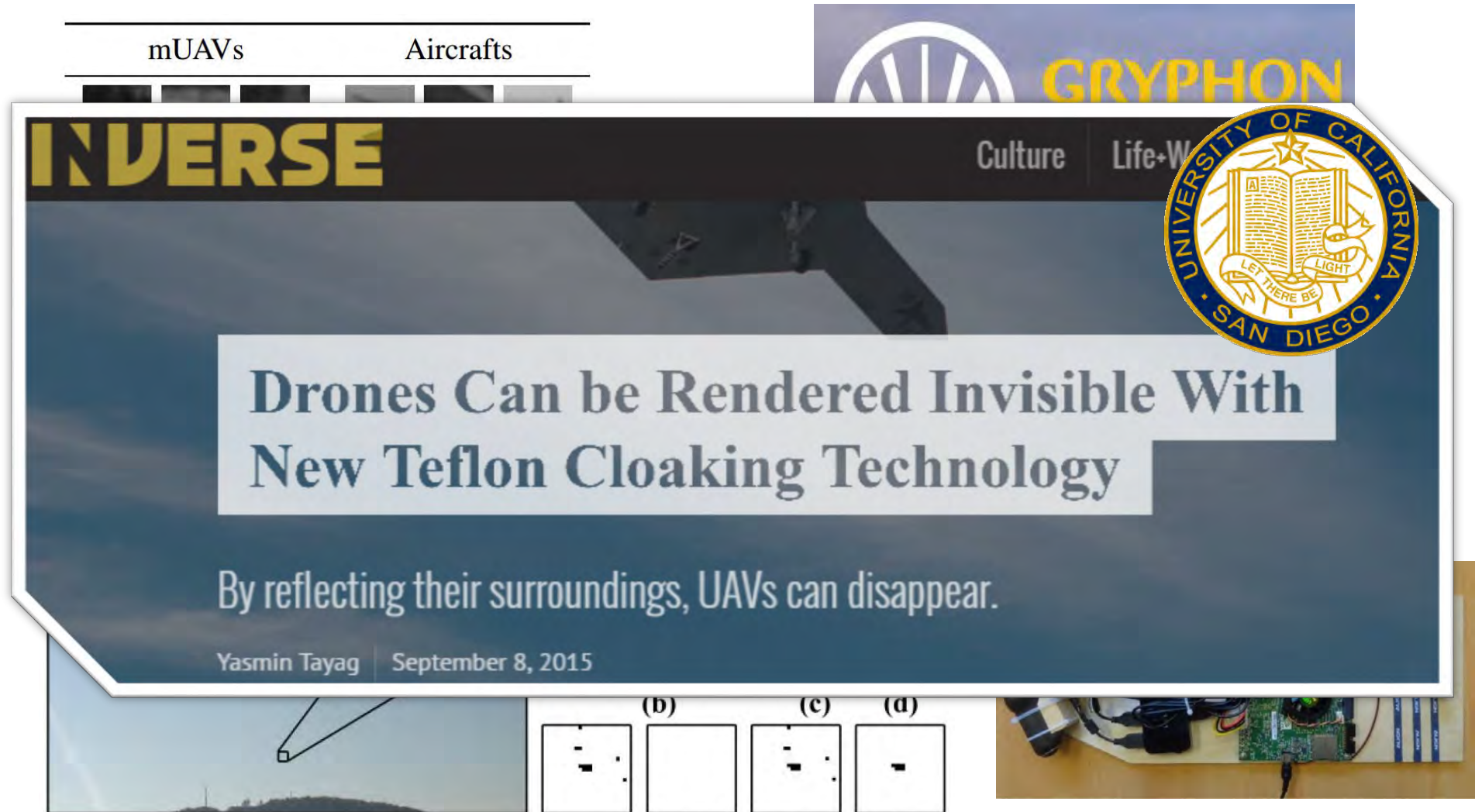
INVERSE Culture Life+W

Drones Can be Rendered Invisible With New Teflon Cloaking Technology

By reflecting their surroundings, UAVs can disappear.

Yasmin Tayag | September 8, 2015

(a) (b) (c) (d)



Tamas Zsedrovits et. al., 2011, 2012

Existing Technologies

- RF-based



observing the up-link
and down-link
communication
between the drone
and its controller.

The mobile devices/laptops may be recognized as
the drones

Existing Technologies

- Radar-based



Disadvantages:

1. Drones are often small and made by plastic, they don't reflect signal well
2. This technique creates much interference to the environment and expensive

Existing Technologies

- MAC address

No.	Time	Source	Destination	Protocol	Length	Info
36	36.863998	192.168.1.2	91.189.94.25	TCP	74	55256 > http [SYN] Seq=0 Win=14600 Len=0 MSS=1460 SACK PERM=1 TSval=165424 TSecr=0 WS=128

maintain a database for all the drones

41	39.089731	192.168.1.1	192.168.1.3	TCP	66	5551 > 58256 [ACK] Seq=27 Ack=17 Win=1448 Len=0 TSval=1257 TSecr=662982706
42	39.090229	192.168.1.1	192.168.1.3	TCP	92	5551 > 58256 [PSH, ACK] Seq=27 Ack=17 Win=1448 Len=26 TSval=1257 TSecr=662982706
43	39.092621	192.168.1.1	192.168.1.3	TCP	101	5551 > 58256 [PSH, ACK] Seq=52 Ack=23 Win=1448 Len=25 TSval=1257 TSecr=662982706

these ports may be modified

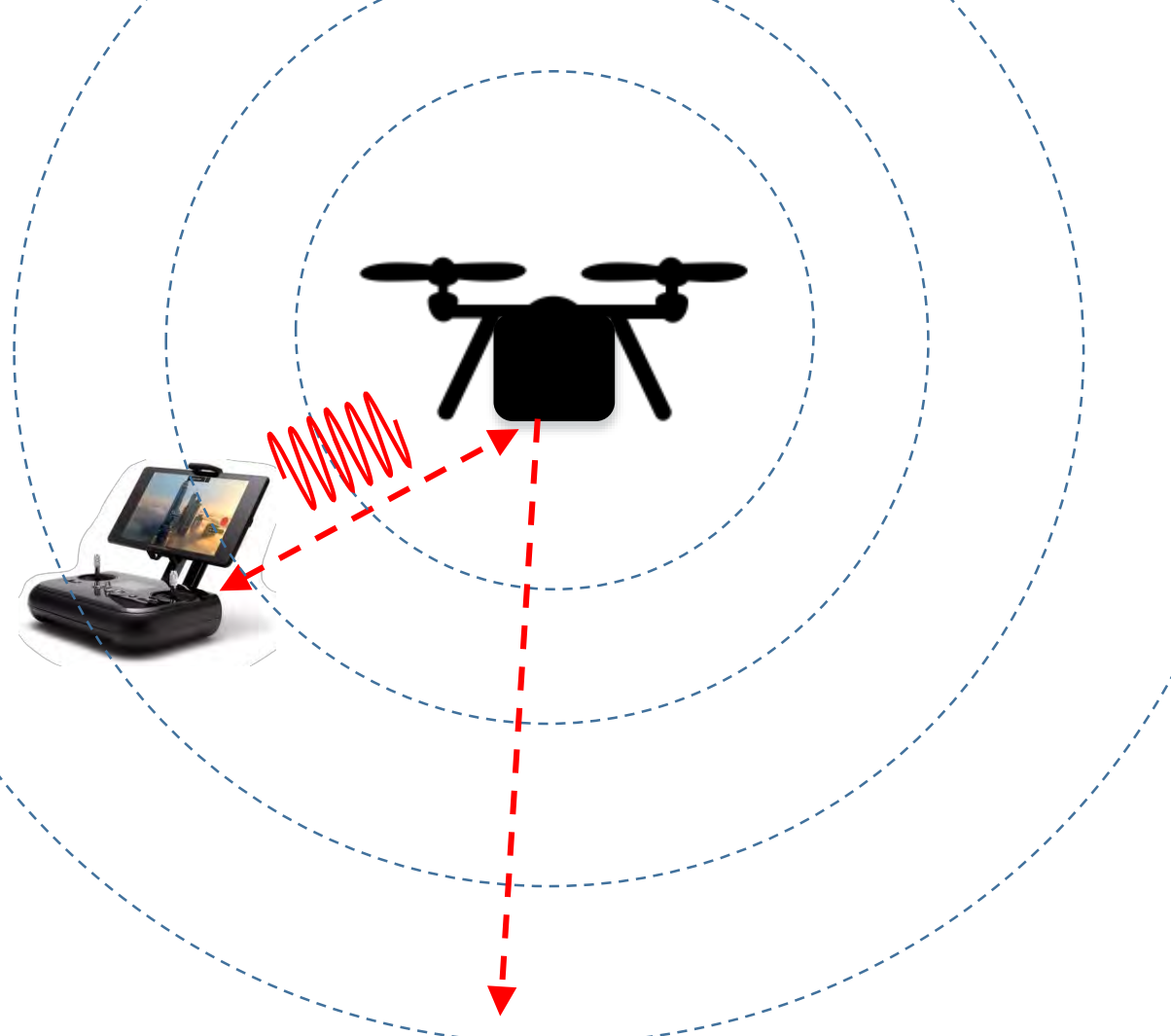
47	39.101470	192.168.1.1	192.168.1.3	TCP	123	5551 > 58256 [PSH, ACK] Seq=121 Ack=0 Win=1448 Len=37 TSval=1258 TSecr=662982715
48	39.101512	192.168.1.1	192.168.1.3	TCP	72	36986 > 58257 [PSH, ACK] Seq=1 Ack=0 Win=5792 Len=6 TSval=1258 TSecr=662982715
49	39.101723	192.168.1.1	192.168.1.3	TCP	66	36986 > 58257 [FIN, ACK] Seq=7 Ack=0 Win=5792 Len=0 TSval=1258 TSecr=662982715
50	39.102727	192.168.1.1	192.168.1.3	TCP	92	5551 > 58256 [PSH, ACK] Seq=178 Ack=67 Win=1448 Len=26 TSval=1258 TSecr=662982715

the MAC address could be easily spoofed

55	39.113968	192.168.1.1	192.168.1.3	TCP	74	ftp > 58259 [SYN, ACK] Seq=0 Ack=0 Win=5792 Len=0 MSS=1460 SACK PERM=1 TSval=1260 TSecr=662982725 WS=4
56	39.114592	192.168.1.1	192.168.1.3	TCP	74	5559 > 58260 [SYN, ACK] Seq=0 Ack=0 Win=5792 Len=0 MSS=1460 SACK PERM=1 TSval=1260 TSecr=662982725 WS=4
57	39.124014	192.168.1.1	192.168.1.3	TCP	74	sgi-eventmond > 58261 [SYN, ACK] Seq=0 Ack=0 Win=5792 Len=0 MSS=1460 SACK PERM=1 TSval=1261 TSecr=662982733 WS=4
58	39.125887	192.168.1.1	192.168.1.3	FTP	92	Response: 220 Operation successful
59	39.127903	192.168.1.1	192.168.1.3	TCP	66	ftp > 58259 [ACK] Seq=27 Ack=16 Win=5792 Len=0 TSval=1262 TSecr=662982736
60	39.128224	192.168.1.1	192.168.1.3	FTP	92	Response: 230 Operation successful
61	39.130368	192.168.1.1	192.168.1.3	FTP	92	Response: 250 Operation successful
62	39.133238	192.168.1.1	192.168.1.3	FTP	101	Response: 227 PASV ok (192,168,1,1,213,205)

Proposed Approach

Matthan passively listens the signal from Drone's communication and analyses the drone's physical characteristics

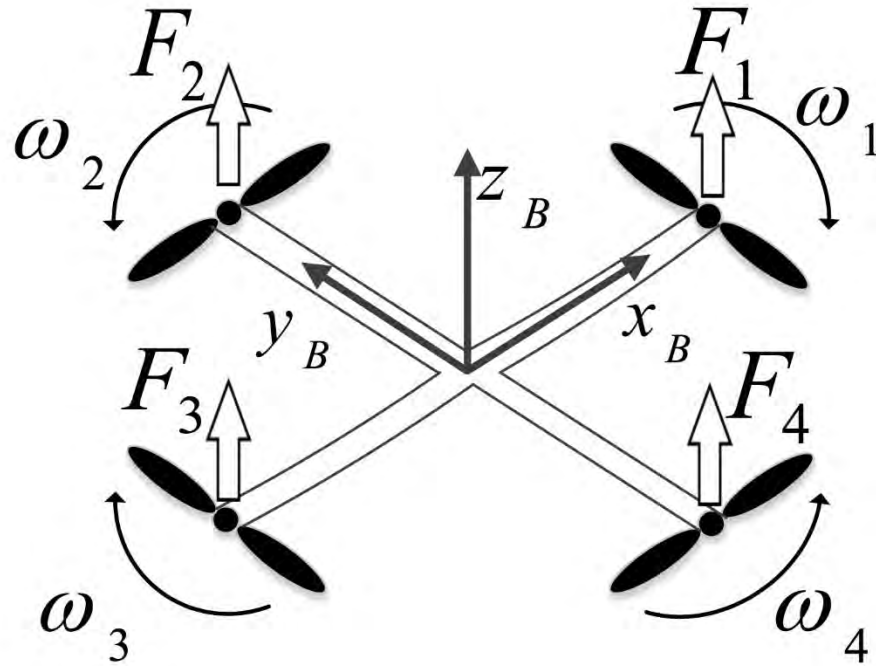


Physical Siganatures:

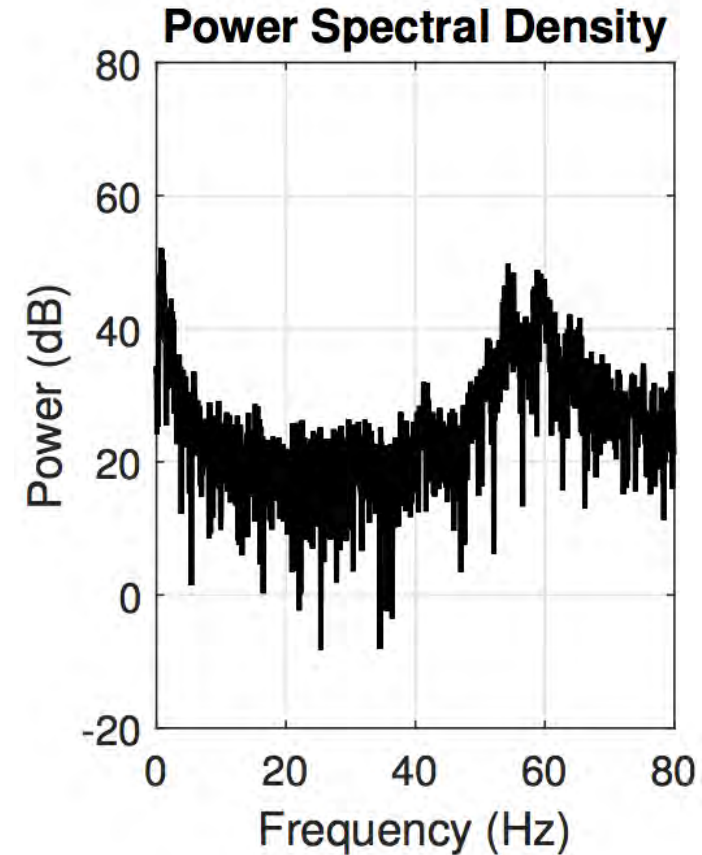
- **Body Shifting** (caused by Control Loop Mechanism)
- **Body Vibration** (caused by Propellers Motion)

Matthan

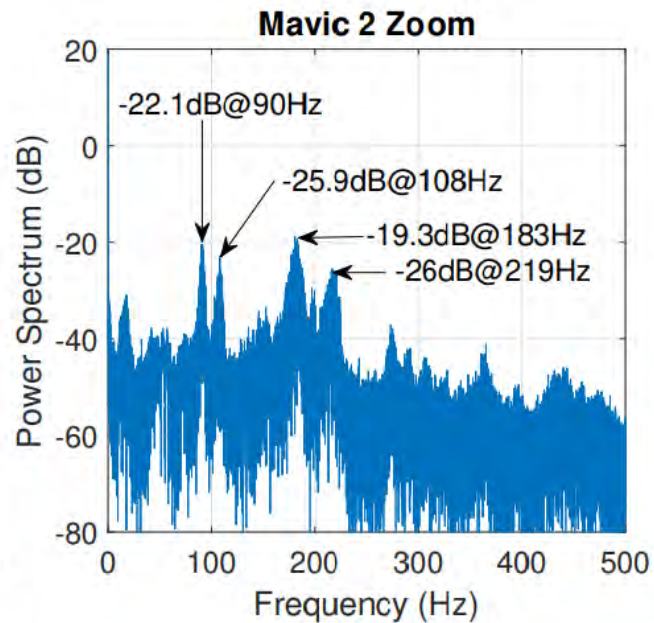
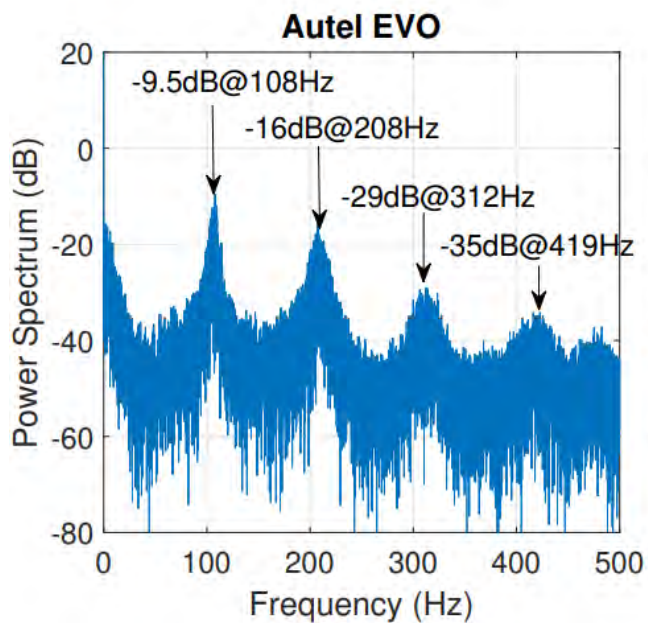
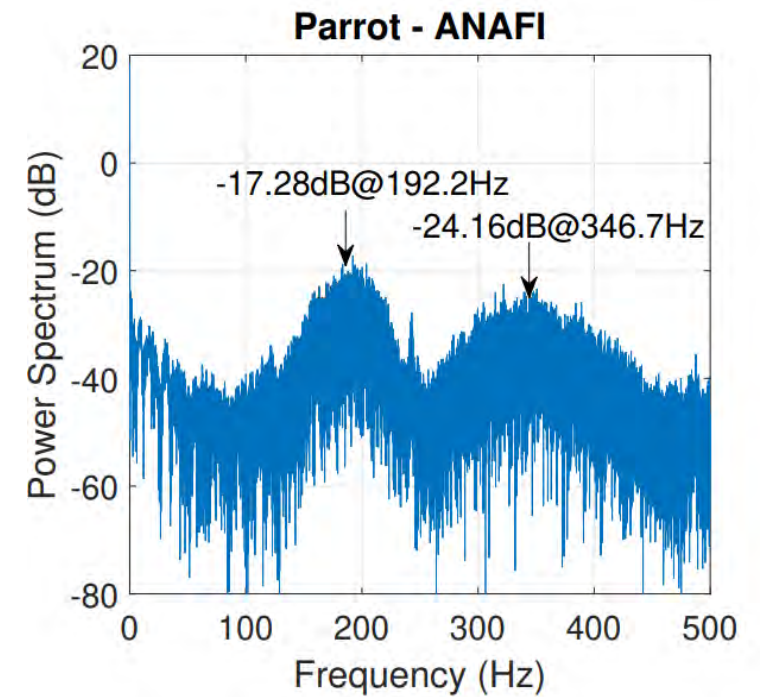
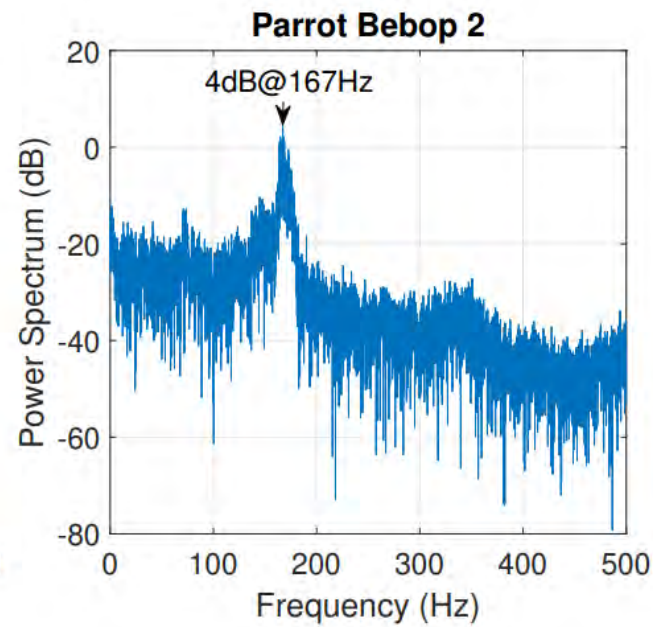
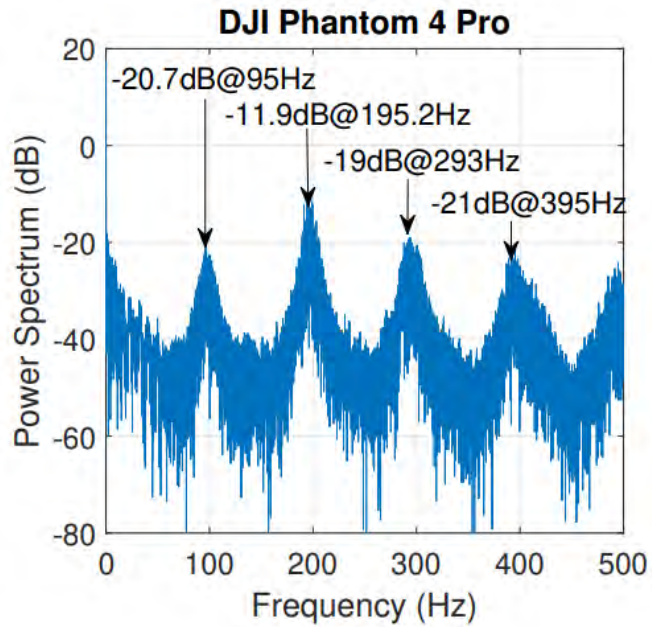
Body Vibration Observation



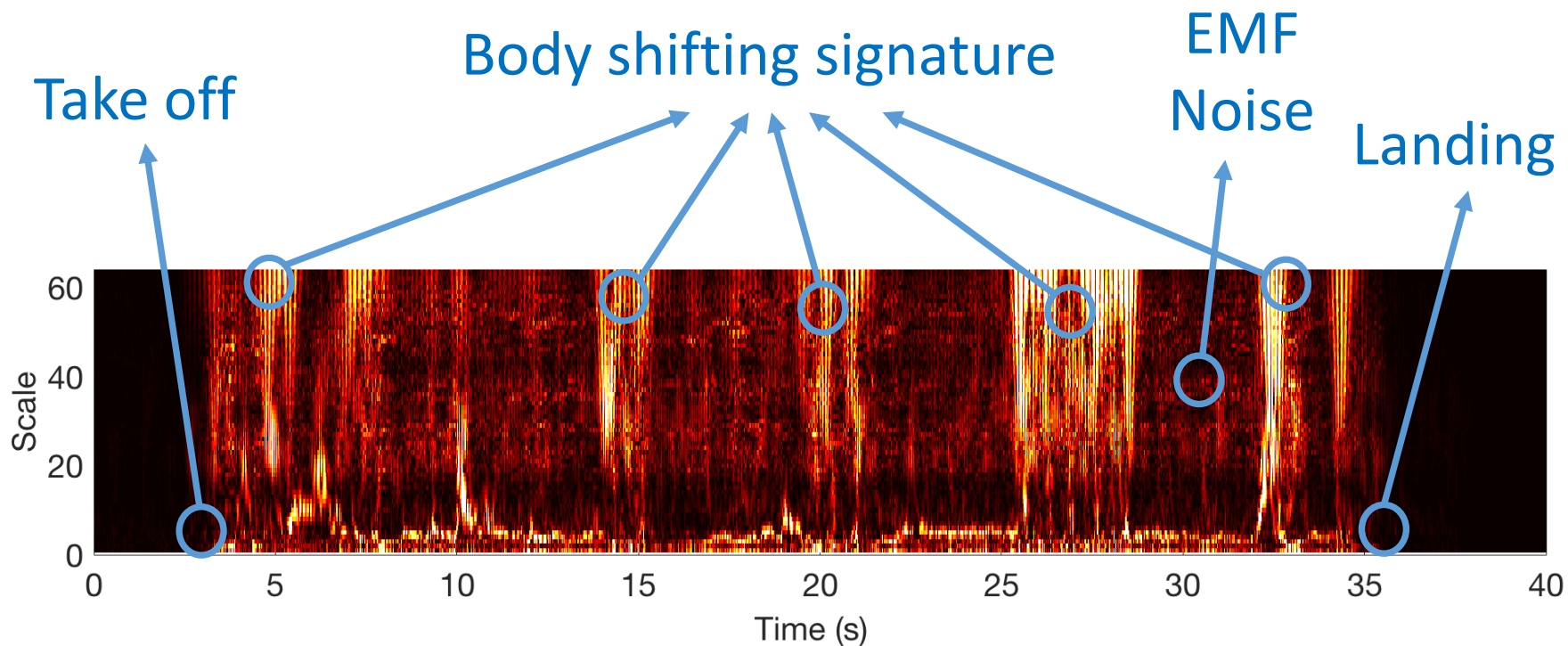
Body vibration signature



Idea: The body vibration of the drone can be detected by a Short-Time Fourier Transform



Body Shifting Validation



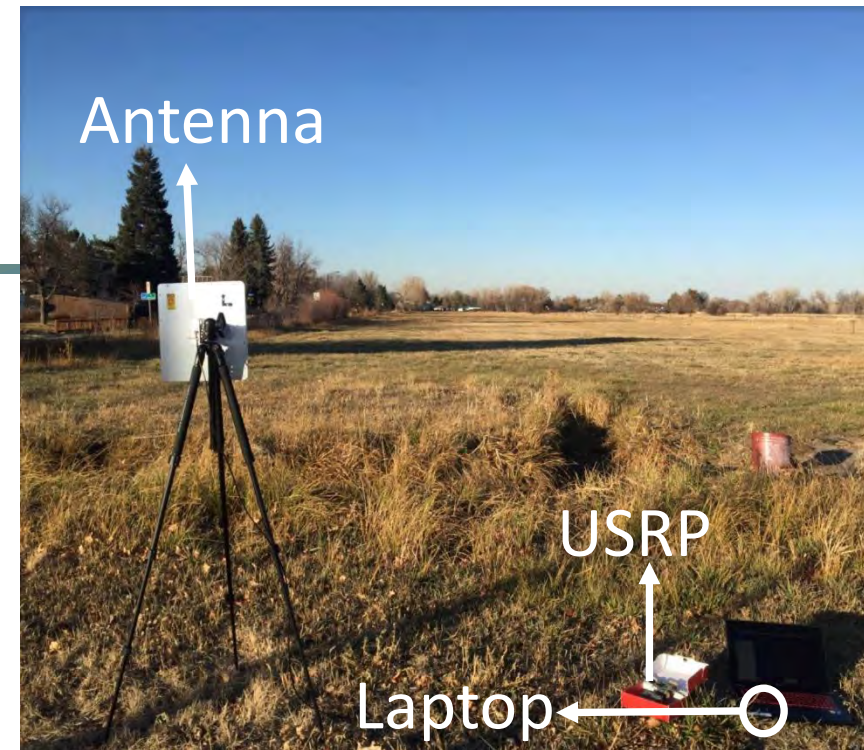
Evaluation

❑ Hardware

- SDR USRP B200
- 2.4GHz directional antenna

❑ Environment setup

- Drones used: *Parrot Bebop, Protocol Dronium One Special Edition, Sky Viper, Swift Stream, Parrot AR Drone, Protocol Galileo Stealth, and DJI Phantom*
- Environments: Urban, Campus, Sub-urban
- Distance: 10m → 600m

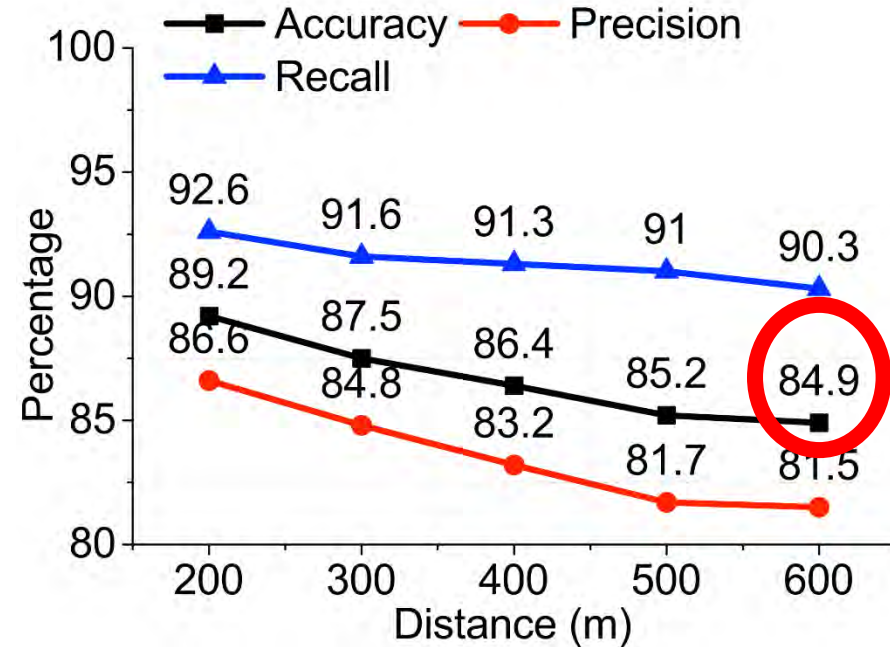
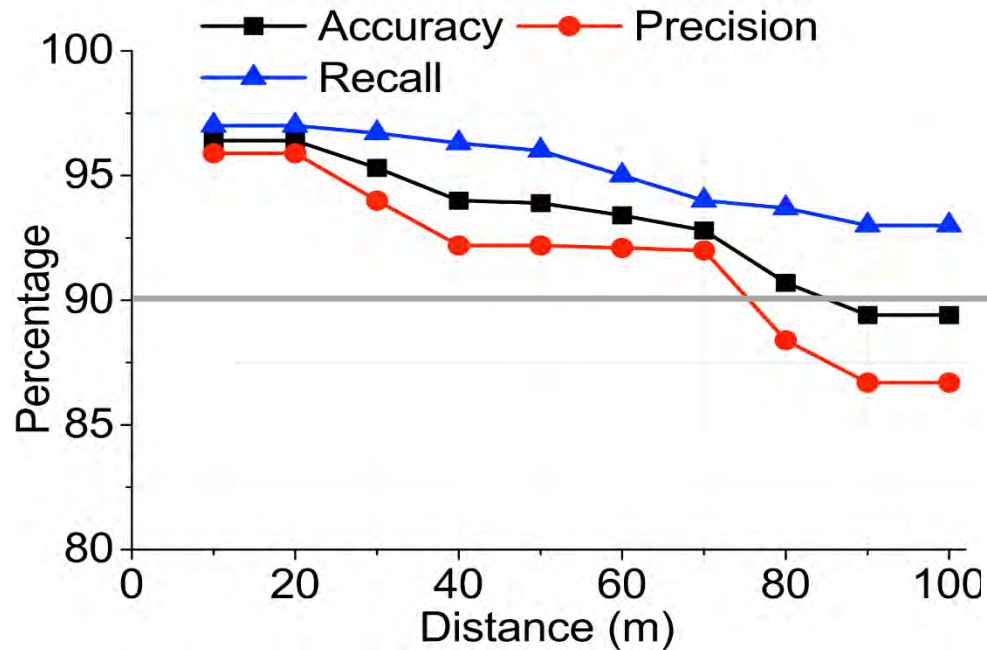


Setup



7 types of used Drones

Detect Drones at Different Distances



Distance from **10m to 600m**

Drone Localization

Drone incidents are increased

AP Leaflets dropped over NFL games revive concerns about drones

Leaflets dropped over NFL games revive concerns about drone

November 27, 2017

SANTA CLARA, Calif. (AP) — A Northern California man was cited for flying a drone over two NFL games this

SFGATE LOCAL NEWS SPORTS REAL ESTATE BUSINESS A&E EAT + DRINK LIVING TRAVEL OBITS

Drone drops flyers with swastikas outside Ariana Grande concert, fundraiser dinner in Sacramento

By Dianne de Guzman, SFGATE Updated 5:33 pm PDT, Saturday, May 4, 2019

We need to localize both the drone and its controller

- NFL football
- United States
- Oddities
- North America
- Sports
- California
- U.S. News
- Football

Federal and local laws prohibit flying drones near games, and authorities are examining additional ways to prevent the unmanned aircraft from hovering over crowds of tens of thousands of people after the flights Sunday, Santa Clara police Lt. Dan Moreno said. He declined to discuss the security measures being considered.

The biggest concern is a drone injuring spectators, Moreno said.

“Those blades are sharp and spinning fast,” he said, adding that authorities also are concerned with terrorists arming drones, though no such attack has been reported in the

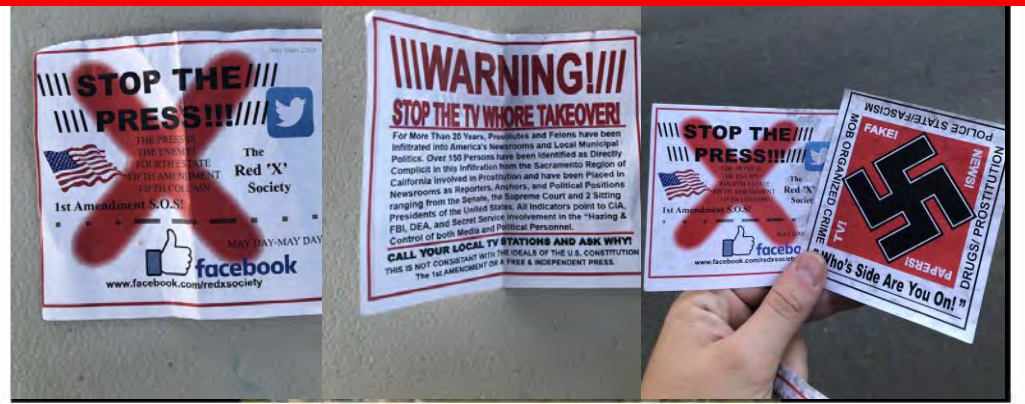
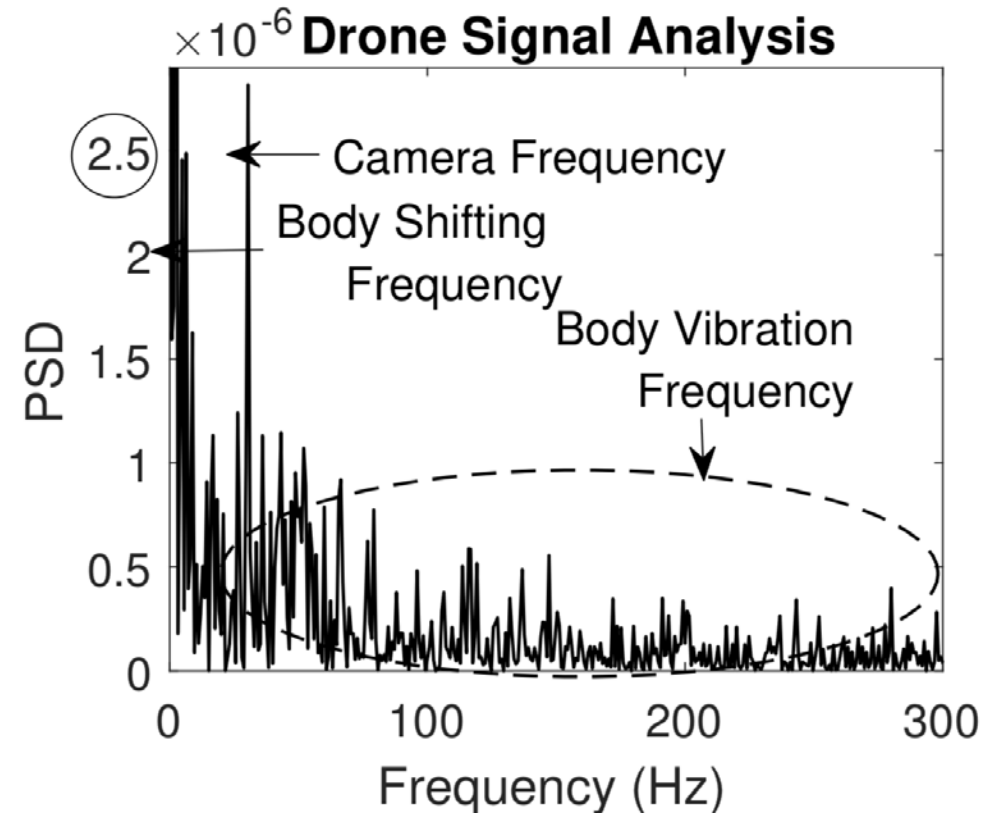
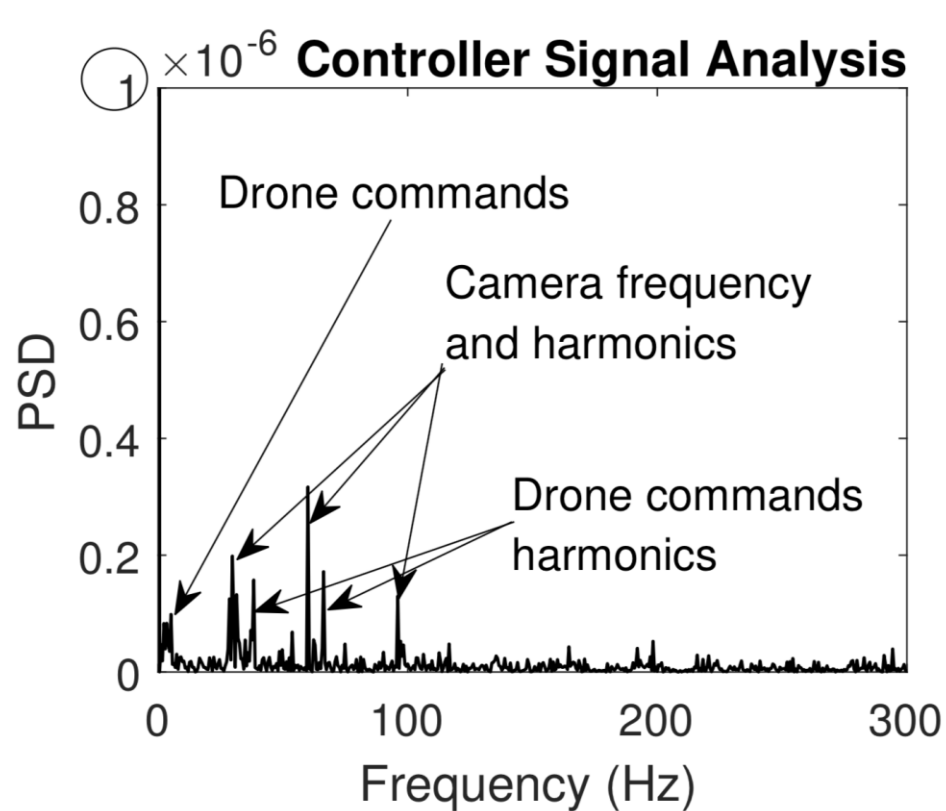


Photo: Spooth/Getty Images

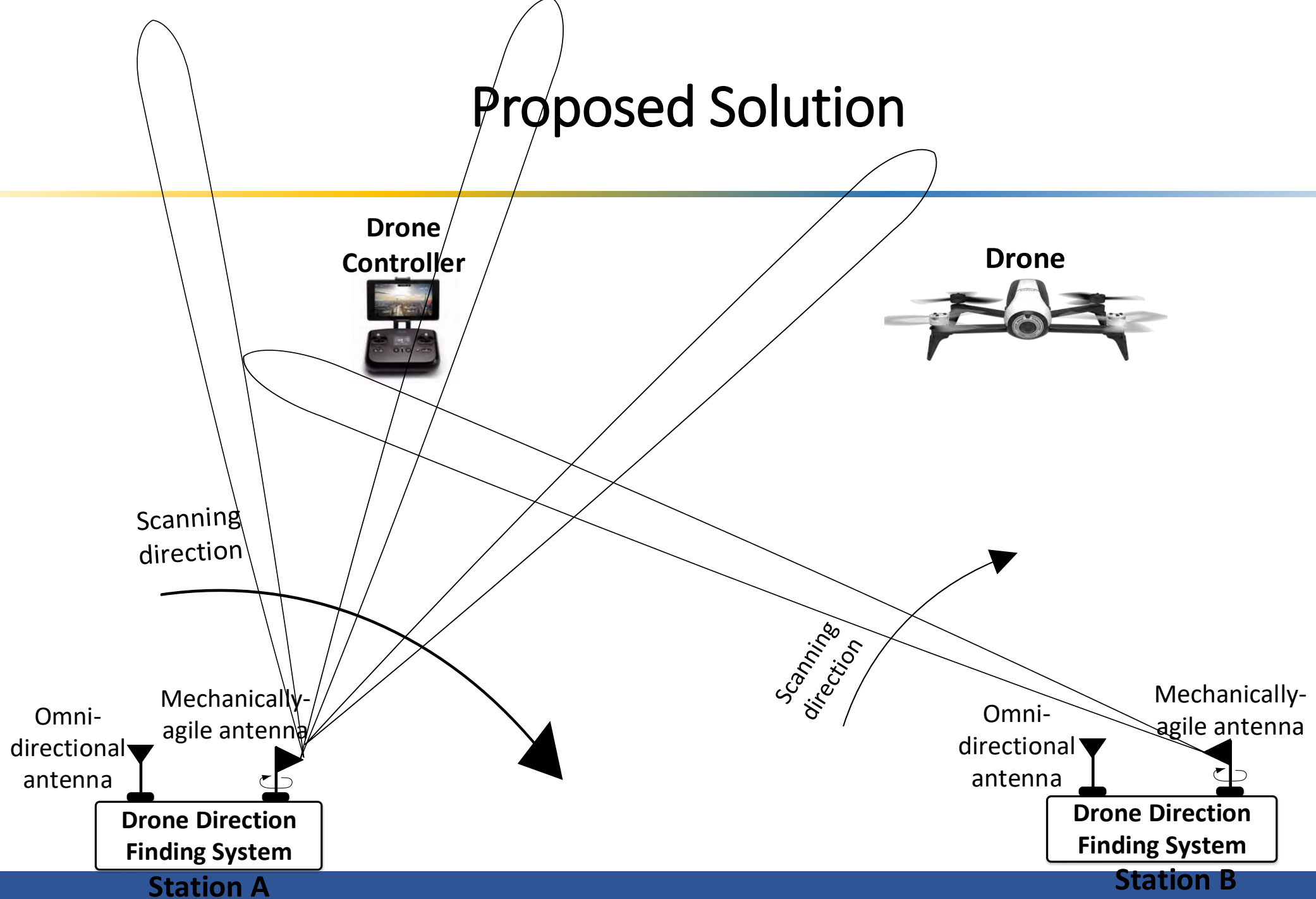
Photo illustration -- A drone (not the one pictured) was seen outside of an Ariana Grande concert and a Sacramento State fundraiser dinner, dropping flyers with anti-media sentiments onto crowds below.

Localizing the controller

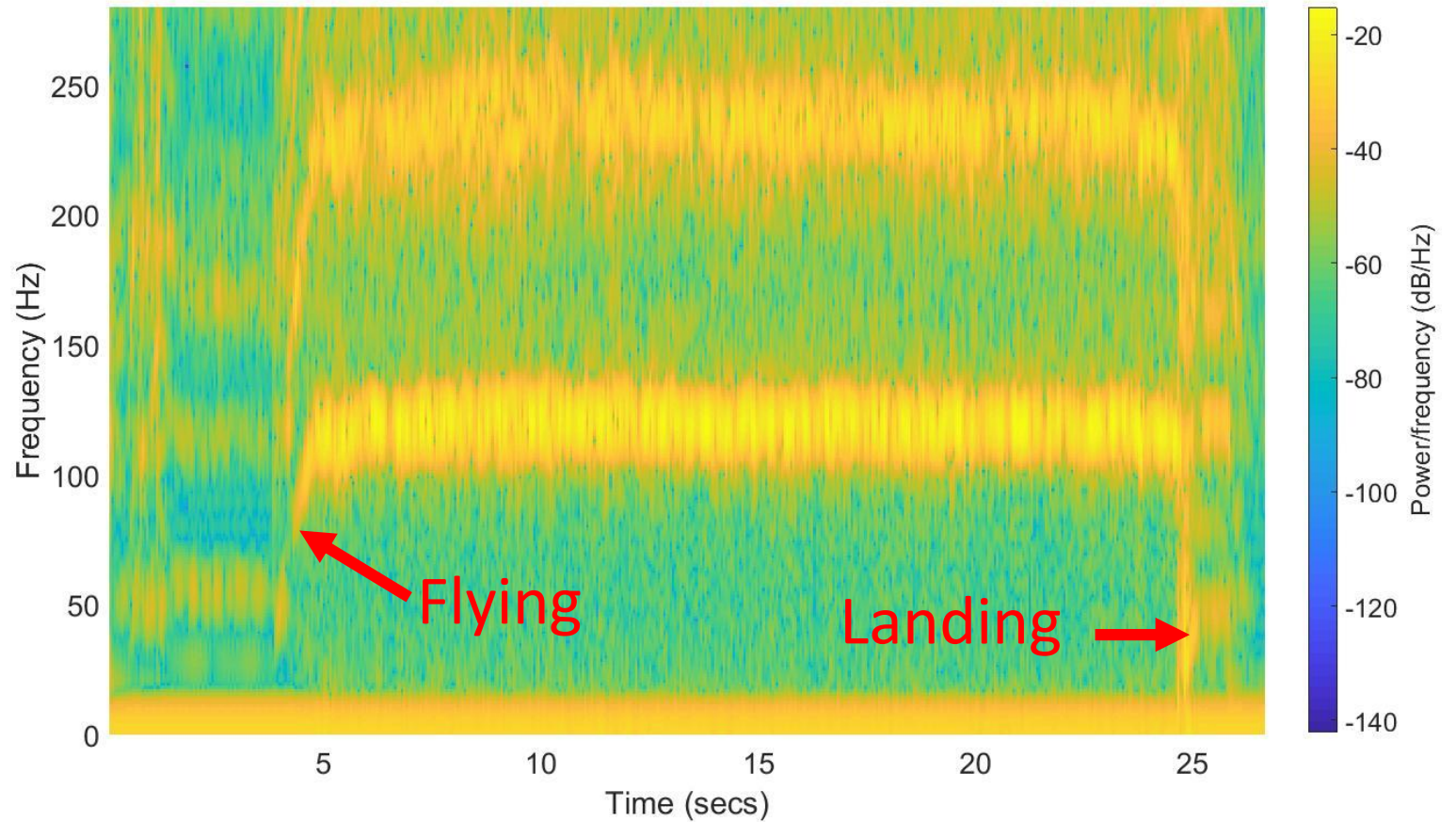
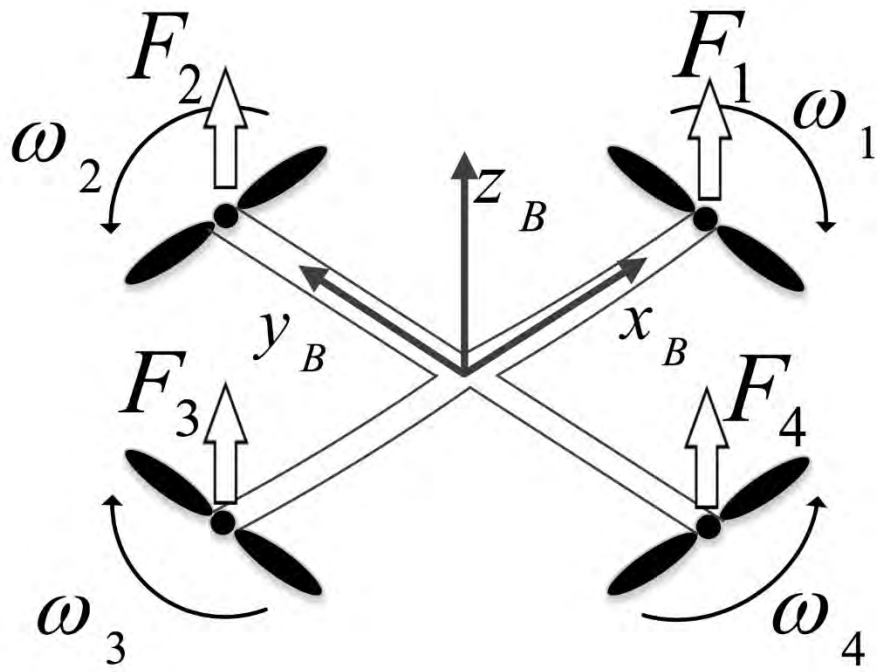
- Detect the controller based on its correlation with the drone signal



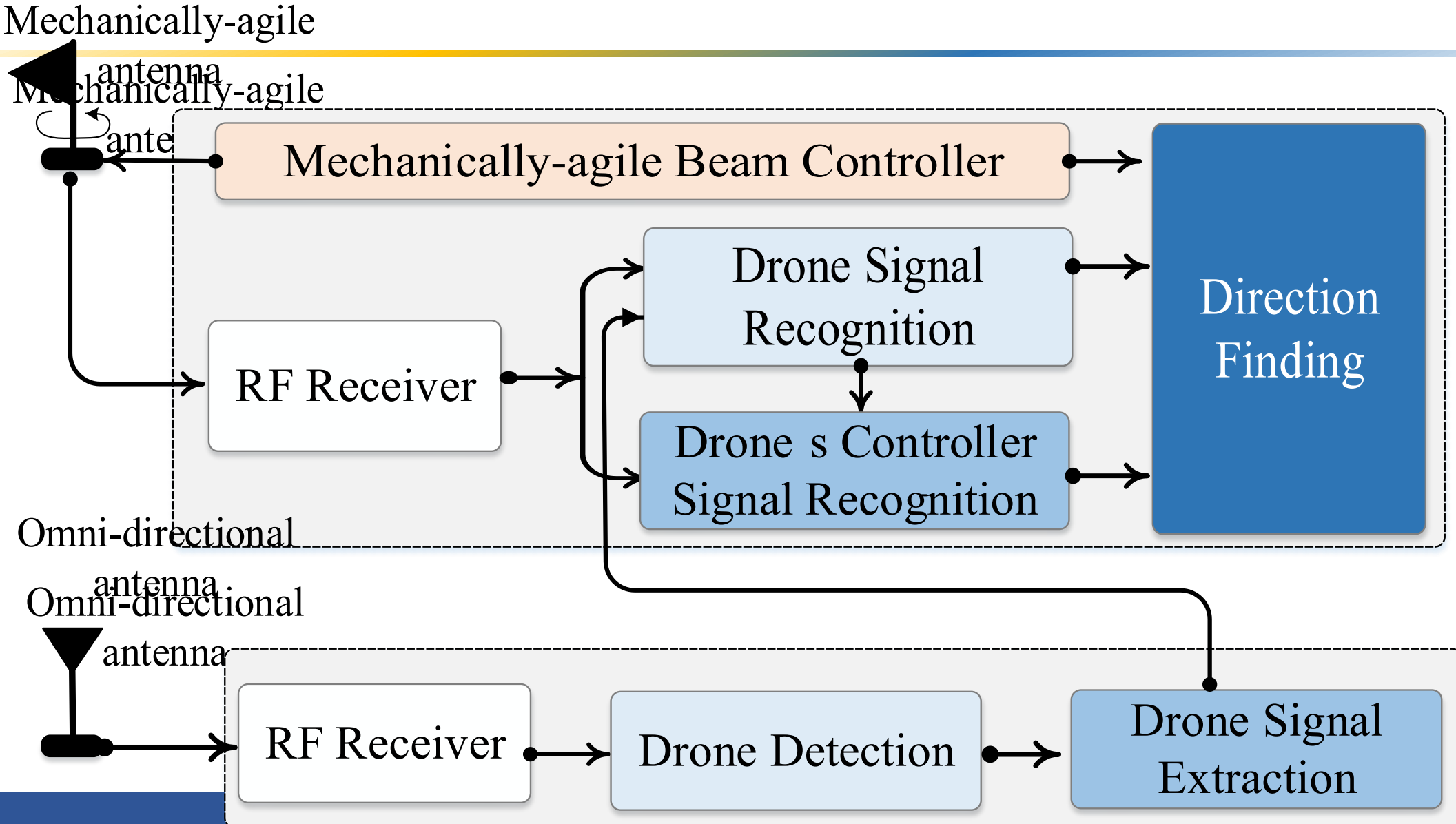
Proposed Solution



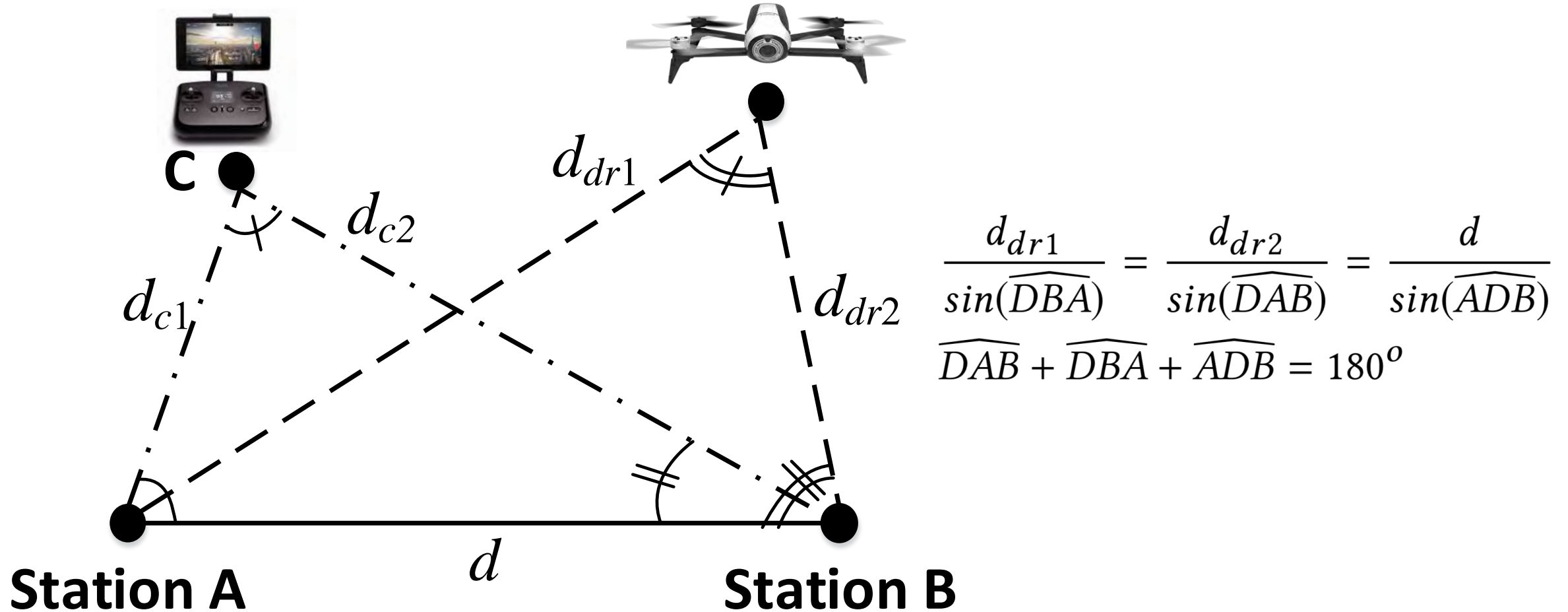
Localizing the drone signal based on drone body vibration signature



Proposed System



Localizing the drone



Experimental Validation

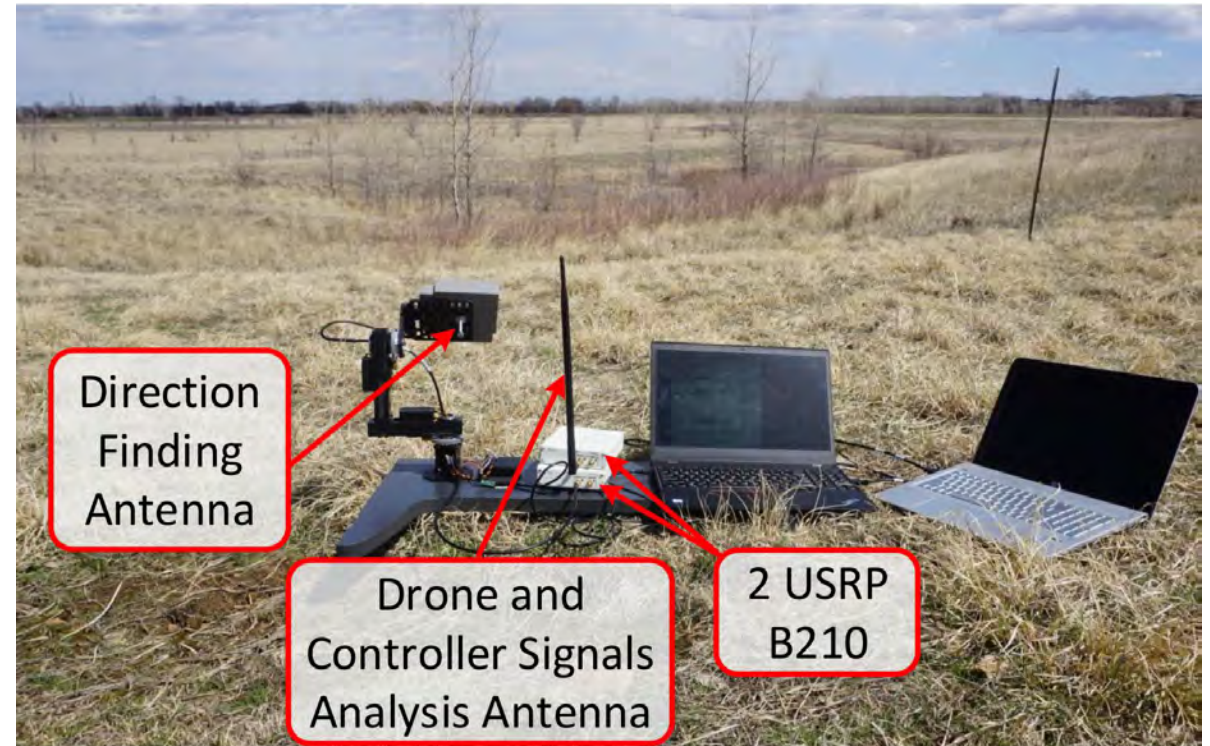
- ❑ Drones:
 - Bebop 2, DJI Phantom Pro 4

- ❑ Software Defined Radios:
 - 2 x USRP B210

- ❑ Antenna
 - 9 dBi omnidirectional antenna (detection)
 - 15 dBi directional antenna (angle finding)

- ❑ Distance to drone
 - 30m to 150m

- ❑ # of measurements: 100

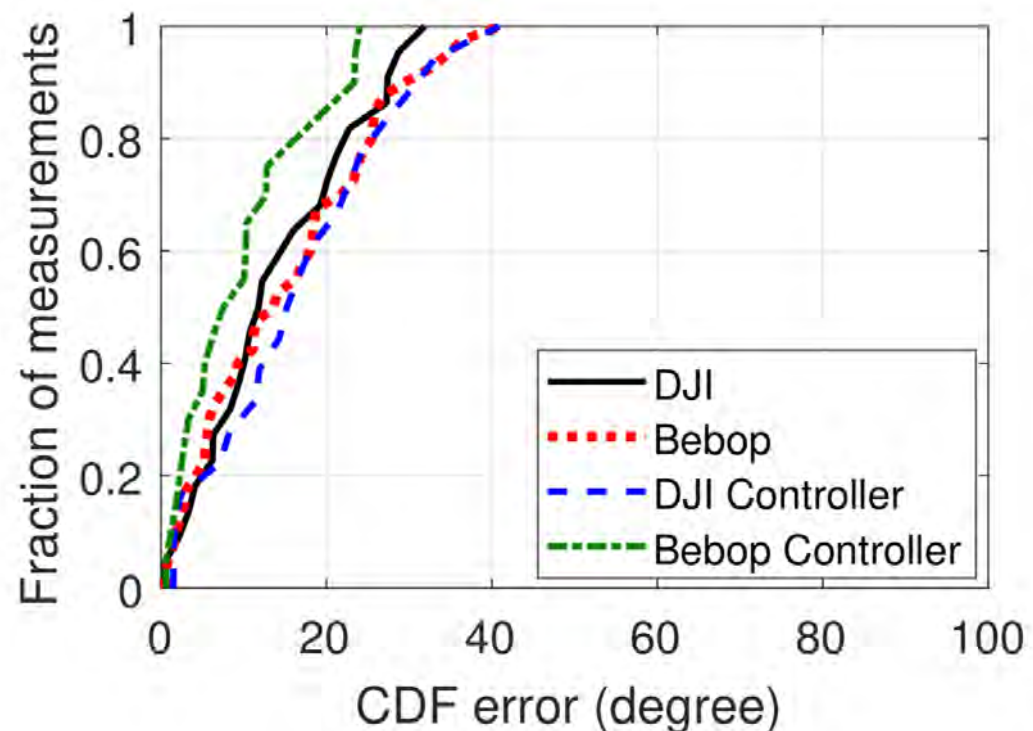


A sensing station during experiment

Preliminary Results (1)

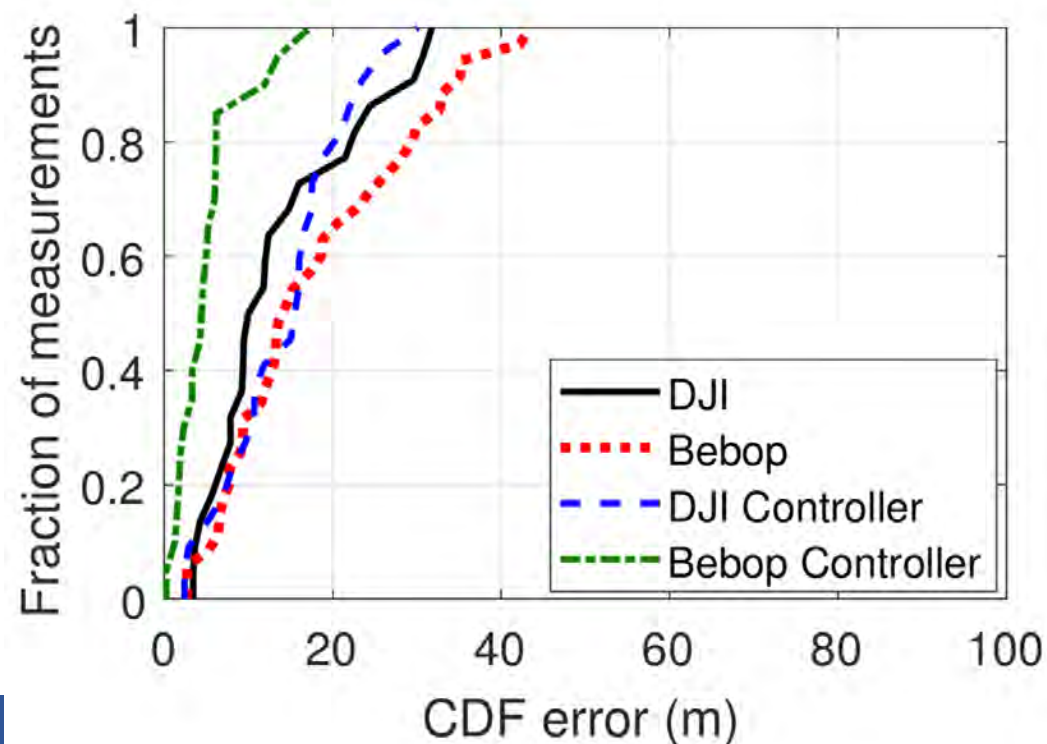
□ Estimating the angles (mean error)

- DJI drone (9.9°), Bebop drone (14.5°)
- DJI controller (15.45°), Bebop controller (4.4°)

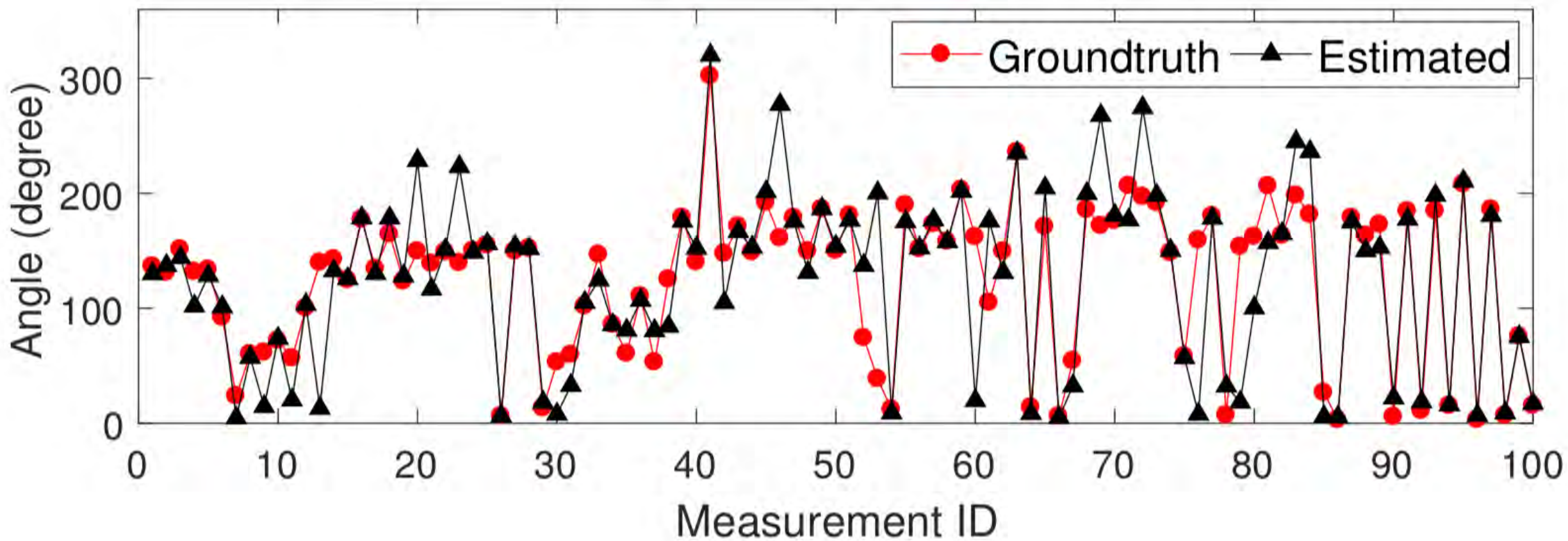


• Estimating the distances (mean error)

- DJI drone (11.8 m), Bebop 2 (13.62m)
- DJI controller (15.21m), Bebop 2 controller (7.5m)



Preliminary Results (2)



Direction finding results using single station

Conclusions

- ❑ We introduce a **PASSIVE** system **to detect and localize the drones and its controllers** based on their emitted RF signal, which is designed for communication
- ❑ It is an on-going research effort, please let us know if you are interested...



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Dawn M.K. Zoldi, CEO P3 Tech Consulting

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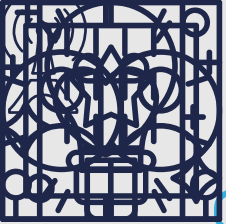
SOLUTIONS

THE UNIVERSAL INTEGRATOR

Our Office Locations



- ★ Global Headquarters
- Service Area
- Regional Office
- Field Office



Scientel Solutions Highlights

Diversity

Our winning team is comprised of 20% females, 30% minorities and over 15% veterans

25+ Years

Scientel Solutions was originally established in 1992 as Nuclear Energy Services (Halliburton)

300+

Over 300 towers built

Connected

Direct connection into over 20 major data centers spanning 3 continents

Innovation

Highly trained engineering team with the ability to lead customers to reach their full technological potential

\$1M

Scientel has donated over \$1M to charitable and veteran organizations over the last five years

Growth

Fifteen offices throughout North America + Europe

10M

Scientel has connected over 10 million IP addresses throughout the world

What We Do

Scientel Solutions works to Coach, Design, Implement, and Support advanced solutions to complex network challenges.



NETWORKING

- Switching/Routing
- PTP/Microwave
- WiFi/Private LTE
- Millimeter Wave
- IoT

SECURITY

- Drone Defense
- IP Video
- Access Control
- MET Unit

LIFECYCLE MANAGEMENT

- Remote Monitoring
- Break/Fix
- Warranty & Upgrades
- Network Operations Center
- Support & Maintenance

Drone Monitoring as a Service (DMAAS)

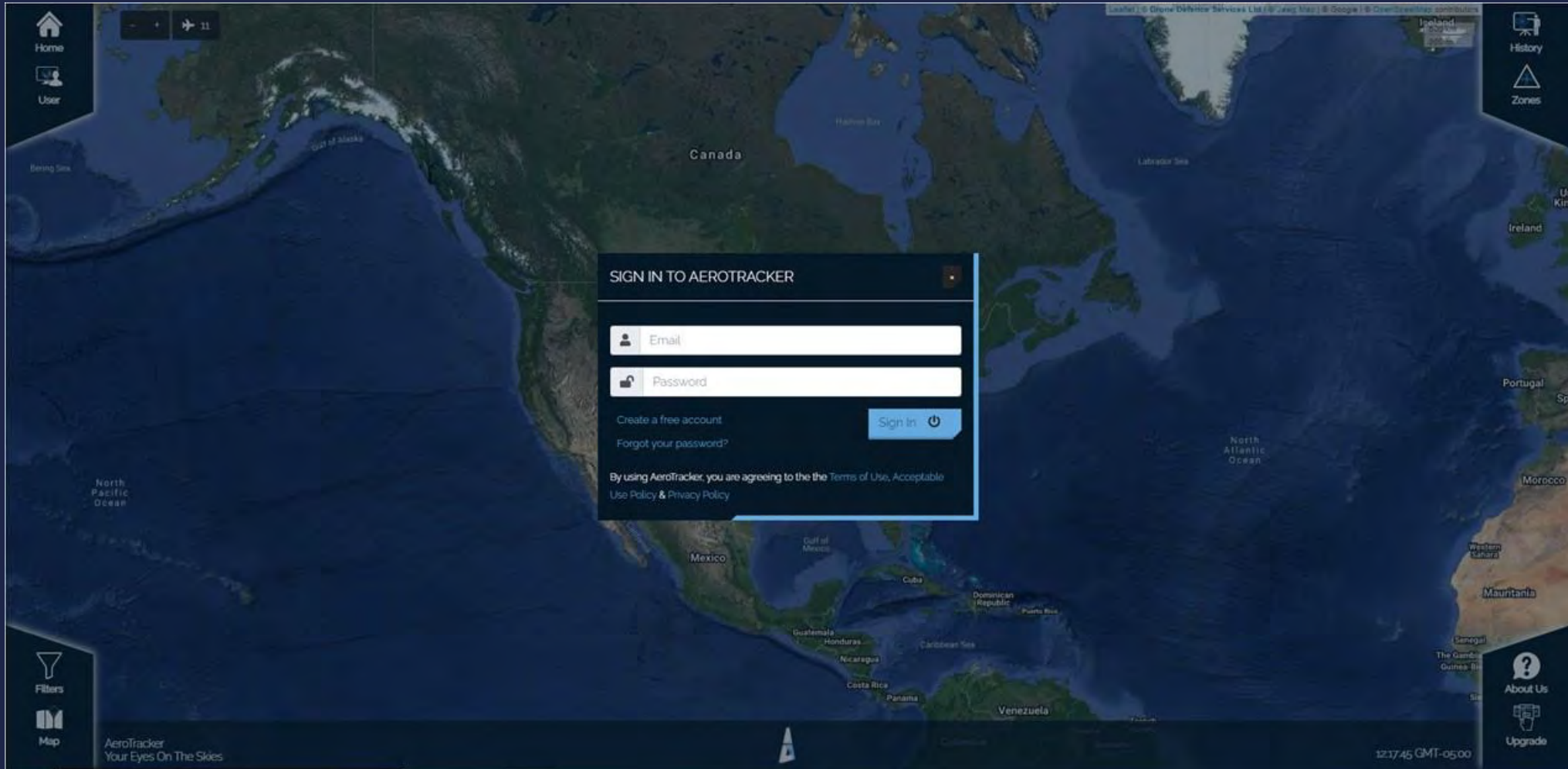
We use multi-sensory, radio frequency-scanning technologies to **detect, track and identify drones** across a large area, on land or at sea.

Our team works with security-cleared experts to design, implement and support the right system for your environment.

Our backwards-compatible systems can be fully integrated into existing Security Management Systems (SMS), reducing the training requirement for your staff.

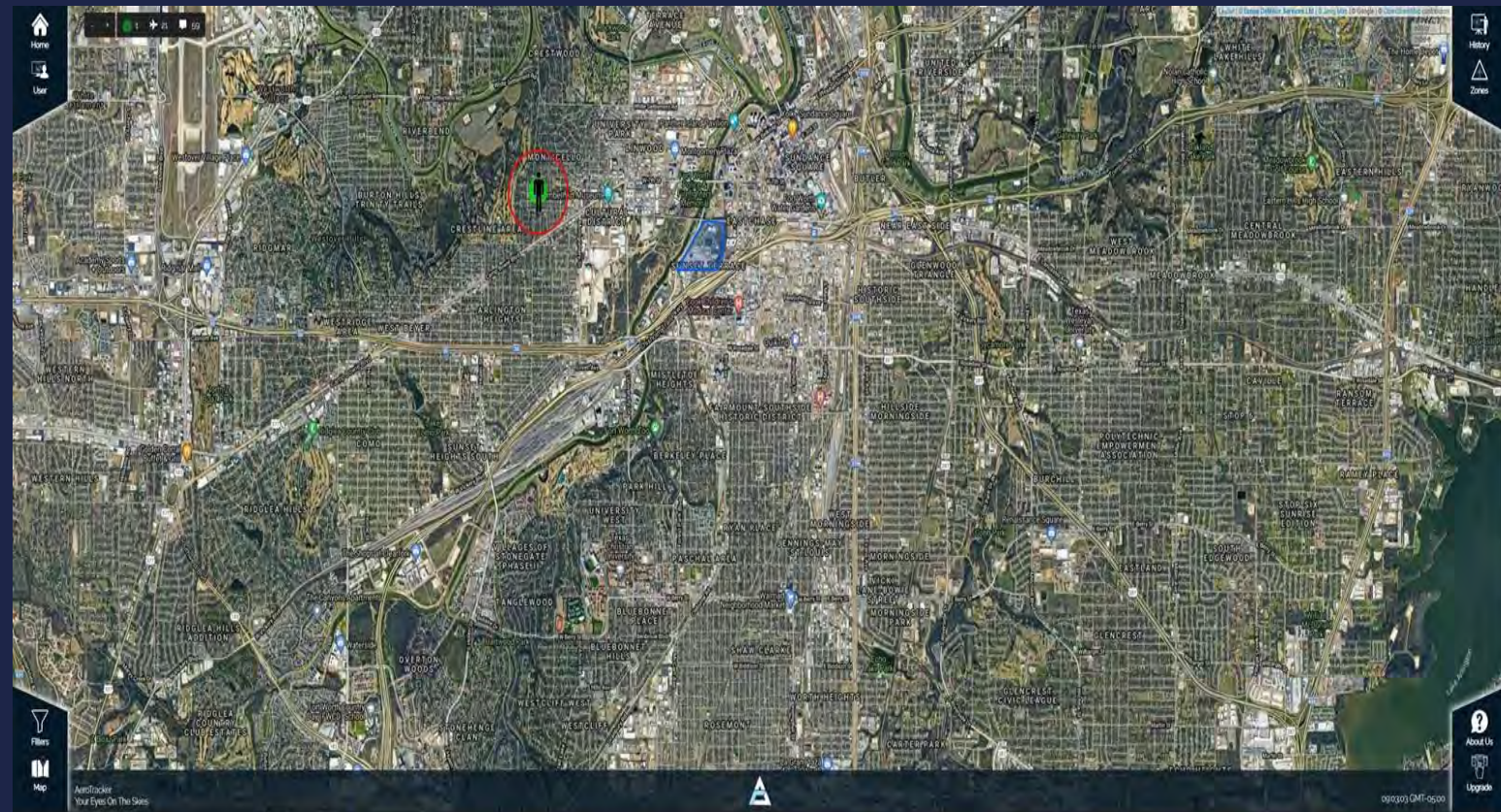


Sign in Page



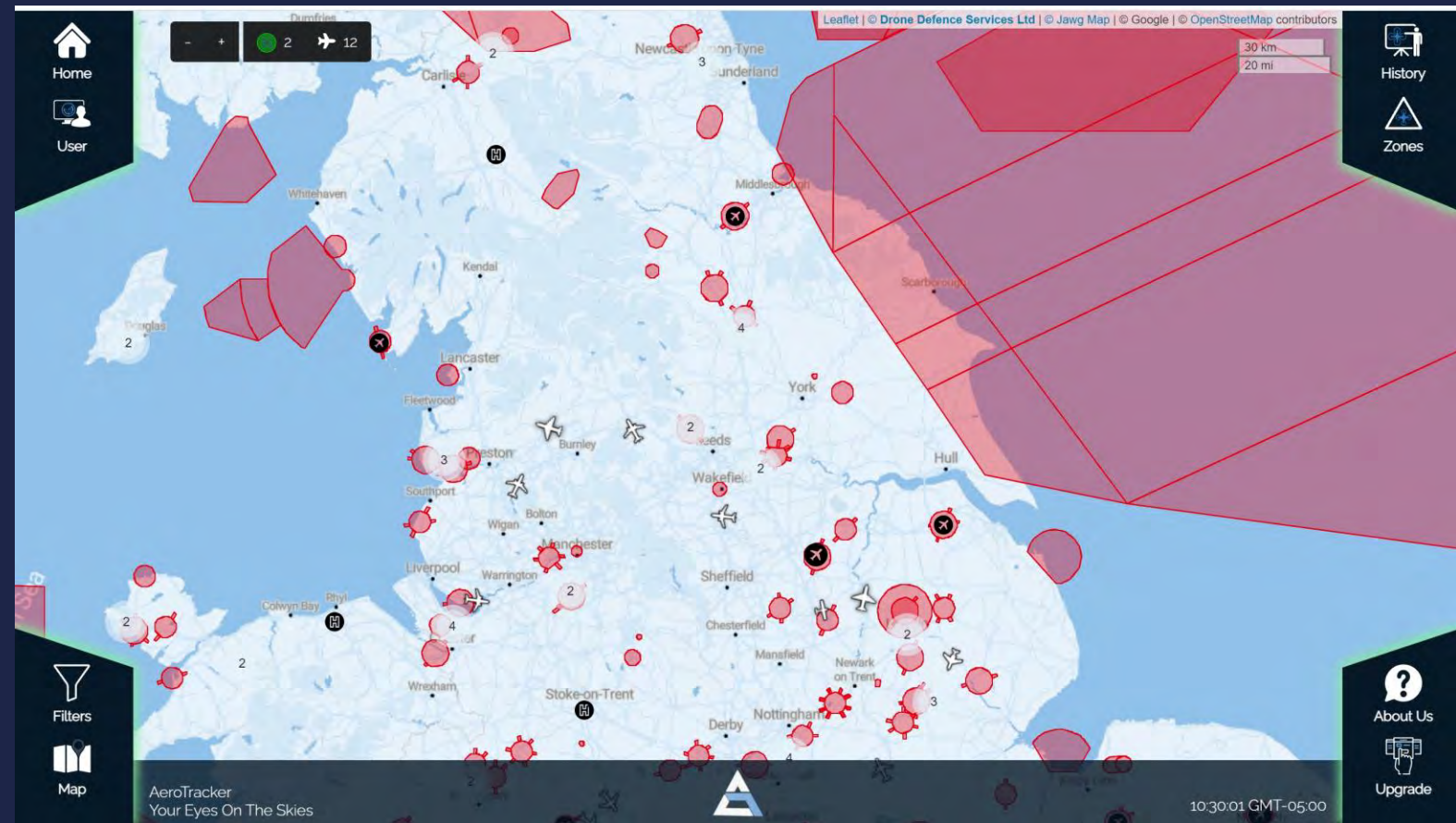
Live View with Zone

- Unlimited number of zones with the Enterprise License
- Shows the position of not only the drone but also the controller.
- All drones are colored based on their activity.
- Safe and Watch List can be programmed.

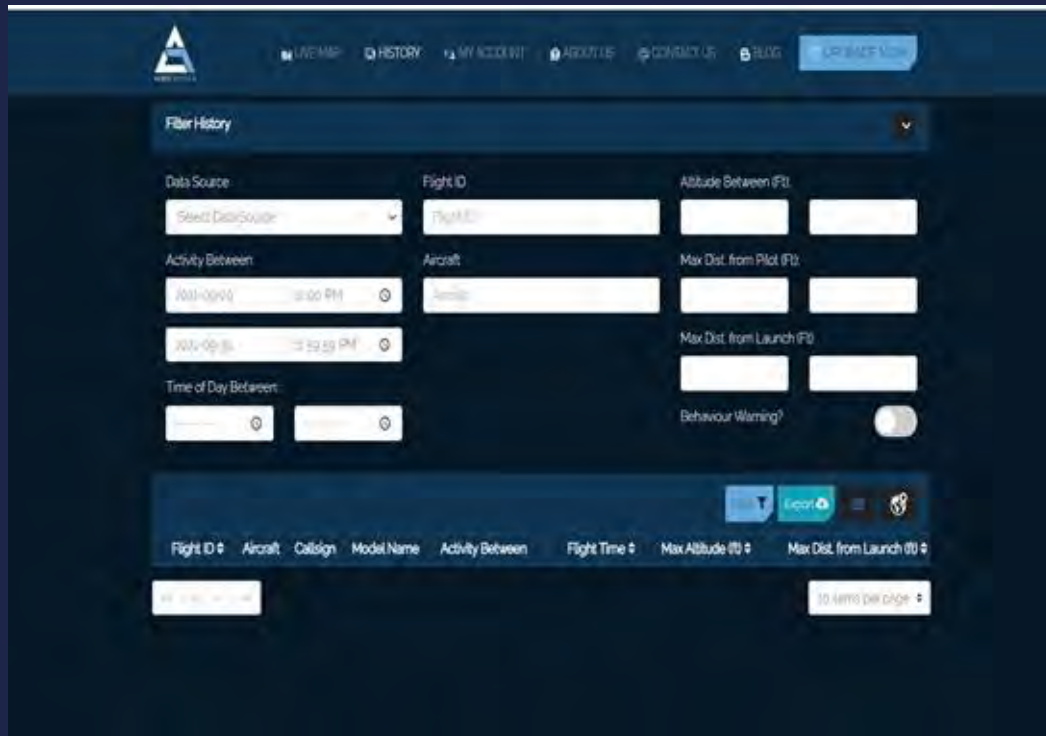


Automatic Dependent Surveillance – Broadcast (ADS-B)

- System presents ADS-B data for restricted airspace
- Broadcasts device type, velocity, position and altitude



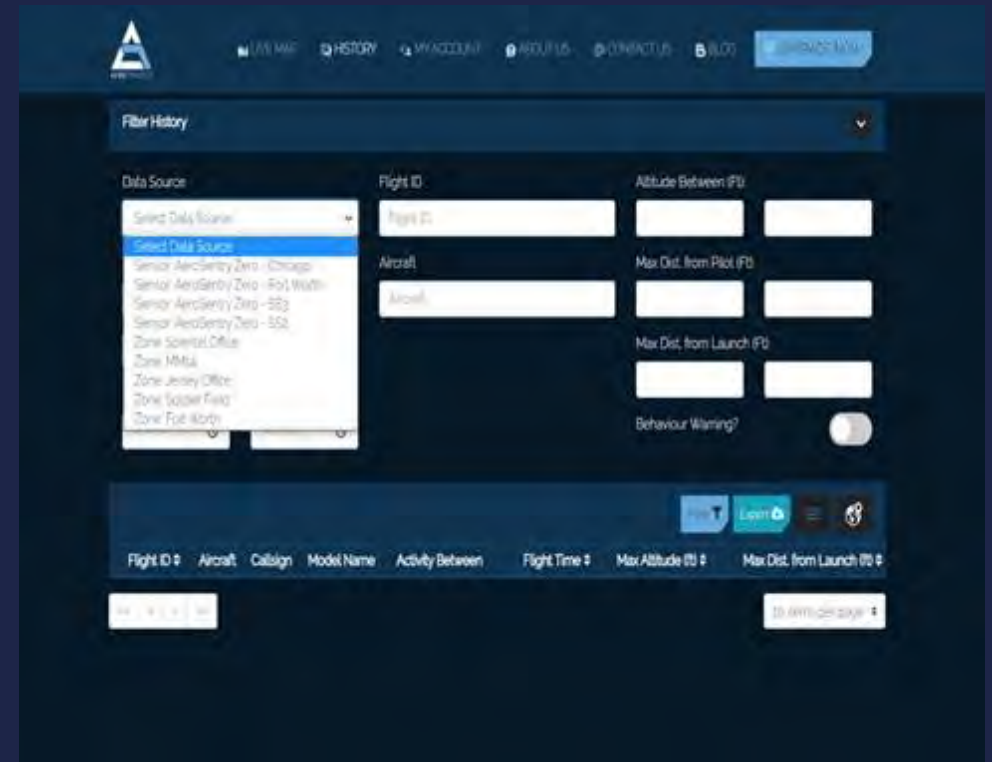
History Page



The screenshot shows the 'Flight History' page with the following filters applied:

- Data Source:** Select Data Source
- Activity Between:** 2021-09-09 12:00 PM to 2021-09-09 12:59 PM
- Time of Day Between:** (empty)
- Behaviour Warning:** (checked)

The table below the filters is currently empty. The table headers are: Flight ID, Aircraft, Callsign, Model Name, Activity Between, Flight Time, Max Altitude (ft), and Max Dist. from Launch (ft). A '10 rows per page' dropdown is visible at the bottom right of the table area.



The screenshot shows the 'Flight History' page with the 'Data Source' dropdown menu open, displaying the following options:

- Select Data Source
- Select Data Source
- Sensor AeroSentry Zero - Chicago
- Sensor AeroSentry Zero - FoL Waltham
- Sensor AeroSentry Zero - SSP
- Sensor AeroSentry Zero - SSZ
- Zone Scientel Office
- Zone MMA
- Zone Jersey Office
- Zone Upper Field
- Zone Full Body

The table below the filters is currently empty. The table headers are: Flight ID, Aircraft, Callsign, Model Name, Activity Between, Flight Time, Max Altitude (ft), and Max Dist. from Launch (ft). A '10 rows per page' dropdown is visible at the bottom right of the table area.

History Page Filtered

Filter History

Data Source: Sensor AeroSentry Zero - Chicago

Flight ID: Flight ID

Altitude Between (Ft):

Activity Between: 2021-09-15 12:00 PM - 2021-09-30 11:59 PM

Aircraft: Aircraft

Max Dist. from Pilot (Ft):

Max Dist. from Launch (Ft):

Time of Day Between:

Behaviour Warning?

Export

Total Flights: 724 Total Drones: 724 Good Drones: 465 Warning Drones: 28 Bad Drones: 231

Flight ID	Aircraft	Callsign	Model Name	Activity Between	Flight Time	Max Altitude (ft)	Max Dist. from Launch (ft)
2738674	DROOL-BUNKO-TAINT	MAVIC 2	Mavic 2	30/9/2021 11:46:36 - 30/9/2021 11:46:36	0:00:00	96.34	20.9
2738670	STELE-SHEEP-RHINE	MAVIC AIR 2S	Mavic Air 2S	30/9/2021 11:38:58 - 30/9/2021 11:39:21	0:00:23	276.69	194.99
2738686	STELE-SHEEP-RHINE	MAVIC AIR 2S	Mavic Air 2S	30/9/2021 11:27:10 - 30/9/2021 11:27:10	0:00:00	196.64	1175.92
2738643	FLUNG-APHID-SNOOD	MAVIC MINI	Mavic Mini	30/9/2021 11:08:23 - 30/9/2021 11:25:29	0:17:06	396.34	212.04
2738644	DROOL-BUNKO-TAINT	MAVIC 2	Mavic 2	30/9/2021 11:08:41 - 30/9/2021 11:33:34	0:04:53	104.99	72.06
2738632	DROOL-BUNKO-TAINT	MAVIC 2	Mavic 2	30/9/2021 11:00:46 - 30/9/2021 11:00:46	0:00:00	72.61	2.59
2738616	ETHER-FLUME-WIDTH	MAVIC MINI 2	Mavic Mini 2	30/9/2021 10:53:24 - 30/9/2021 10:57:49	0:04:25	386.17	660.34
2738484	MOREL-FACED-FLOAT	MAVIC 2	Mavic 2	30/9/2021 10:33:52	0:00:00	164.7	265.18

Filter History

Data Source: Sensor AeroSentry Zero - Chicago

Flight ID: Flight ID

Altitude Between (Ft):

Activity Between: 2021-09-15 12:00 PM - 2021-09-30 11:59 PM

Aircraft: FLUNG-APHID-SNOOD

Max Dist. from Pilot (Ft):

Max Dist. from Launch (Ft):

Time of Day Between:

Behaviour Warning?

Export

Total Flights: 1 Total Drones: 1 Good Drones: 0 Warning Drones: 0 Bad Drones: 1

Flight ID	Aircraft	Callsign	Model Name	Activity Between	Flight Time	Max Altitude (ft)	Max Dist. from Launch (ft)
2738643	FLUNG-APHID-SNOOD	MAVIC MINI	Mavic Mini	30/9/2021 11:08:23 - 30/9/2021 11:25:29	0:17:06	396.34	212.04

10 items per page

Sample of Flight Data

Filter History

Data Source: Flight ID:

Activity Between:

Time of Day Between:

Altitude Between (Ft):

Max Dist. from Pilot (Ft):

Max Dist. from Launch (Ft):

Behaviour Warning?

[Filter](#) [Export](#)

Total Flights	Total Drones	Good Drones	Warning Drones	Bad Drones
1	1	0	0	1

Legend: ■ Bad

Flight ID	Aircraft	Callsign	Model Name	Activity Between	Flight Time	Max Altitude (ft)	Max Dist. from Launch
2738643	FLUNG-APHID-SNOOD	MAVIC MINI	Mavic Mini	30/9/2021 11:08:23 30/9/2021 11:25:29	01:7:06	396.34	211

10 items per page

AEROTRACKER FLIGHT REPLAY - FLUNG-APHID-SNOOD

[Download event report](#)

History Map Feature

Filter History

Data Source: Sensor AeroSentry Zero - Chicago

Flight ID:

Altitude Between (Ft): -

Activity Between: 2021-09-30 12:00 PM - 2021-10-01 11:59:59 PM

Aircraft:

Max Dist. from Pilot (Ft): -

Max Dist. from Launch (Ft): -

Time of Day Between: -

Behaviour Warning?

Total Flights: 60 | Total Drones: 60 | Good Drones: 38 | Warning Drones: 1 | Bad Drones: 21

Flight ID	Aircraft	Callsign	Model Name	Activity Between	Flight Time	Max Altitude (ft)	Max Dist. from Launch (ft)
2737770	TREAD-CHOIR-GRUEL	MAVIC AIR 2	Mavic Air 2	1/10/2021 08:49:44 - 1/10/2021 08:51:28	0:01:44	188.64	423.75
2737738	TREAD-CHOIR-GRUEL	MAVIC AIR 2	Mavic Air 2	1/10/2021 08:34:01 - 1/10/2021 08:43:07	0:09:06	172.57	967.98
2737681	CLOWN-GROOM-BASIN	MAVIC MINI	Mavic Mini	1/10/2021 07:59:42 - 1/10/2021 08:06:51	0:07:09	137.8	1938.19

History Map

Total Flights: 60 | Total Drones: 60 | Good Drones: 38 | Warning Drones: 1 | Bad Drones: 21

Legend: bad (red), good (green), warning (yellow)

Map showing drone activity locations in Chicago and surrounding areas.

Export to PDF

AEROTRACKER FLIGHT REPLAY - PINCH-ENEMY-ROWER

Download Data Report

- View Properties
- Date
- Altitude
- Distance from Launch
- Speed
- Altitude
- Coordinate
- PINCH-ENEMY-ROWER
- Registration
- Drone
- Manufacturer
- Mavic 2
- Model Name

DRONEDEFENCE

Drone Incident Report - 2737801

Date	2021-10-01 14:06:03	Drone ID	PINCH-ENEMY-ROWER
Start Time	14:06:03	End Time	14:06:06
Flight Durations (secs)	3	Min Altitude (m)	46.1
Max Distance from Launch (m)	48.07	Max Altitude (m)	46.1
Location Co-ordinates	Not Available	Location	Not Available

Map of Drone Flight



Drone Details (if available)

Manufacturer	DJI	Model	Mavic 2
Rotors		Control Range	
Top Speed		Camera	
Price		Weight	
Flight Time		Year	
Popularity		Payload	

These flight details were captured using Drone Defence's www.AeroTracker.io drone detection system. To get this data in real-time visit www.AeroTracker.io



www.DroneDefence.co.uk

Email:

info@dronedefence.co.uk

Tel: +44 (0) 843 289 2805

Flight Data

Filter History

Data Source: Sensor AeroSentry Zero - Chicago

Activity Between: 2021-09-15 12:00 PM - 2021-09-30 11:59:59 PM

Time of Day Between: [] []

Flight ID: FLUNG-APHID-SNOOD

Aircraft: FLUNG-APHID-SNOOD

Altitude Between (Ft): [] []

Max Dist. from Pilot (Ft): [] []

Max Dist. from Launch (Ft): [] []

Behaviour Warning?

Filter Export [] []

Total Flights	Total Drones	Good Drones	Warning Drones	Bad Drones
1	1	0	0	1

Legend: bad

Flight ID	Aircraft	Callsign	Model Name	Activity Between	Flight Time	Max Altitude (ft)	Max Dist. from Launch (ft)
2736543	FLUNG-APHID-SNOOD	MAVIC MINI	Mavic Mini	30/9/2021 11:08:23 30/9/2021 11:25:29	0:17:06	395.34	212.04

Total Flights	First Detected	Last Detected	Total Flight Time	Average Flight Time
1	16:08:23 2021-09-30	16:08:23 2021-09-30	0:17:06	0:17:06

Aircraft Information

Search: []

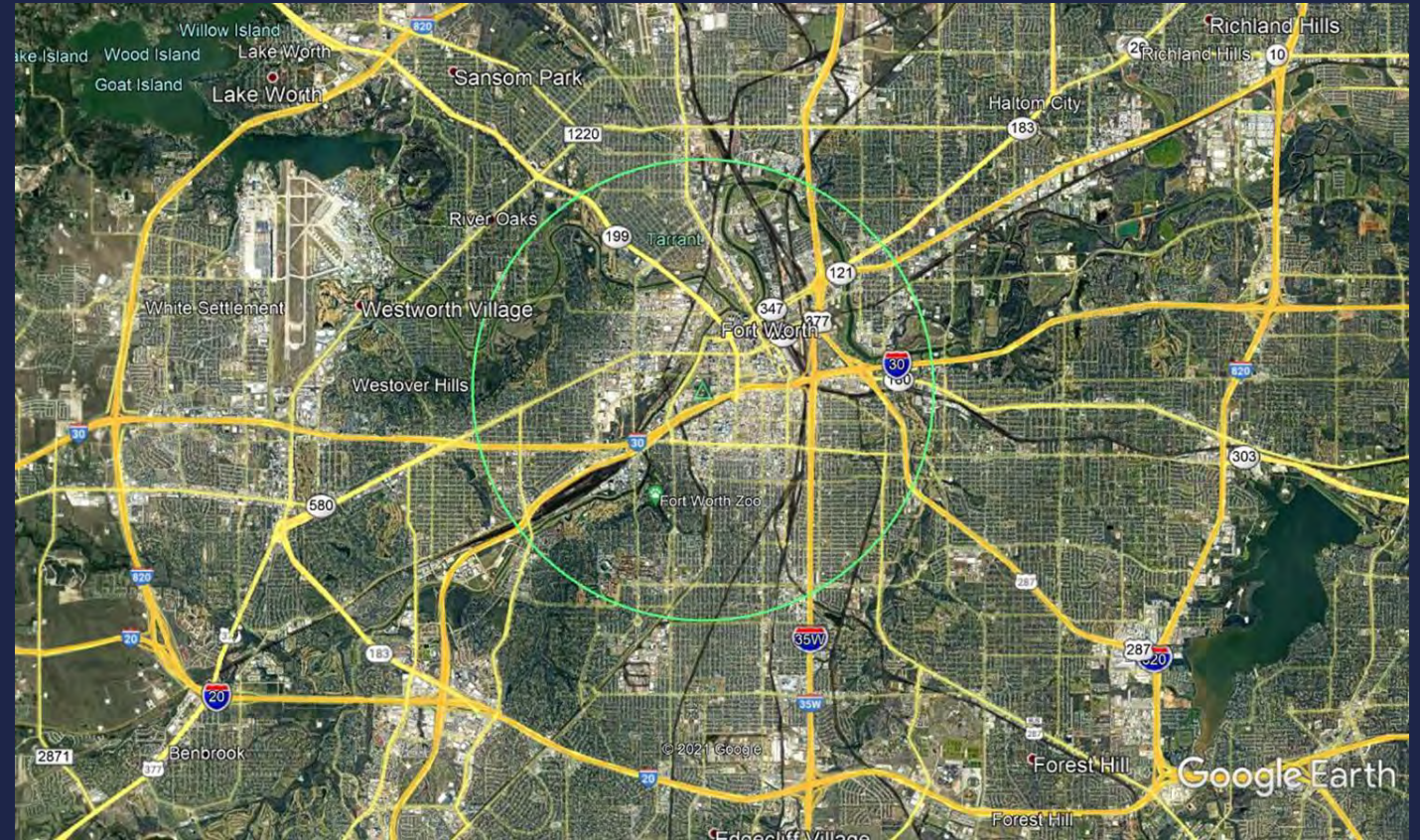
Flight Altitudes

Flight Counts by Hour

Flight Counts by Day

Fort Worth Sensor

- Installed one 360 degree sensor next to Fort Worth Police Department
- Installed at a height ~40 ft
- Min 5km detection radius



A Sample Week in Fort Worth

Total Flights

130

Total Drones

130

Good Drones

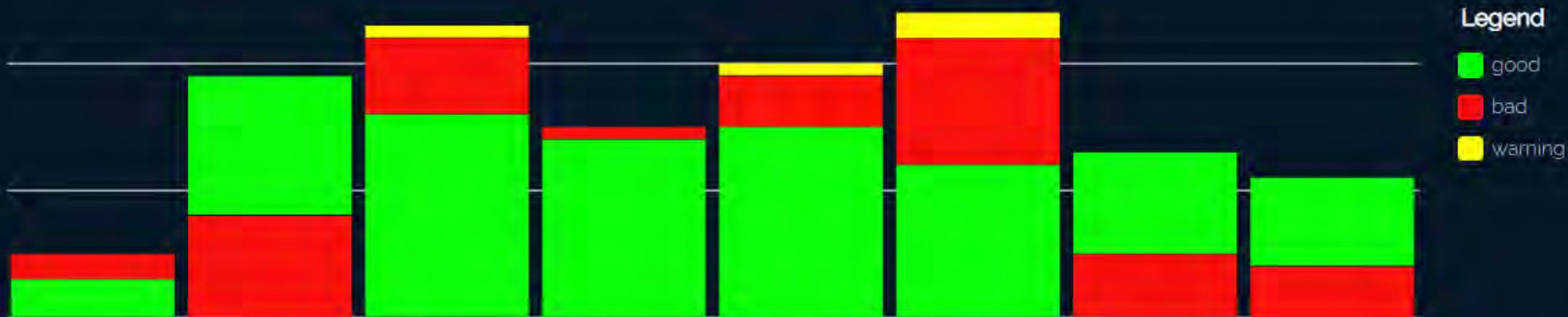
86

Warning Drones

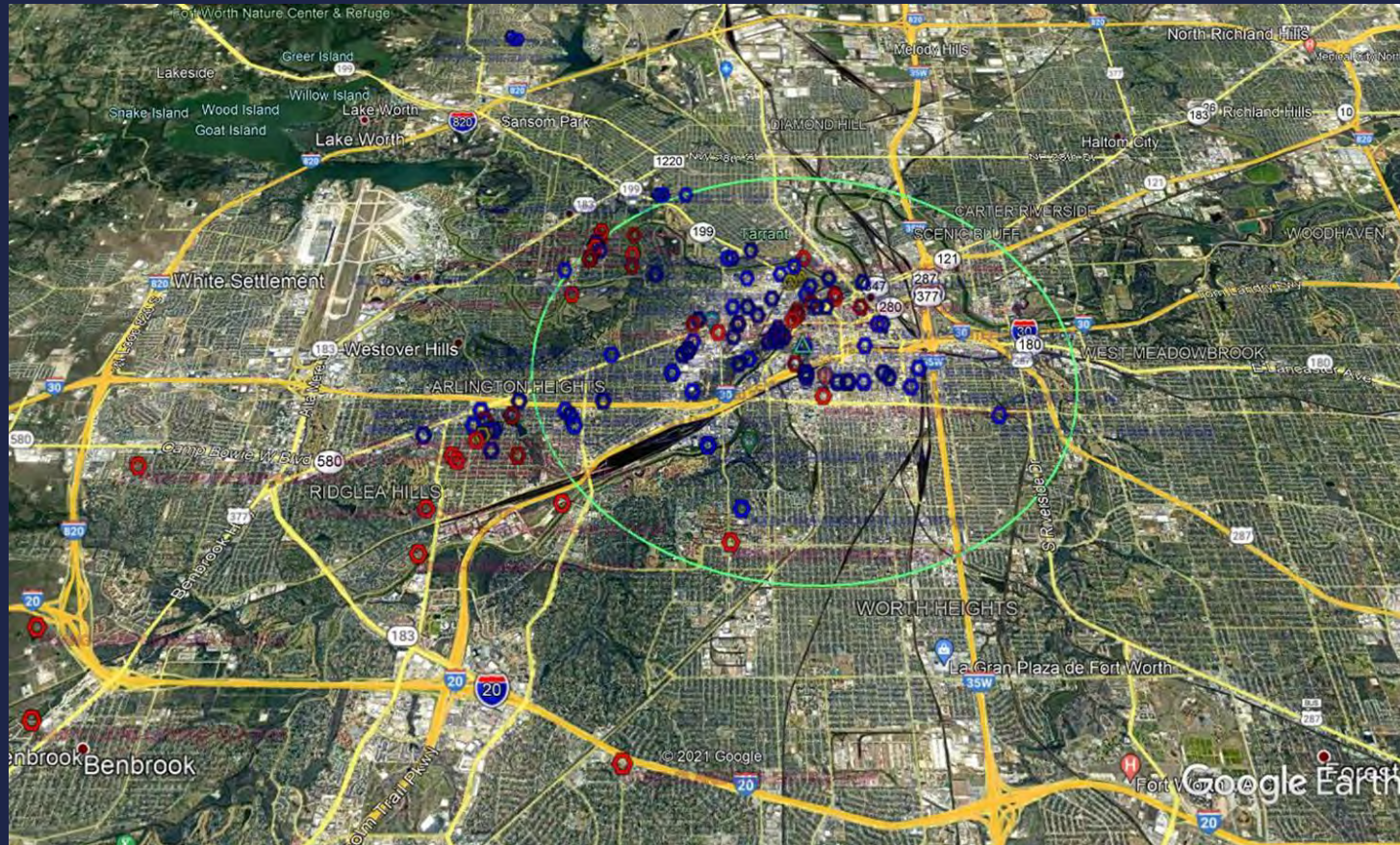
4

Bad Drones

40

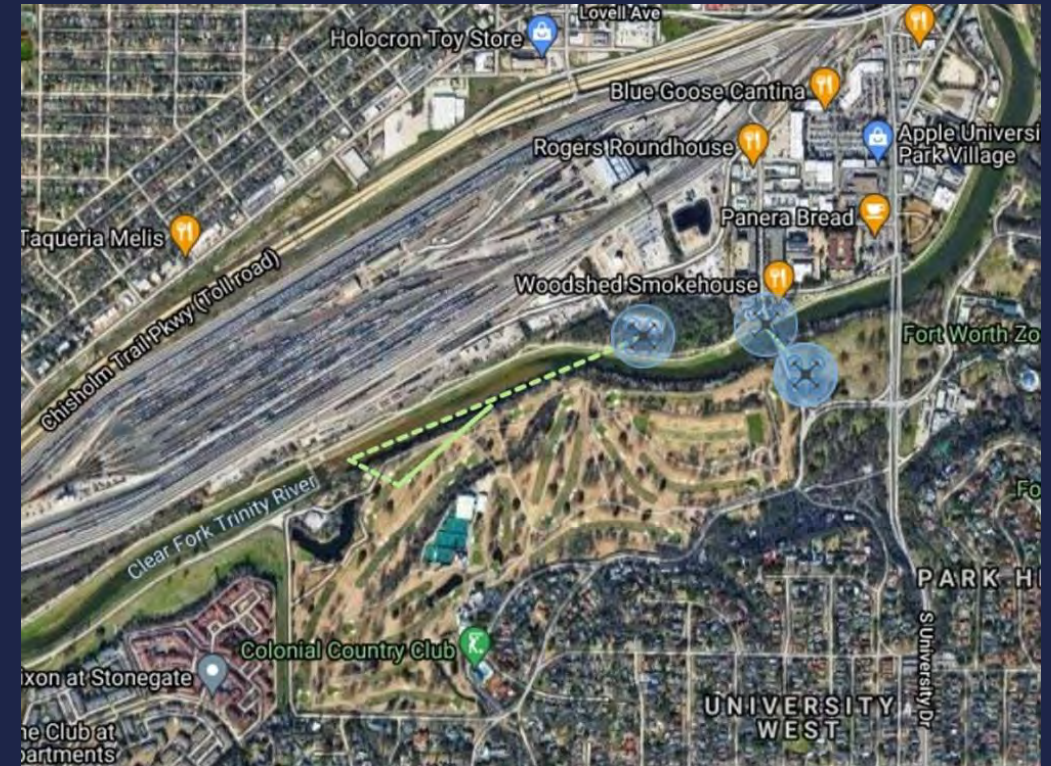
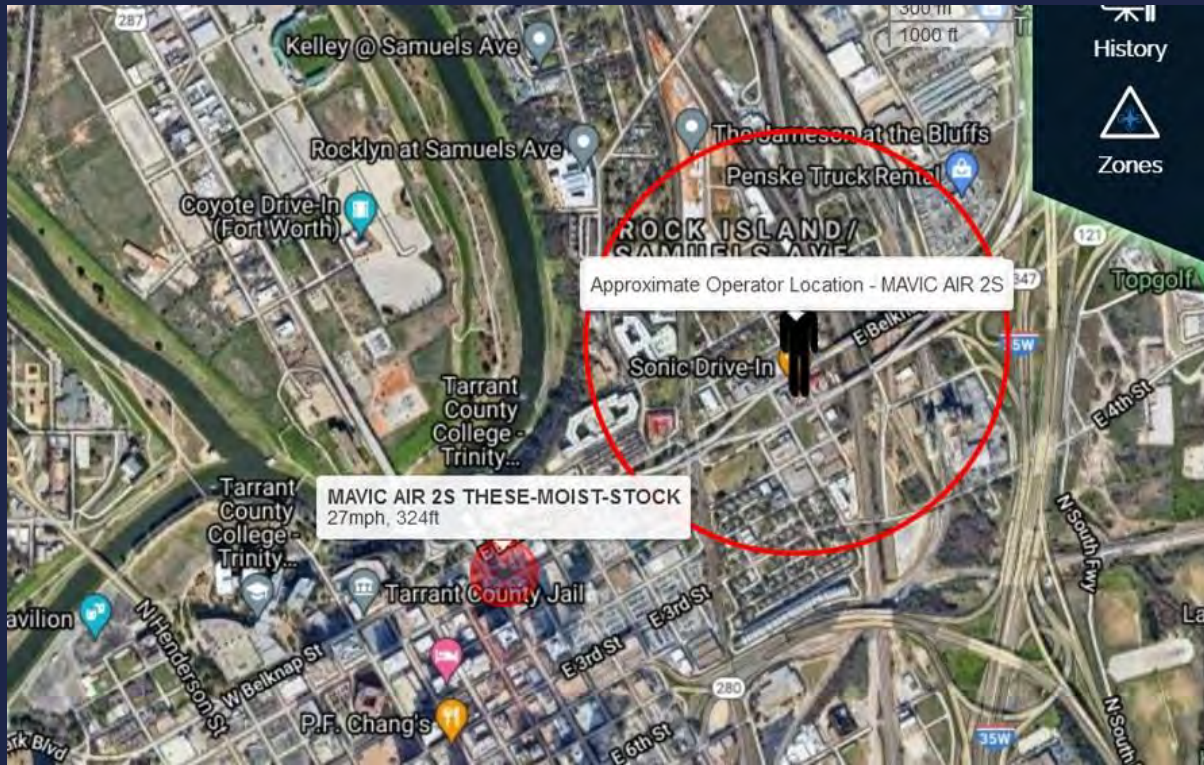


Fort Worth Detailed Violations

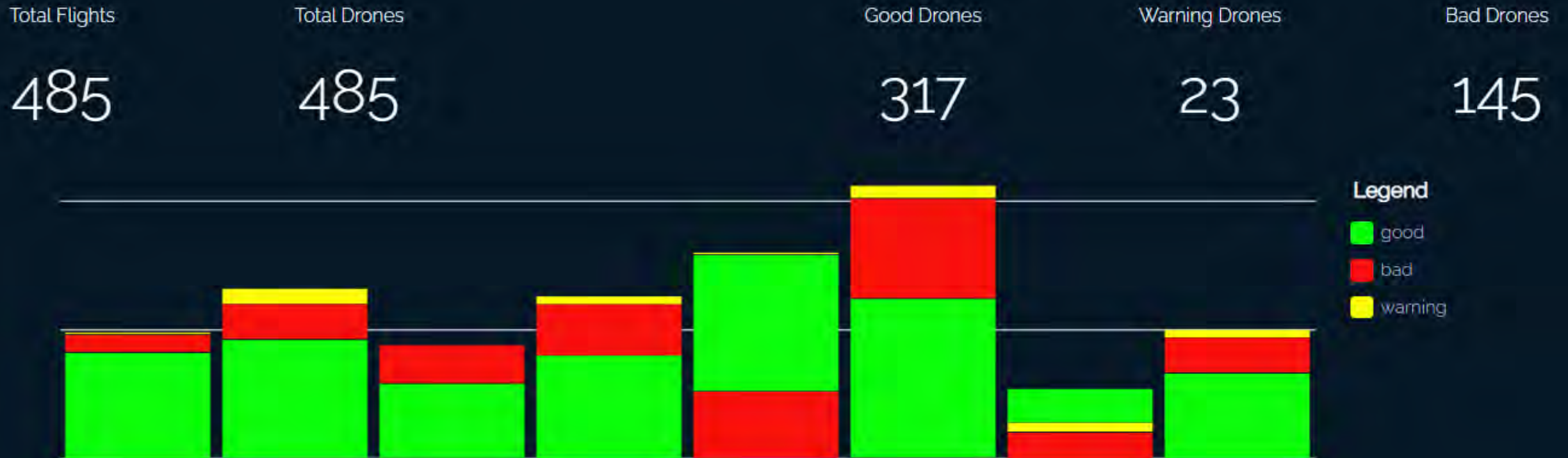


- Red – Flights exceed 400 ft or Controller was more than 500m from Drone
- Yellow – Within 10%
- Blue – No, FAA violations but still could be violating local regulations

Fort Worth Detailed Violations



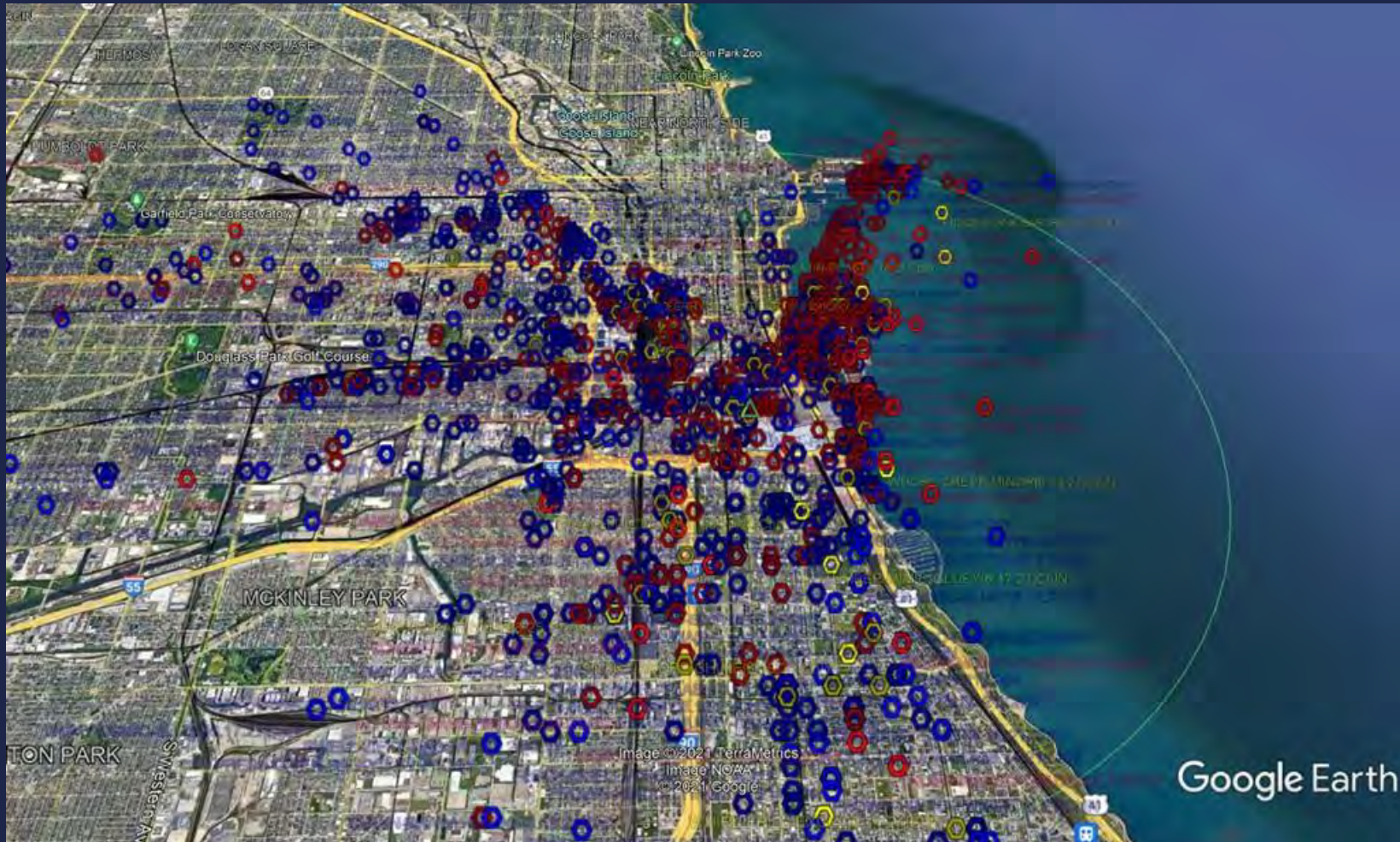
A Sample Week in Chicago



Chicago Detailed Violations

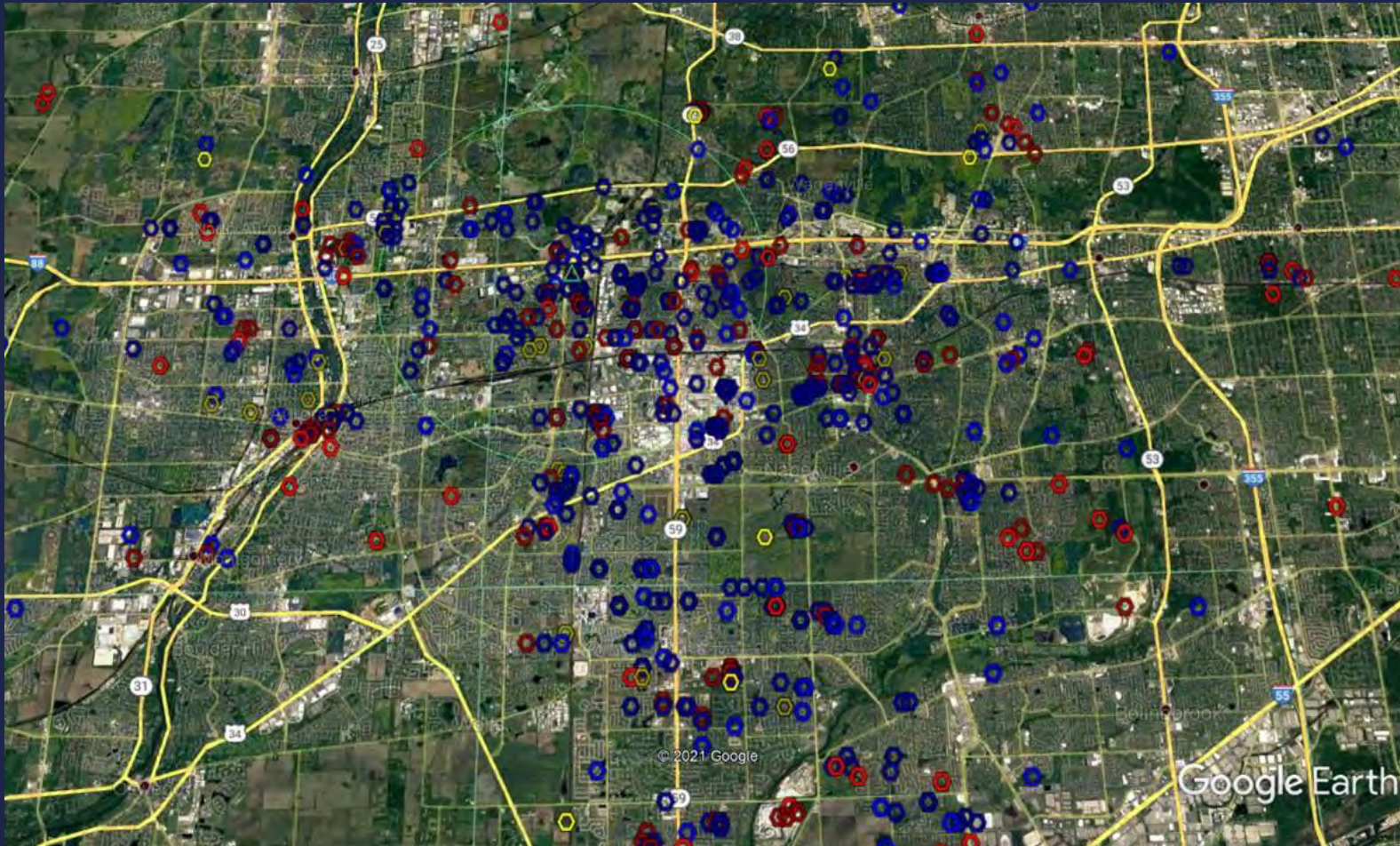


Chicago Detailed Violations



- Red – Flights exceed 400 ft or Controller was more than 500m from Drone
- Yellow – Within 10%
- Blue – No, FAA violations but still could be violating local regulations

Not just a Big City Issue



SkyFence™

Fixed Installation Drone Protection

SkyFence™ is a scalable, automatic and fully integrated **electronic countermeasures system that stops more than 99% of commercial drones**. It prevents drones from flying into or close to a protected location by disrupting the devices' command and navigation radio transmissions.

The SkyFence™ is automatically activated, and it works in any weather, day or night. The system **stops more than 99% of commercial drones—with no effect on communications systems**.





Questions?

Thank you!





SKYBASE

Unlock Aviation's Full Potential

“Flight-Autonomy Decision-Making System”

Two Decades in Aerospace



Michael Read

Founding Team (post pivot)



Eric  

Head of Design

Chief Test Pilot

People Person, Leader, Mentor

- ⦿ US Navy Test Pilot School
- ⦿ Lt. Col US Army (Aviation)
- ⦿ Head of Design DC and formerly Cubic Defense
- ⦿ Master + Bachelors Eng.



Maëlle  

Product Owner

Embedded Systems Engineer

Creative, Problem-Solver, Thinker

- ⦿ Cockpit Design, Avionics career
- ⦿ 3 Masters Degrees
- ⦿ Studied with French Air Force on Tactical UAV programs
- ⦿ Contracted to Safran & CloudSat



Michael  

Vision

Partnerships, Sales, Regulations

Do-er, Influencer, Speaker

- ⦿ Air Force Pilot & Veteran
- ⦿ C-Level Exec at listed company
- ⦿ Developed intricate knowledge of commercialising aviation tech
- ⦿ B.Sc, ATPL

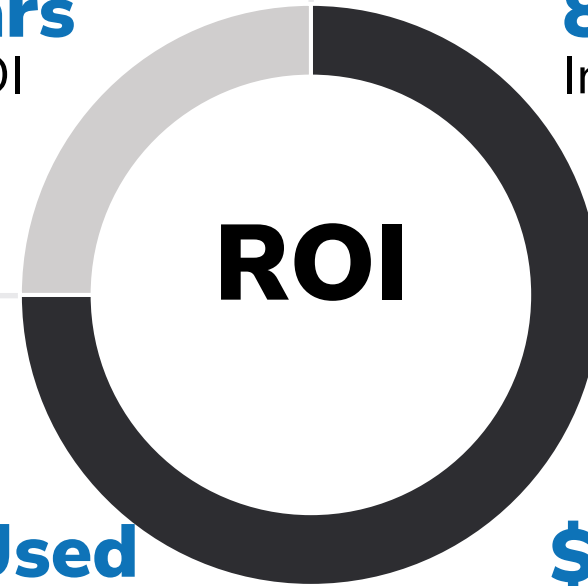
Purpose-driven:
This is for our future generations.

Big Industry with Big Problems Coming

	\$300M
	\$10M
	\$2M

20+ Years
Average ROI

80% Safety
Incidents by pilots



Under-Used
Pilot Shortage,
Routes

\$110B p.a.
-2 Pilots

Locust Plagues Destroying Food Security

Each day, 1 swarm eats food to feed 10M people (\$25M) and can travel 60 miles.



But we can't aerial spray them at night



Locusts on the Ground



Planes on the Ground

Wildfires Devastate Society and Nature

Getting worse every year due to climate change, and also cause huge CO₂ emissions.



But we can't do aerial firefighting at night



The World Needs to Double Food Production

Aerial spray is essential to feed 10B people by 2050.



But aerial spray can't be done at night



Already Dangerous
During the Day

Industry Crunch Has Started

Daytime

Utilisation, Profit

Insurance

Pilot Deaths



LIMITS

Environment

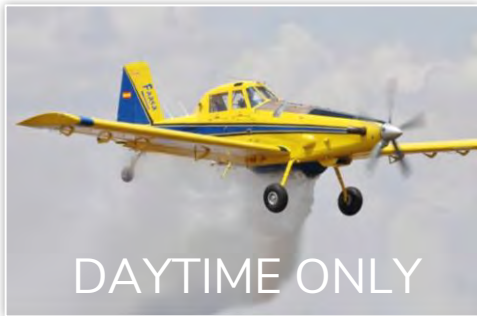
Spray Drift, over-use,
Affects birds & bees,
Wildfires keep burning

Industry

Limited Utilisation
Pilot Shortages

More than 10,000 Pilot-Limited Aircraft in USA

Dirty/Dangerous



Pilot Deaths/Insurance

Dangerous



Pilots Cause Under Utilisation

Dull/Difficult



Pilot Shortages

Difficult

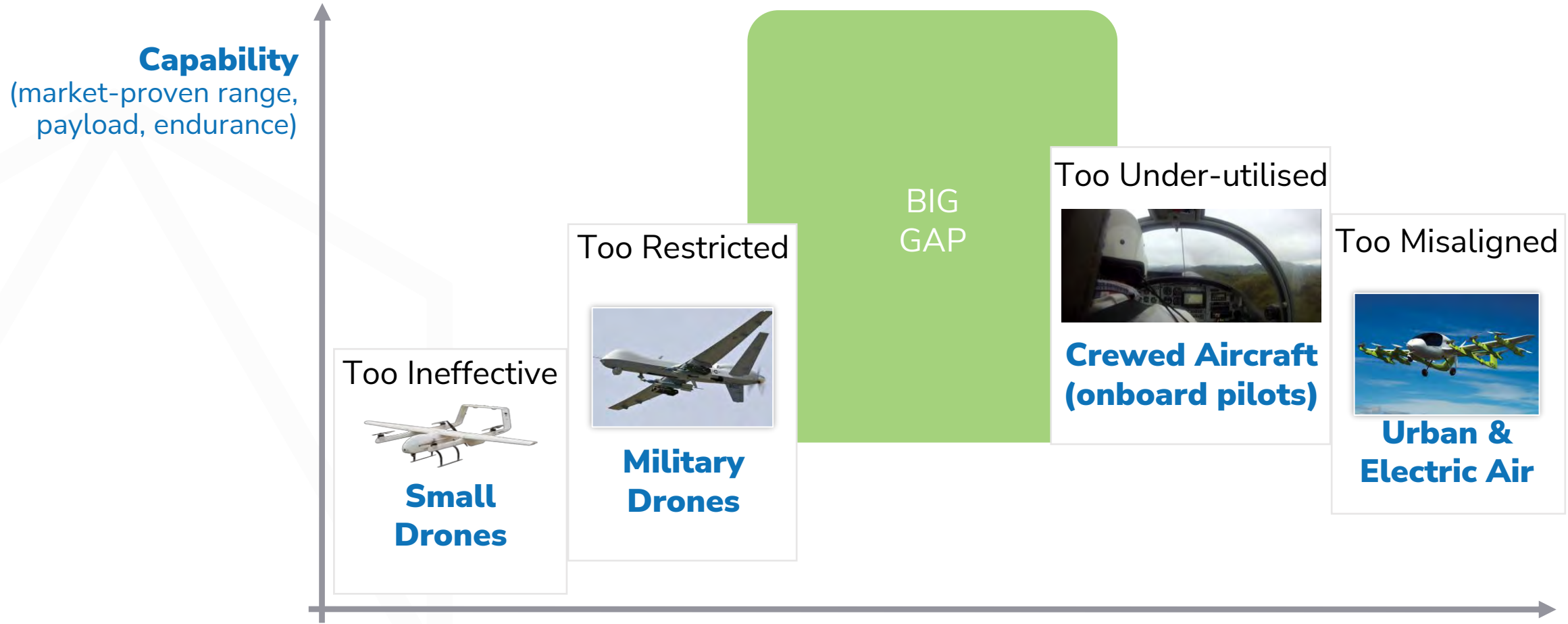


Pilot Costs

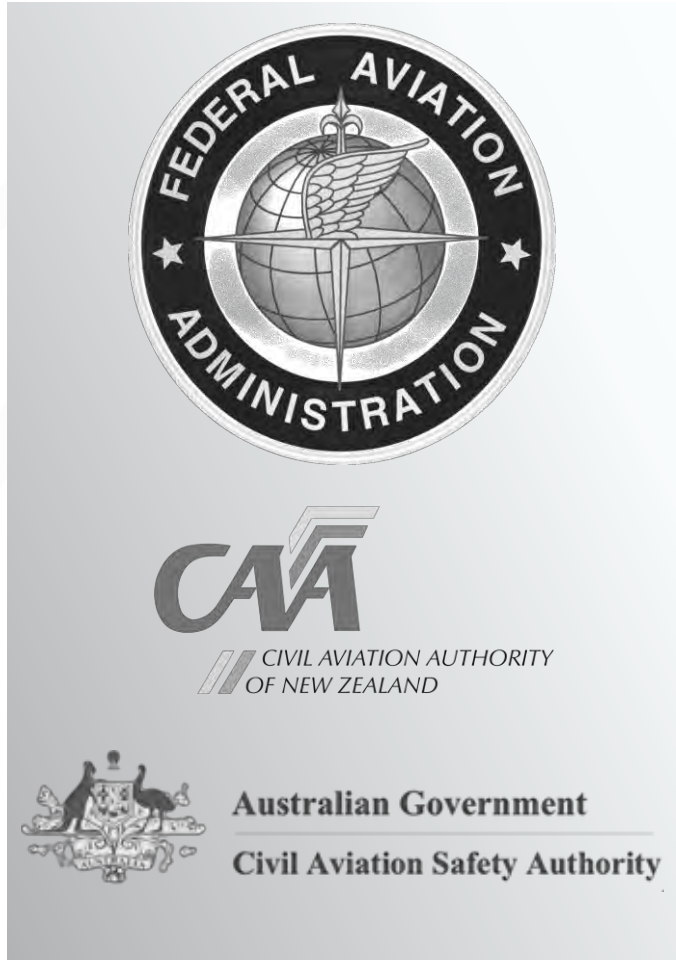


If Pilots = Problems, can we
Take the Pilot out of the Plane
with cool new drones?

Current Alternatives Are Not Solutions



Regulations Control the Industry



After 2025
100,000 Hours?

No Disruption
Or giant leaps



Autonomy Requires
New Regulations

No Certification =
Limited Sales

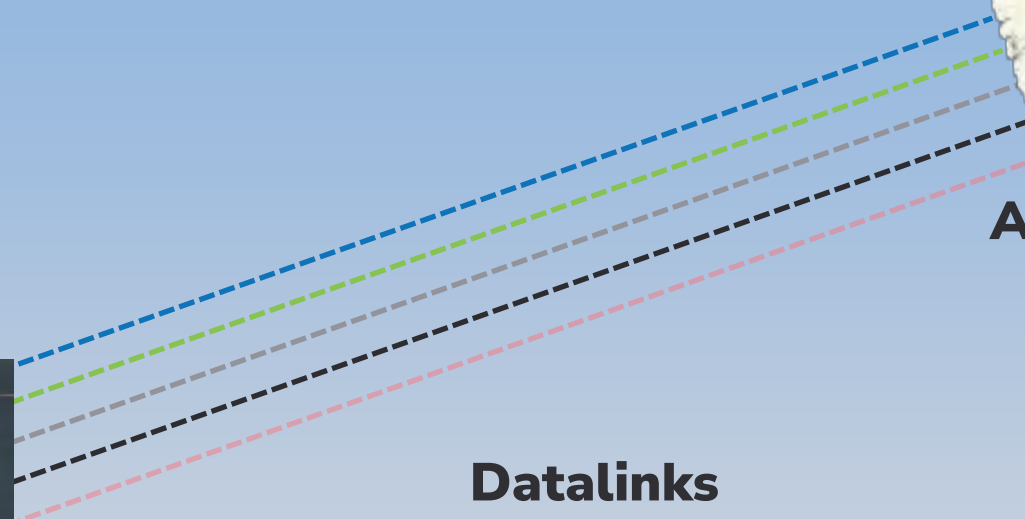
SOFI 'Upgrade' Platform

Supervised Operations

Future Intelligence



Aircraft Upgrade Kit



Datalinks



**Universal
Ground
Cockpit**

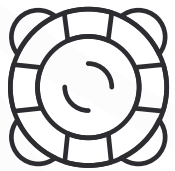
Our Product

**Confidently Monitor &
Assertively Intervene**

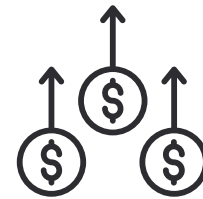
Decision Data: ML+AI



Big Benefits For Our Customers



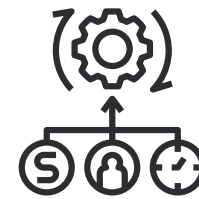
Safety
Increase
(Low & Slow)



Revenue
Double
(Night time, or low cloud)



Profits
Double+
(>30% Opex Savings)



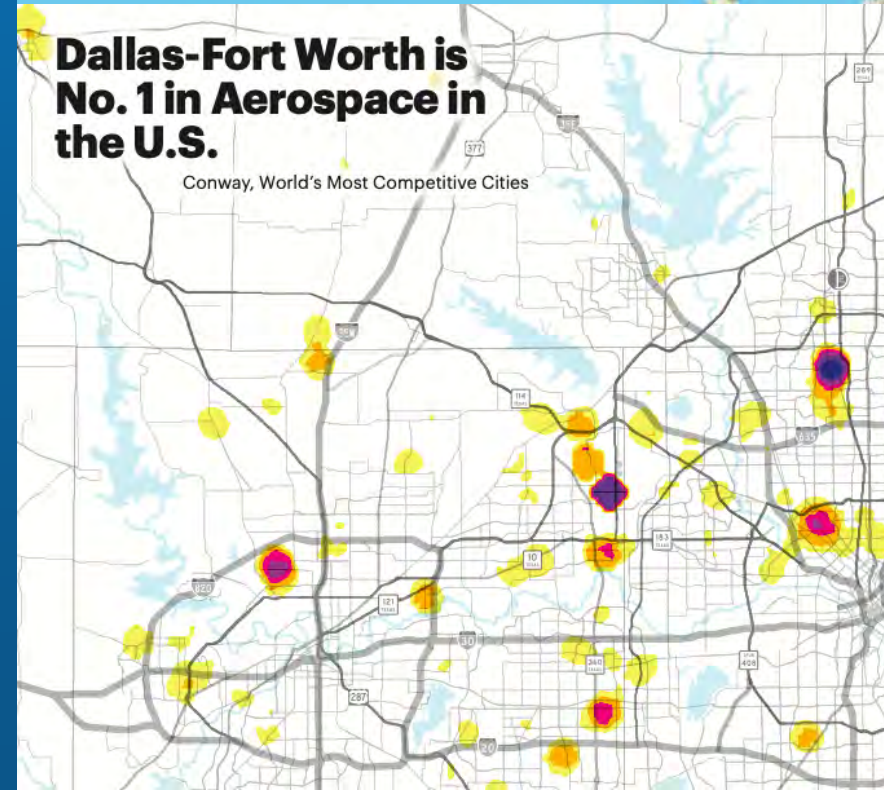
Short
Payback
(<12 months)

The Right Partners



Why Texas?

- It's Big, and just like a little Australia ;-) but with bigger population and bigger economy
- People- World-Leading Aerospace Companies (esp. in Dallas/ Fort Worth), and friendly people = friendly government
- Price- lower cost of living, taxes, logistics
- Place- ideal testing conditions/ test range, proximity to FAA (LA and KC), manufacturing
- Investment Community



What Are We Looking For?



Searching for our Lead Investor (Series A), with experience in Aerospace, and from Texas if possible (Can syndicate \$6M from NZ and Aus)



Team + Facilities in DFW area. Need undergrad's through to highly experienced engineers (esp. flight testing, cert, business dev.)



Friendly Texans to help in any way you can!



SKYBASE

Unlock Aviation's Full Potential

Michael Read
Founder CEO
michael.read@skybase.aero