UAS Safety and Integration Initiative

FAA UAS Symposium and NASA TCL4

UAS
Unmanned Aircraft Systems
Safety + Integration

North Central Texas
Council of Governments

Open for Business (2018)

- Lack of Sufficient Regulation
- Case by Case basis

Getting Down Business (2019)

- 2018 FAA Reauthorization Act
- Integration Pilot Program
- Google Wings BVLOS package delivery
- NPRM flight over people
- ParaZero's Nationwide flight over people waiver

UAS
Unmanned Aircraft Systems Safety+ Integration

North Central Texas Council of Governments

Important Announcements

- Drone Safety Awareness Week in November
- New UAS Related Contract Opportunity

Missing Topics

- Rulemaking on UAS – specific air carrier operations
- Section 2209
- Remote ID NPRM

UAS
Unmanned Aircraft Systems Safety+ Integration

North Central Texas Council of Governments

FAA Broad Agency Announcement (BAA)

- Show partnership with commercial companies
- That are willing to match a $6 million FAA commitment
- to conduct additional UAS integration work
- at the seven UAS test sites across the country

UAS
Unmanned Aircraft Systems
Safety + Integration

North Central Texas
Council of Governments

Inner City UAS Testing

- drone communication,
- collision avoidance,
- safe landing,
- services that support UAS operations,
- and safety in an urban landscape

Hotel Information

- Omni Corpus Christi Hotel

  900 N. Shoreline Blvd.

  Corpus Christi, TX 78401

- 1-800-843-6664 (Omni Central Reservations #)
- Ernest Huffman has the discount code

TEXAS A&M UNIVERSITY CORPUS CHRISTI | LONE STAR UAS CENTER OF EXCELLENCE & INNOVATION

UAS Safety and Integration Task Force
NASA TCL4 Testing Visit
Corpus Christi – August 13th 9:00am to 12:00pm

UAS Unmanned Aircraft Systems Safety + Integration

North Central Texas Council of Governments

UAS Legislative Update

NICK ALLEN

UAS SAFETY AND INTEGRATION TASKFORCE

NORTH CENTRAL TEXAS COUNCIL OF GOVERNMENTS

JUNE 25, 2019

Bills of Interest - Unmanned Aircraft

Dead by procedural action

SB 59 (Zaffirini) - Commercial delivery purposes (5/17/19)

HB 2512 (Miller) - Assessing unsafe environmental conditions (4/26/19)

HB 2912 (Zerwas) - Disaster preparation (5/9/19)

HB 3164 (Clardy) / SB 2034 (Hall) - 911 services or mapping project (4/8/19)

Bills of Interest - Unmanned Aircraft

Dead by procedural action

SB 1701 (Whitmire) / **HB 4084 (Walle) -** Restricts flight over schools (4/8/19)

HB 3494 (Cole) - Restricts flight over commercial airports, adds to current critical infrastructure in code; restricts cities and counties from enforcing UAS ordinances (4/25/19)

HB 4448 (Springer) - Allows images to be used for commercial purposes under FAA guidelines (5/8/19)

Bills of Interest - Unmanned Aircraft

Vetoed by Governor

HB 3082 (Murphy) - Strengthens penalties for flying above critical infrastructure (6/15/19)

SB 2299 (Powell) - Restricts flight over military installations, adds to current critical infrastructure in code (6/15/19)

(SB 2299 amended into HB 3082)

Passed

HB 2340 (Dominguez) - Creates a study for emergency and disaster management, response, and recovery

Signed (5/29/19)

Questions and Comments

Amanda Wilson
Program Manager
(817) 695-9284
awilson@nctcog.org

Rebekah Hernandez
Communications Supervisor
(682) 433-0477
rhernandez@nctcog.org

Nick Allen
Communications Coordinator
(817) 704-5699
nallen@nctcog.org

Kyle Roy
Communications Coordinator
(817) 704-5610
kroy@nctcog.org

www.nctcog.org/legislative

Engineering Research Center for
Collaborative Adaptive Sensing of the Atmosphere

CASA WX: Weather avoidance for drones and air taxis

June 25, 2019

NCTCOG UAS Safety & Integration Task Force Meeting

© University of Massachusetts, Amherst

Key Messages

- Weather can have significant impacts on future drone and air taxi applications.

North Texas has its share of bad weather.

- Nationally, weather observation, forecasting and alerting infrastructure is inadequate to meet the needs of this industry.

North Texas is uniquely positioned to be a test bed for demonstrating key weather avoidance infrastructure and technology.

- We need to continue to invest in weather avoidance technology and work towards generating a Common Operating Picture of weather hazards.

casa

Impacts on Air Taxi services

"eVTOL concepts for Uber Air", Uber Elevate Summit

Gensler Skyport Mobility Hub concept

Infrastructure: What weather-related considerations should be made while deciding locations, designs and operations of skyports/mobility hubs?

Hail

P/C Fox4 News

Winds

P/C Fox4 News

Flooding

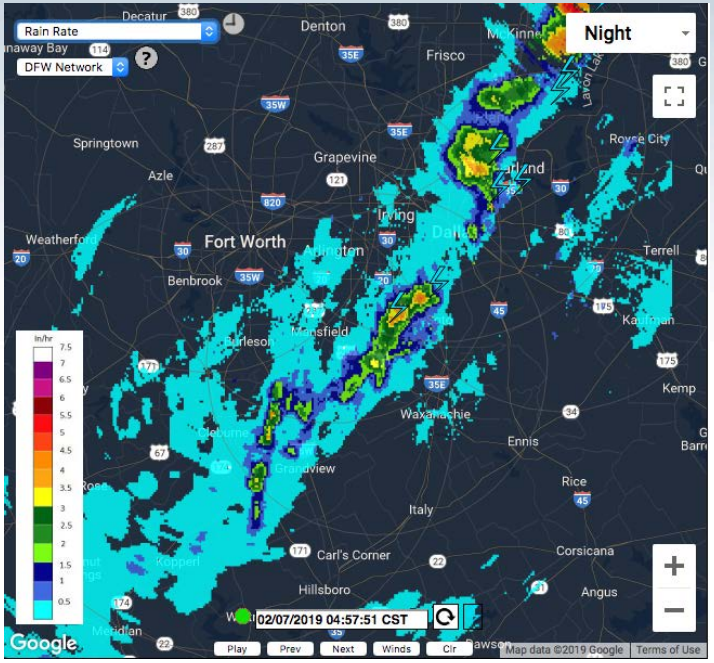
P/C Dallas Morning News

casa

Impacts on Air Taxi services

Routes: How should air taxis operate during weather days? What should diversions look like?

Business models: How would weather impact projected operations, fares, profitability?



Hail

P/C Fox4 News

Winds

P/C Fox4 News

Flooding

P/C Dallas Morning News

casa

Drone operations even more susceptible to weather!

"NASA's First-of-Kind Tests Look to Manage Drones in Cities", NBC DFW, May 2019

Bell NASA SIO Demonstration in Fort Worth, 2020

BNSF's BVLOS operations, *Progressive Railroading*, April 2019

How do we provide UAS operators the weather information they need?

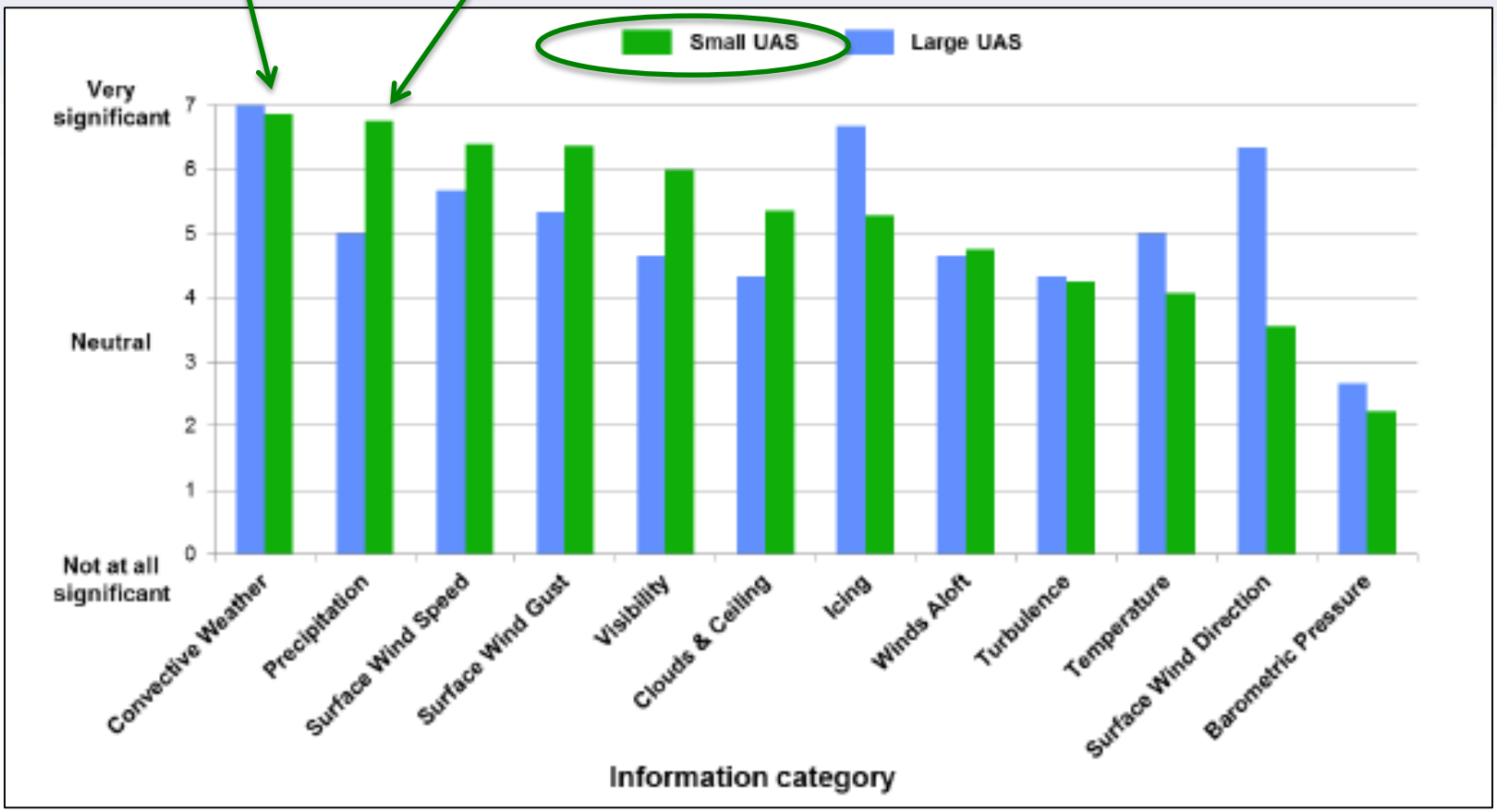
casa

WEATHER HAZARD	IMPACT ON UAS
Cloud base < 900 ft Distance to cloud edge < 2000 ft	Part 107 regulation, VLOS impacts
Visibility < 3 mile	Part 107 regulation, VLOS impacts
Fog, clouds and precipitation	Airframe load, short-circuiting of electronics, VLOS impacts
Icing	Critical performance and safety issue, loss of aircraft
Lightning	Dropped communication due to radio frequency interference
Wind/wind shear	Loss of control, inability to return home, mission failure
Moderate or greater turbulence	Reduced mission duration, loss of control possible

Source: Weather Guidance for Unmanned Systems, NCAR
https://ral.ucar.edu/sites/default/files/public/media/files/uas-weather-broch-2017-10.pdf

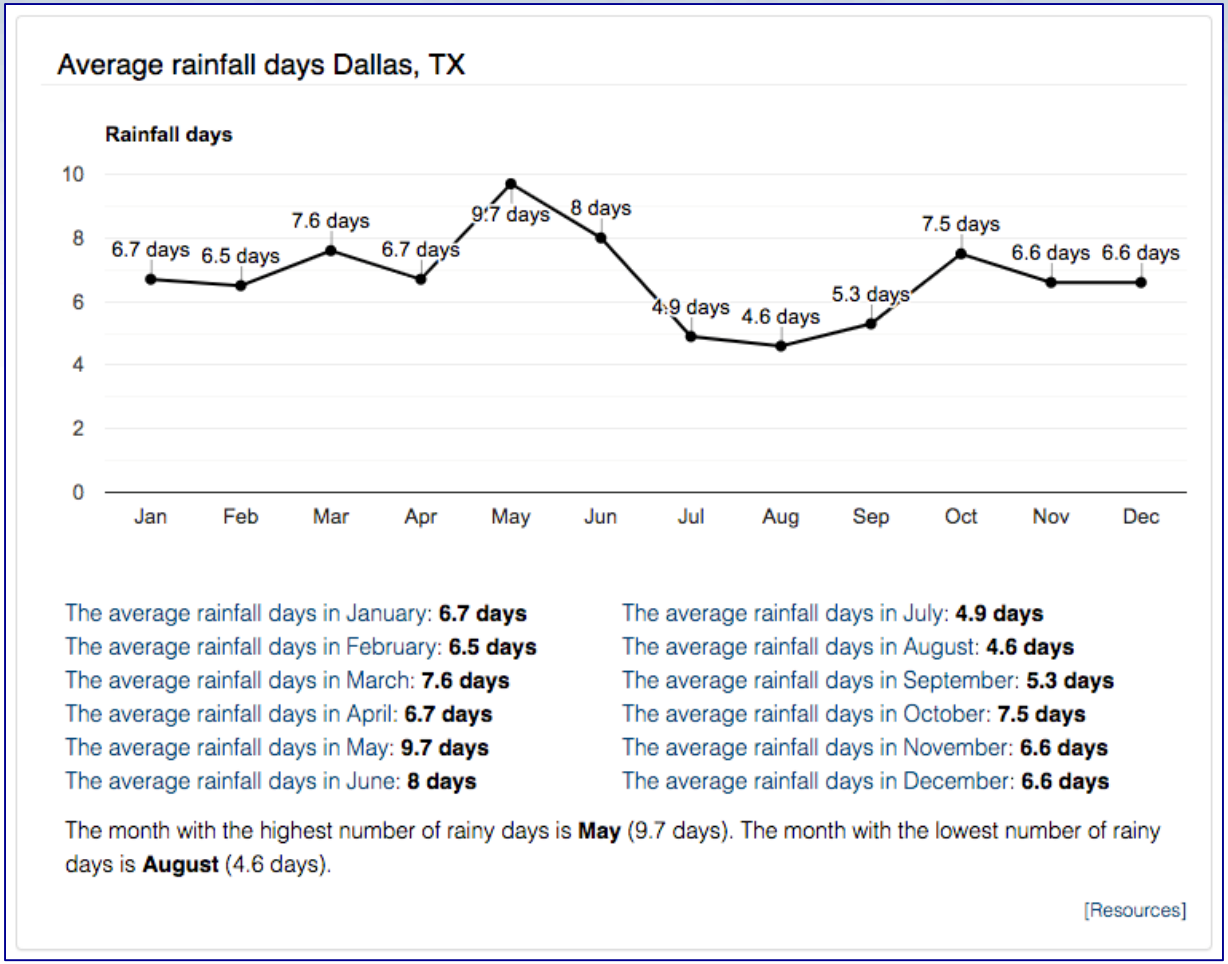
Storms

Rain



Source: *Preliminary Weather Gap Analysis for UAS Operations,* MIT Lincoln Lab Project Report for FAA, 2017

casa

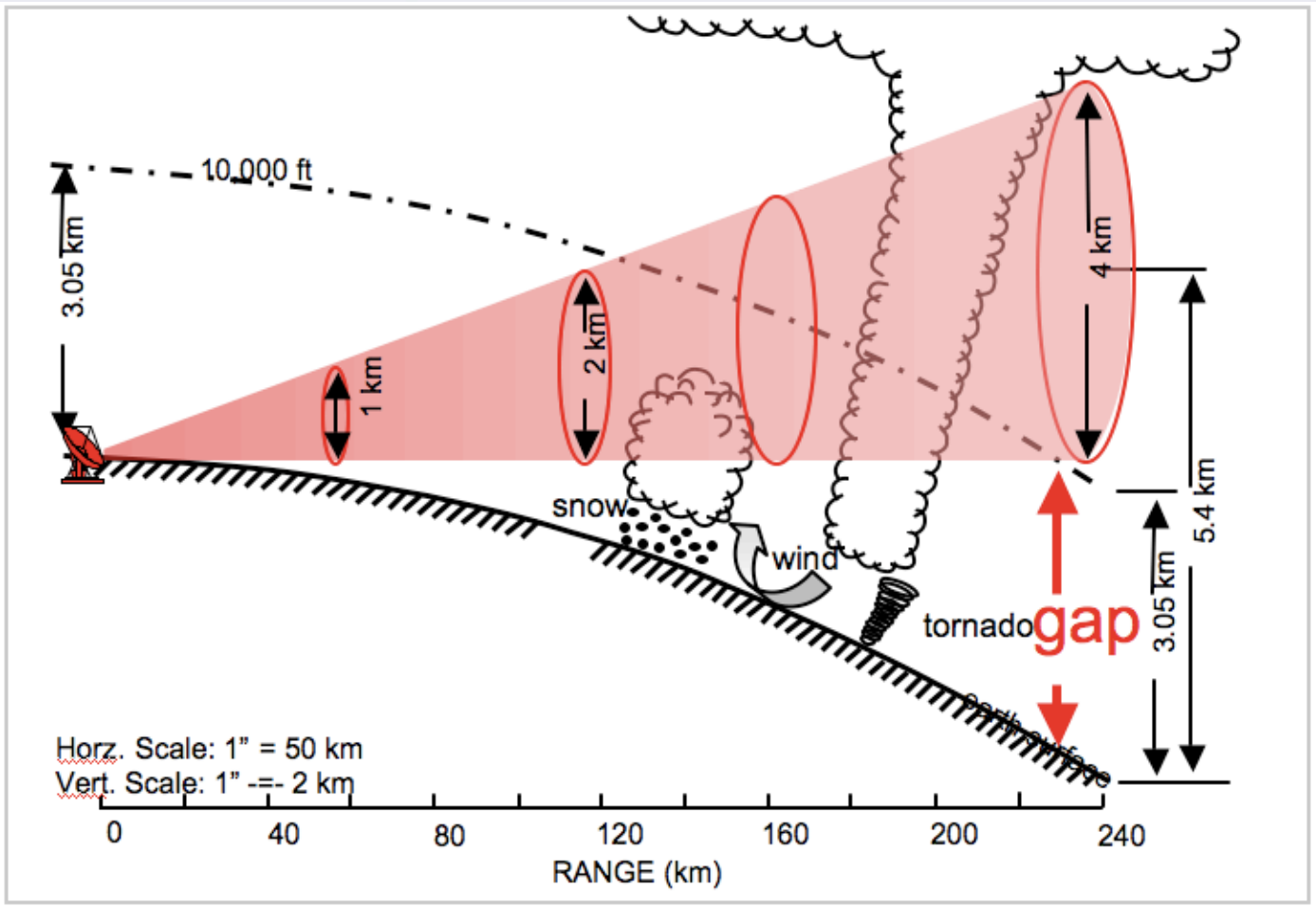


https://www.weather-us.com/en/texas-usa/dallas-climate#rainfall_days

CASA records show ~140 days of rain across the DFW Metroplex (2018)

casa

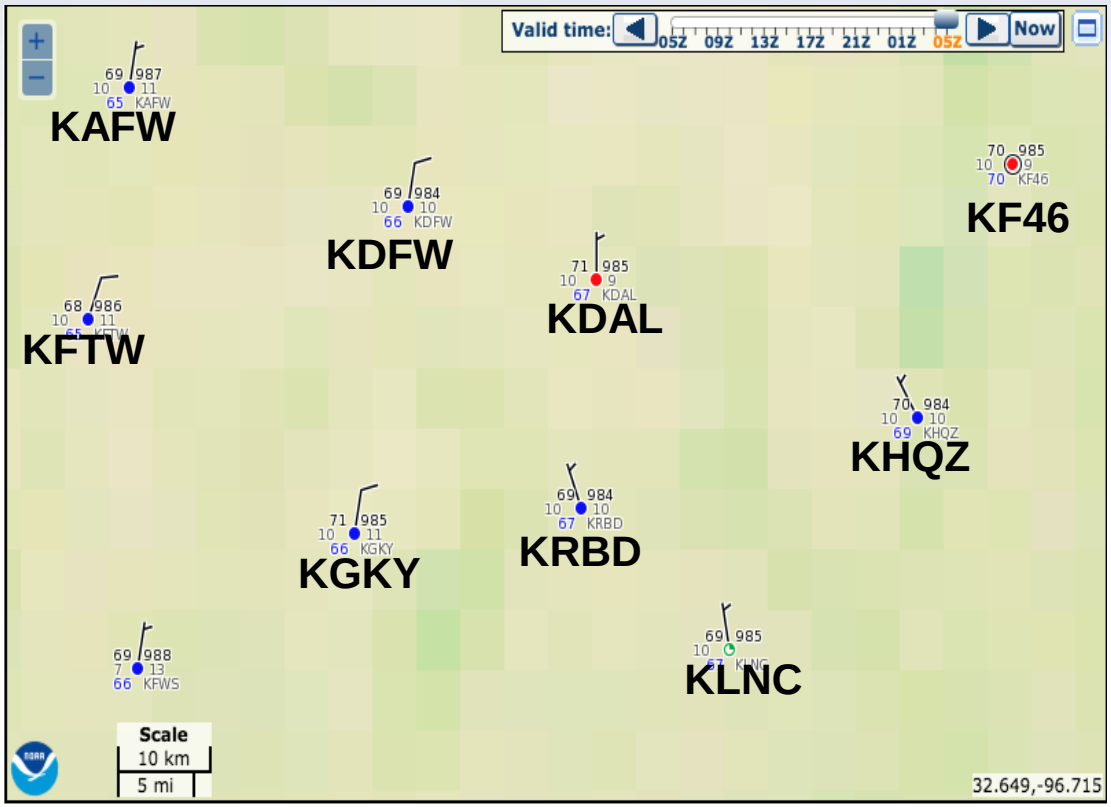
Existing radars not optimized for low-altitude operations



72% of atmosphere <10,000 ft goes undersampled

casa

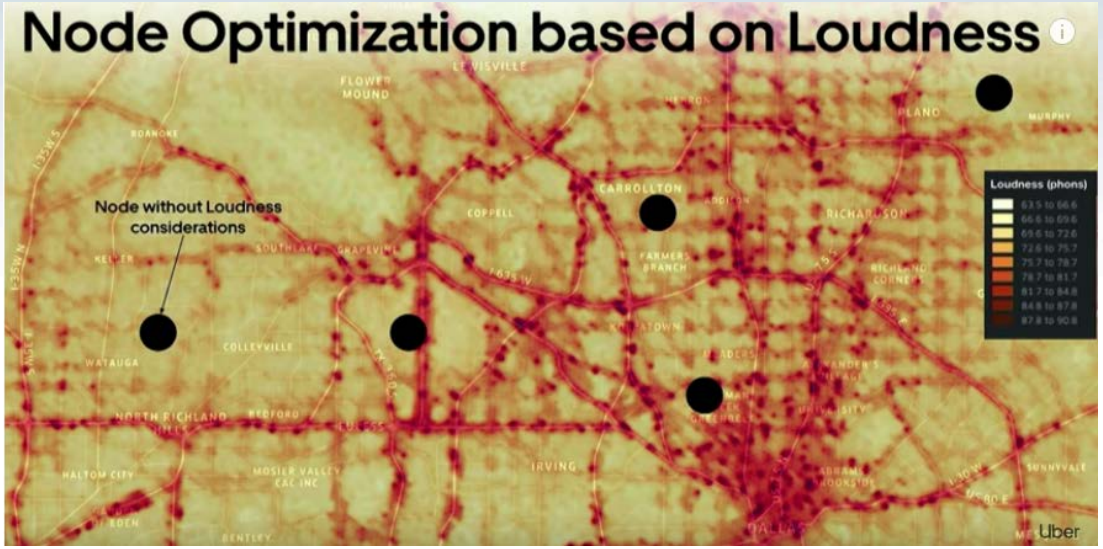
Aviation weather observations optimized for airports…

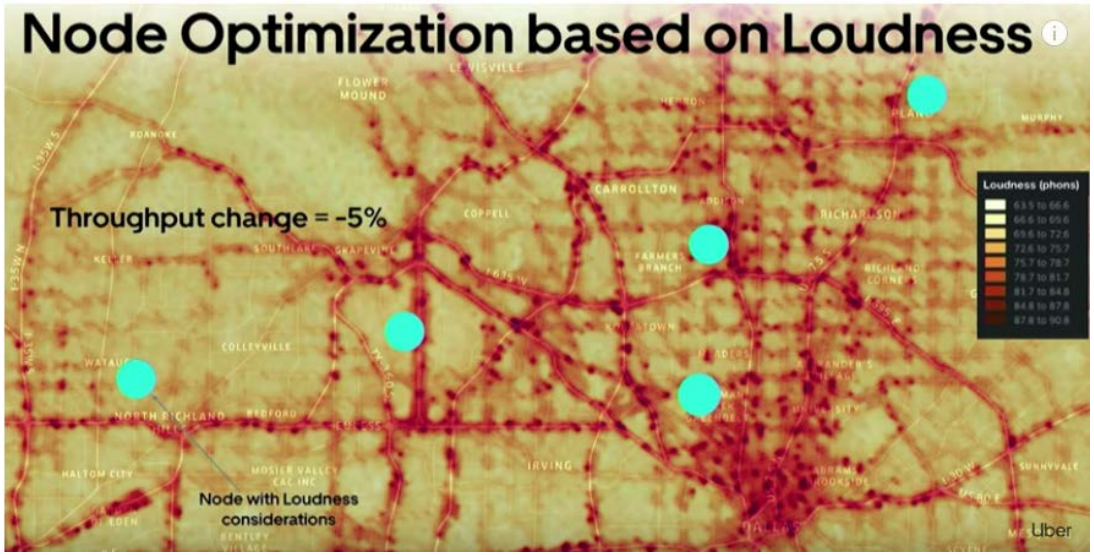


But drones and air taxis will have operations all over the place (hospitals, garages, skyports)!

casa

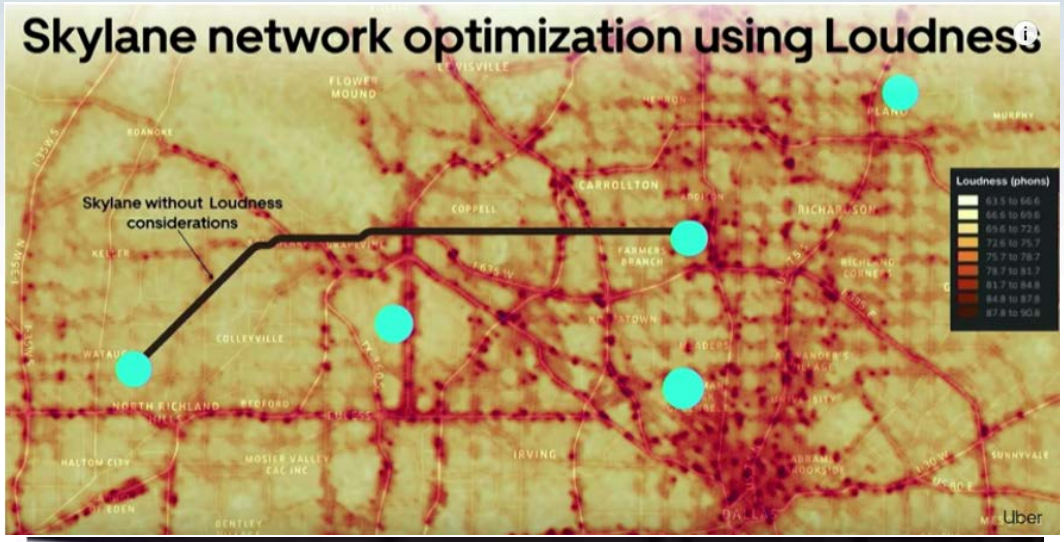
Optimizing node locations based on Noise considerations (Uber)

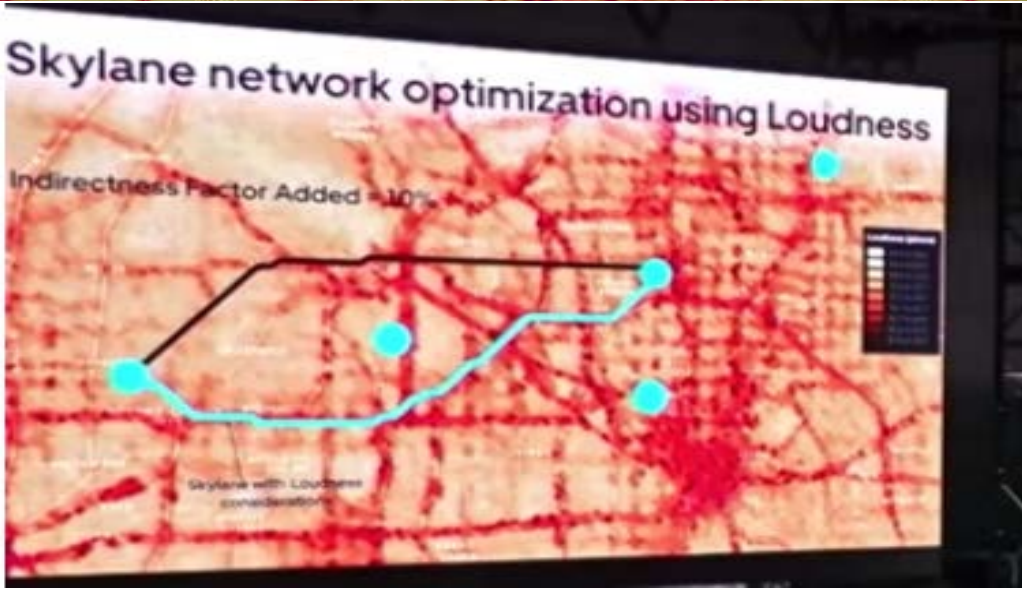




Source: “Driving eVTOL community acceptance”, Project Symphony, Uber Elevate Summit, Washington DC, June 2019

Optimizing routes based on Noise considerations (Uber)





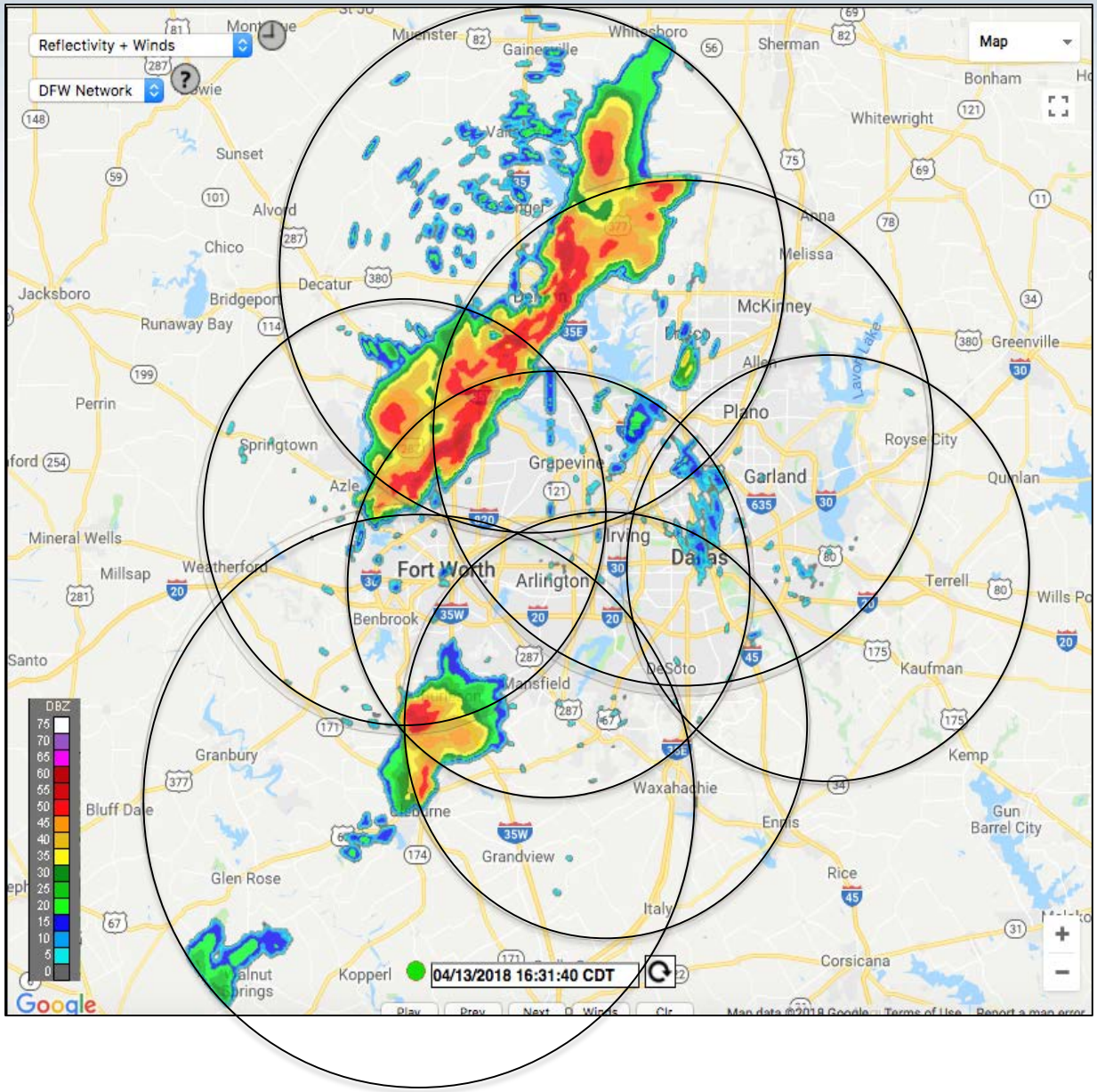
Source: “Driving eVTOL community acceptance”, Project Symphony, Uber Elevate Summit, Washington DC, June 2019

Public-private partnership with North Central Texas cities, National Weather Service to improve severe weather preparedness and response

- CASA Engineering Research Center (universities, industry, government agencies)
- Partnering with NCTCOG, NWS, DFW Airport, Bell
- Deep rooted community connections (1000 EMs across 50 cities in N. Texas)
- Operate weather observation infrastructure, provide weather alerting services.
- Study user decision making and public response
- Develop operations and business models

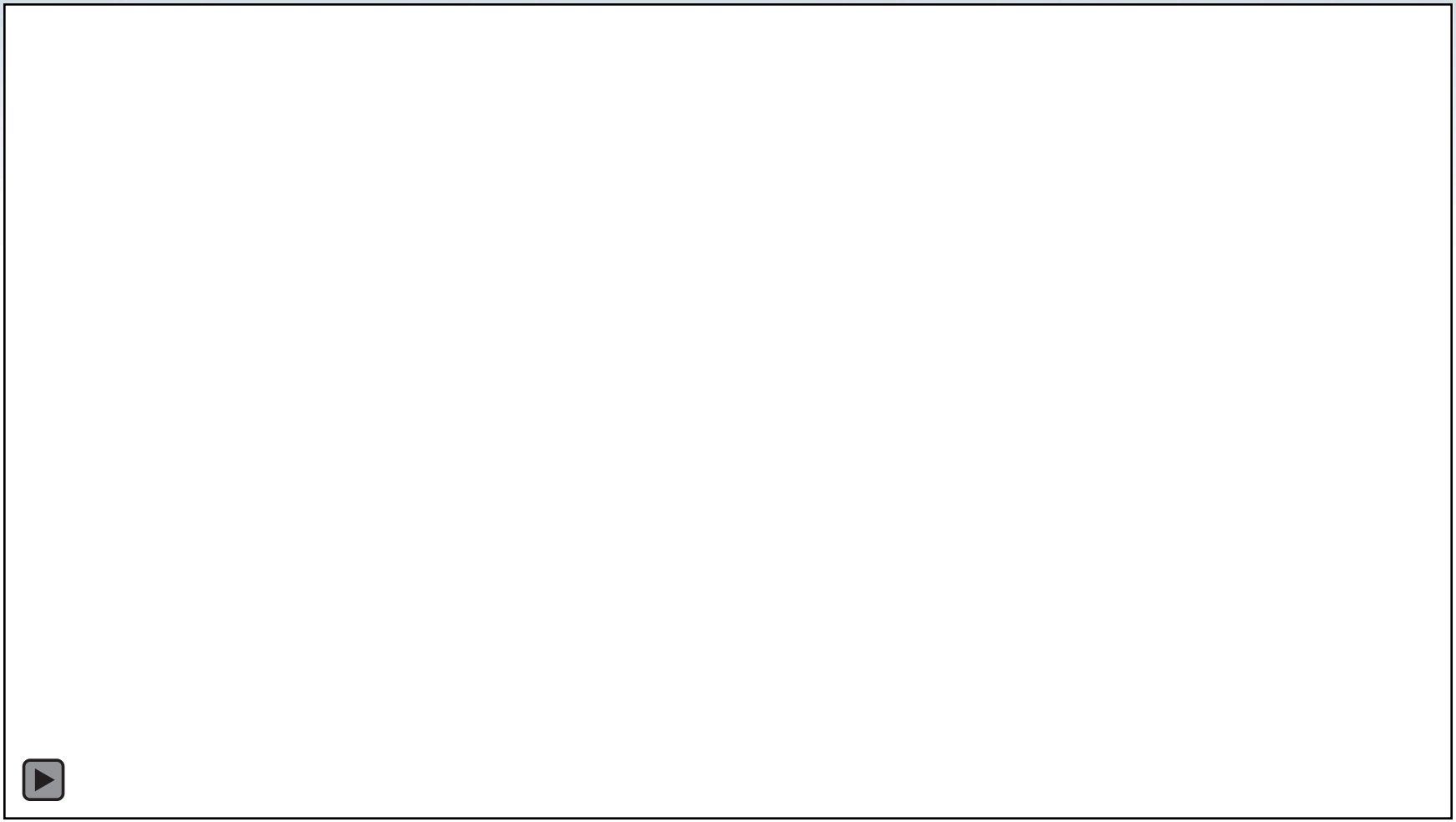
casa

Unique 7-node X-band radar network in North Texas

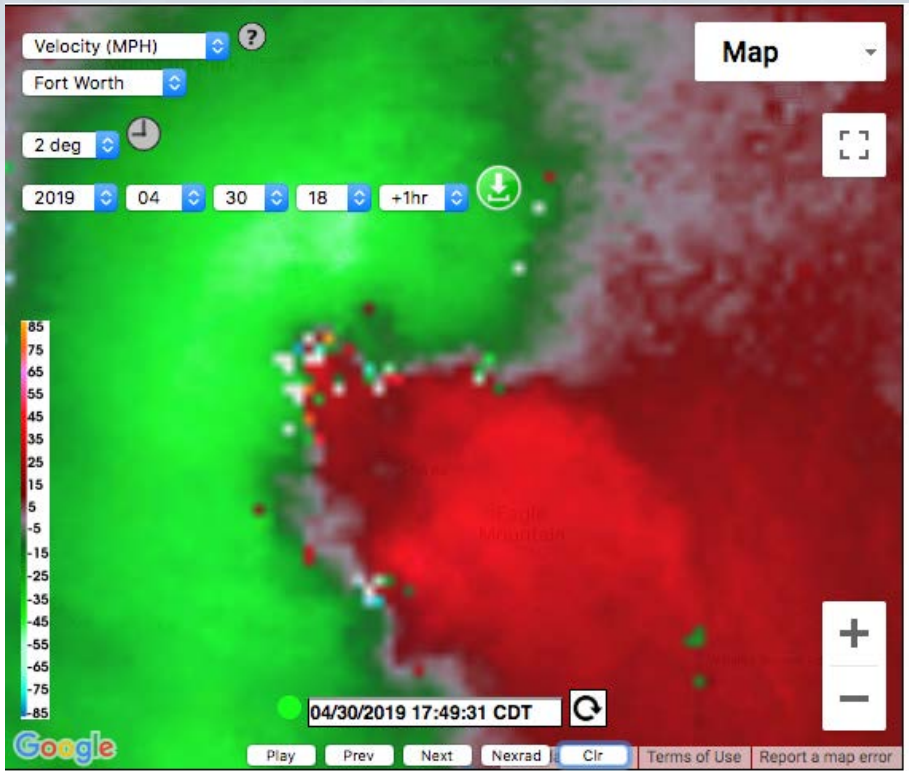


casa

Low-altitude coverage across the Metroplex

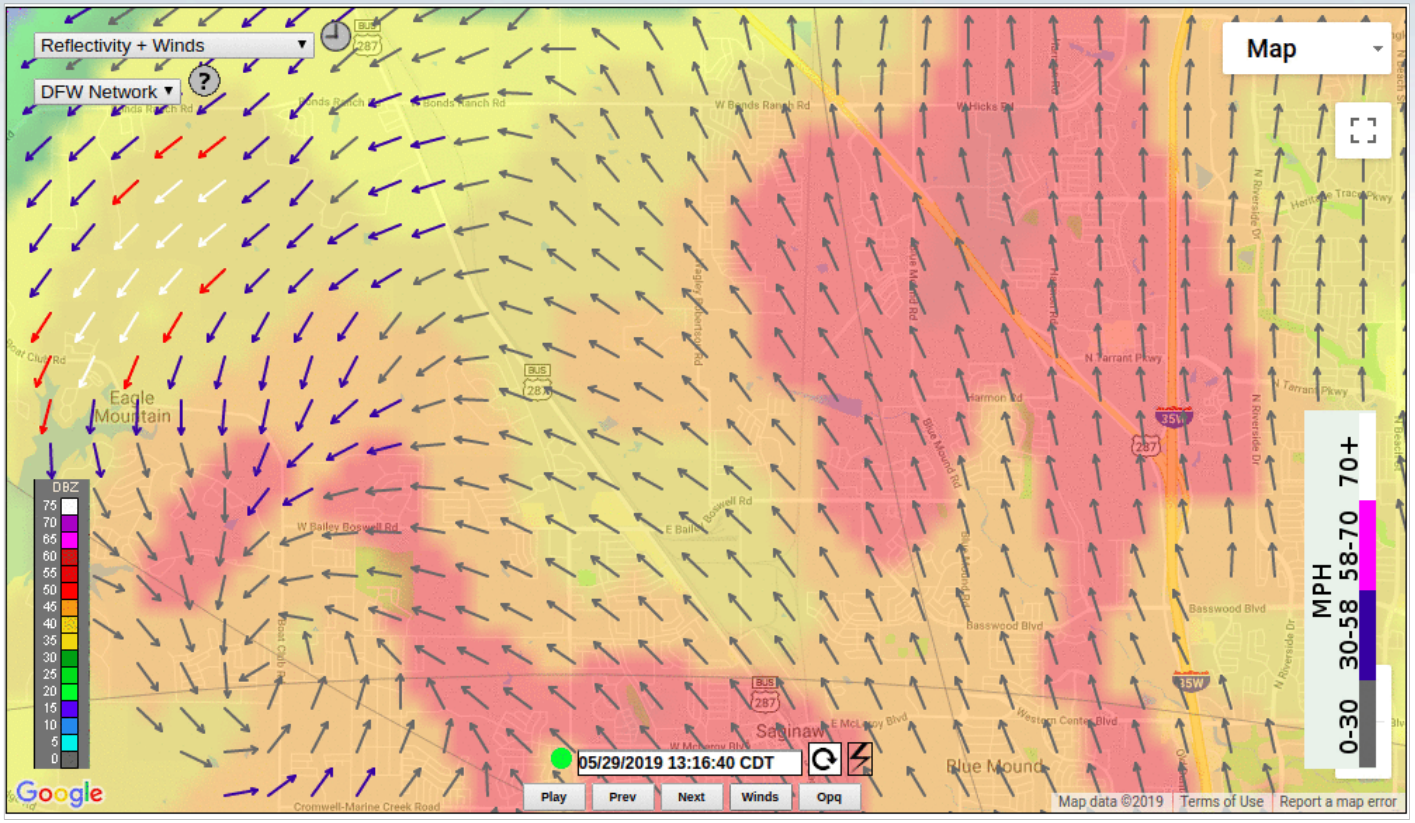


CASA data being used by NWS for tornado warning



April 30, 2019

NWS used CASA data to spot ‘very strong low level rotation’ east of Eagle Mountain Lake and issue a tornado warning.

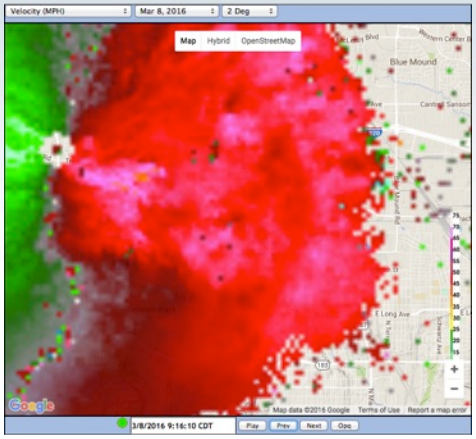


May 29, 2019

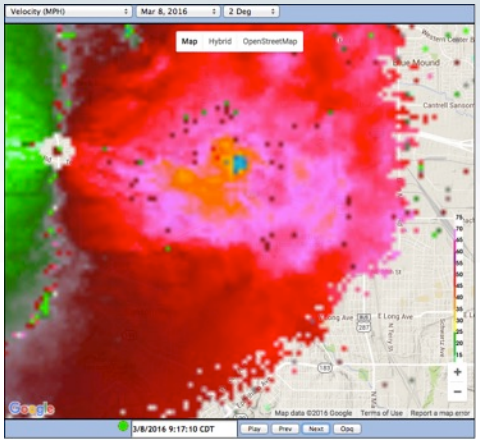
NWS used CASA data to track rotation, with street level precision, as it headed towards Alliance and DFW International Airport.

casa

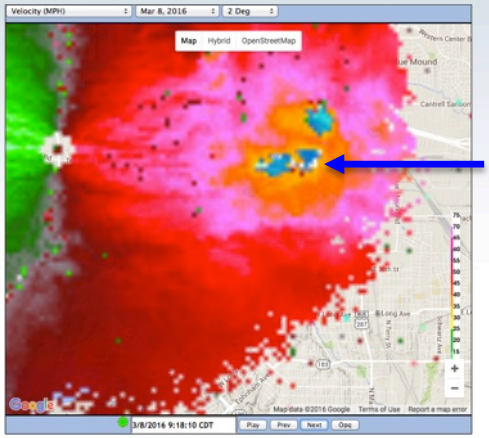
Pinpointing developing wind threats, minute-by-minute



09:16 am



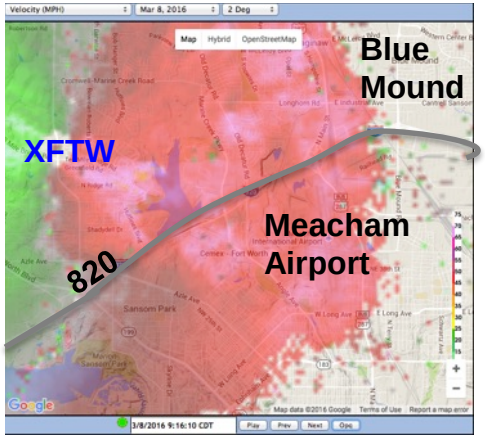
09:17 am

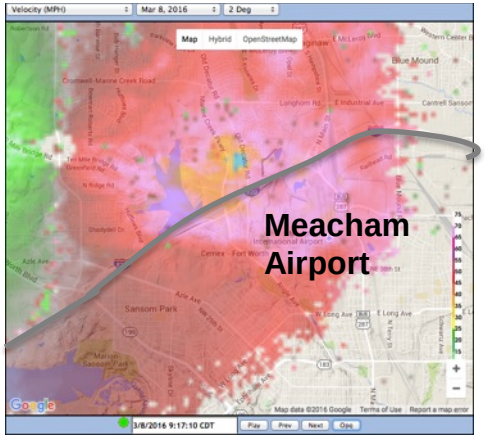


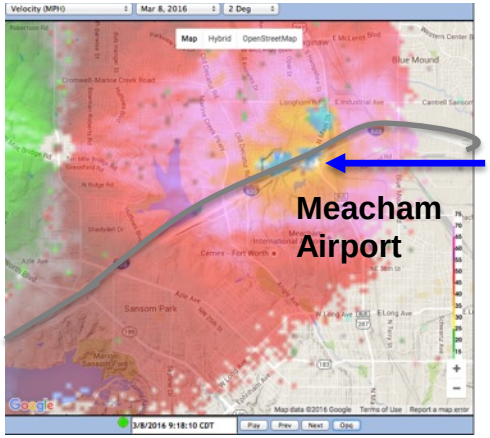
09:18 am

Distinct high velocity radar signature

One minute updates





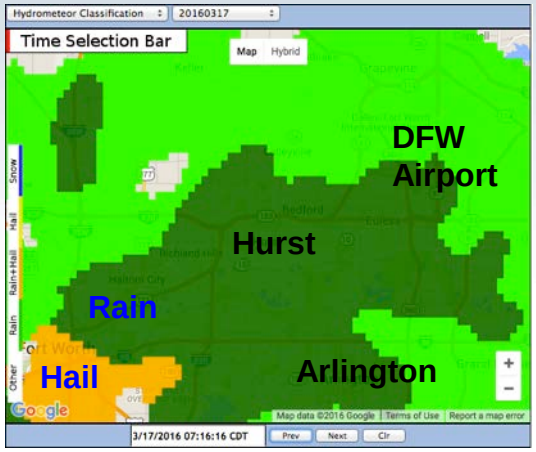


Hangar Damage

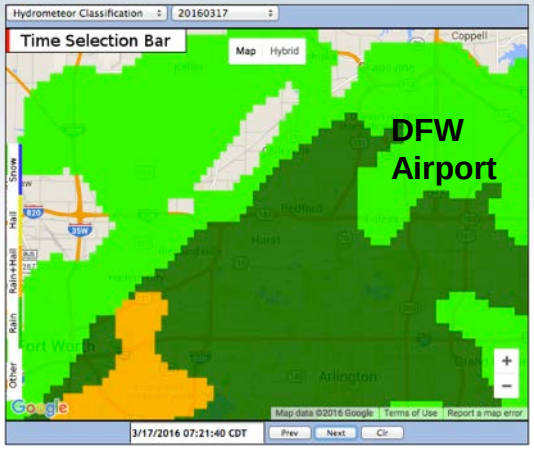
High resolution radar velocity images help pinpoint high wind threats to airport tenants.
Case Study: March 8, 2016. Strong winds caused the roof of one hangar to be blown off and another one to get damaged, north end of Meacham International Airport. CASA provided archived **radar velocity data to pinpoint** location of strongest winds within the storm.

casa

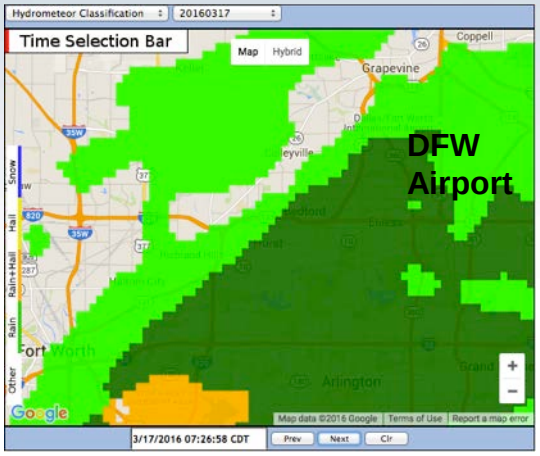
Identifying location of hail within the storm



07:16 am

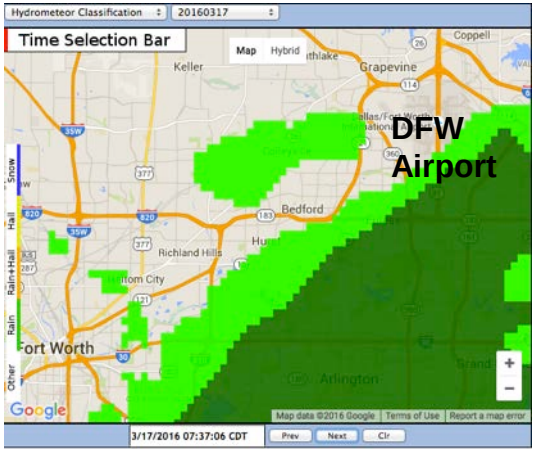


07:21 am

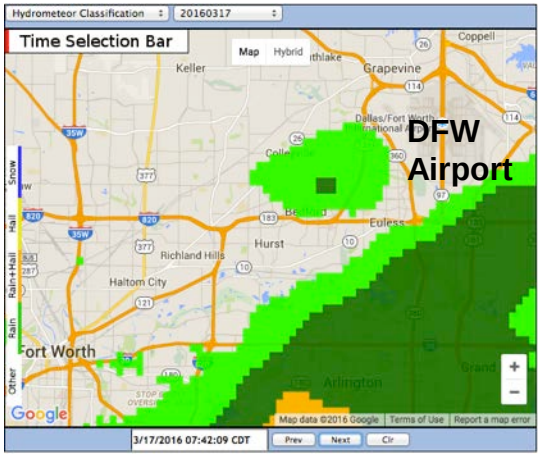


07:26 am

07:32 am



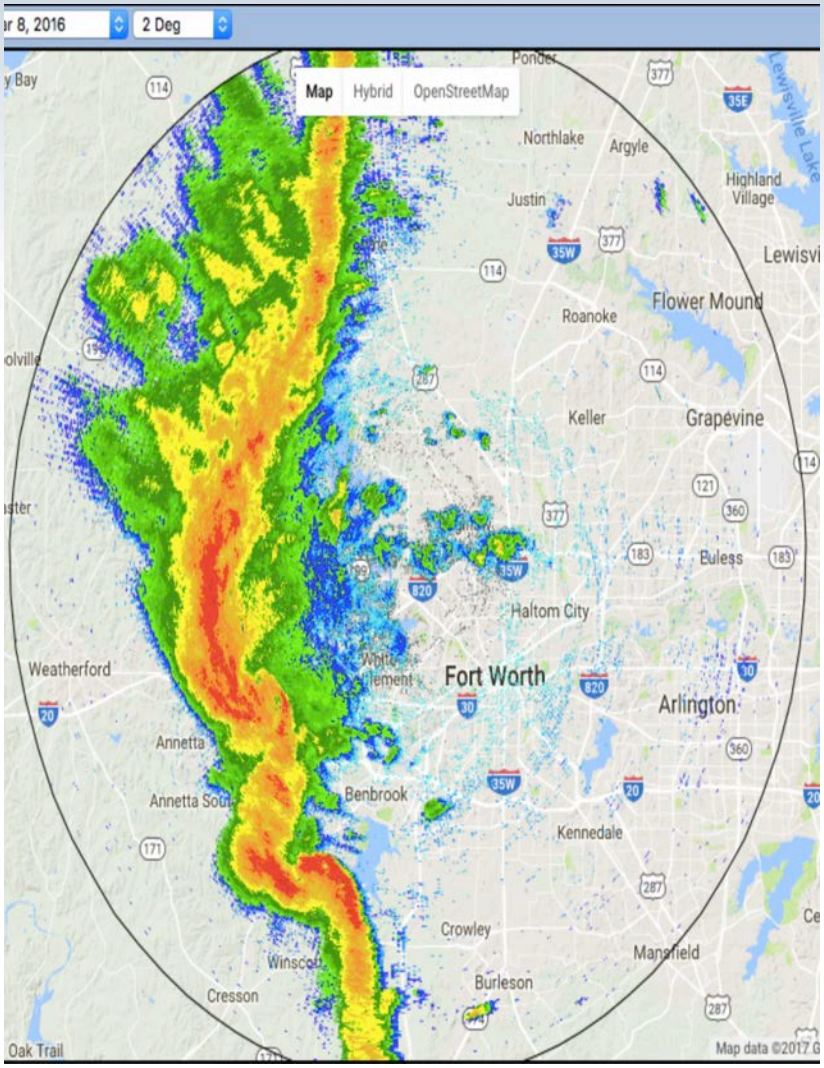
07:37 am



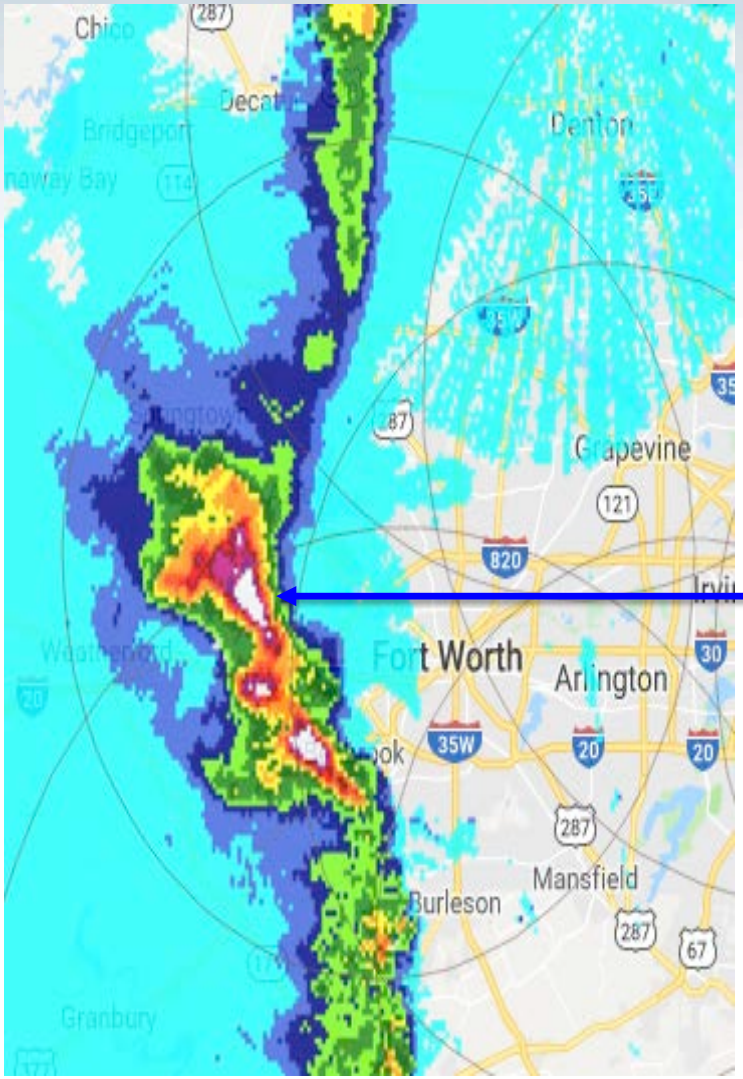
07:42 am

Hail product helps airport operations personnel prepare for impact. **Case Study:** March 17, 2016. Hail storm damage reported widely across the Metroplex. Airport Duty Manager continuously monitored the CASA hail product during the entire event and was able ‘to alleviate the fear that the airport itself was going to be impacted by the hail’.

Identifying pockets of heavy rain within storm events



High Resolution Radar Reflectivity



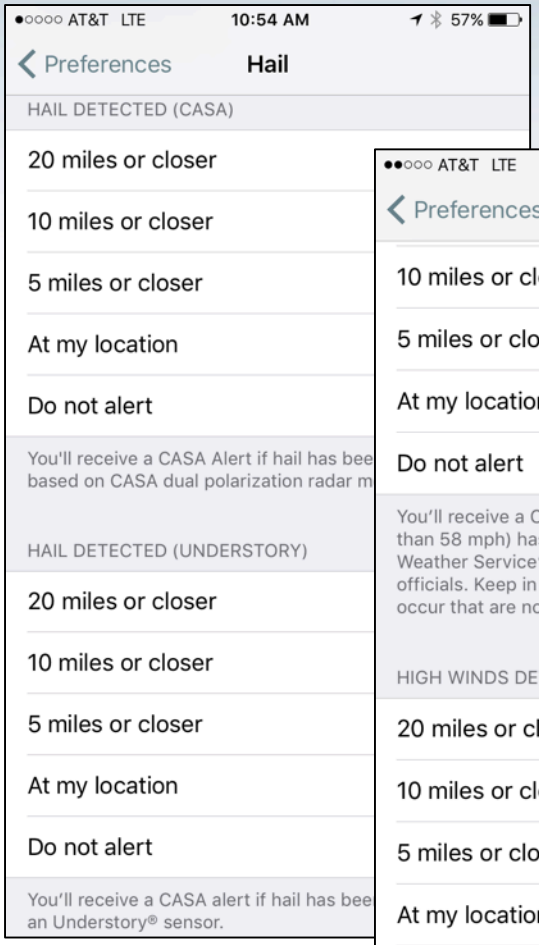
Rain Rate Image

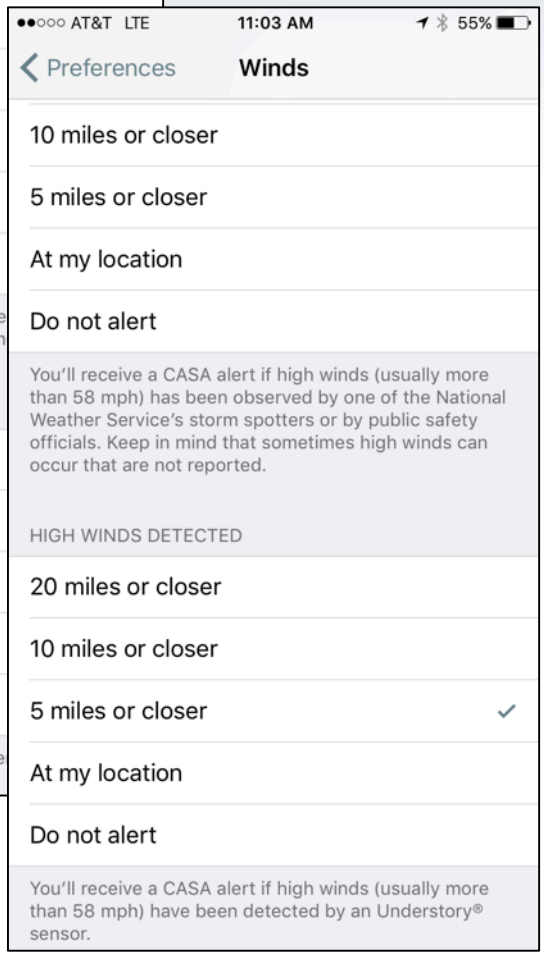
Bright colors showing heaviest rain. White > 7 inches/hour

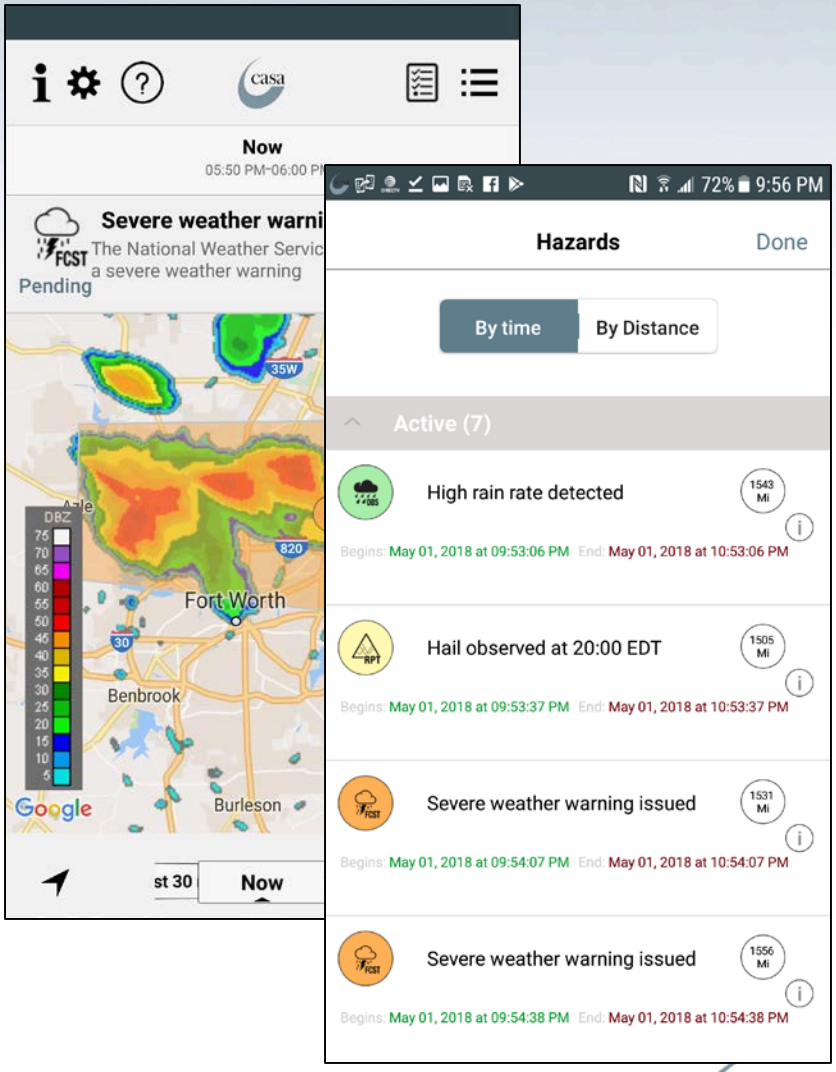
Knowing where the rain is the heaviest can help support flight operations, including diverts, without having to land vehicles.

casa

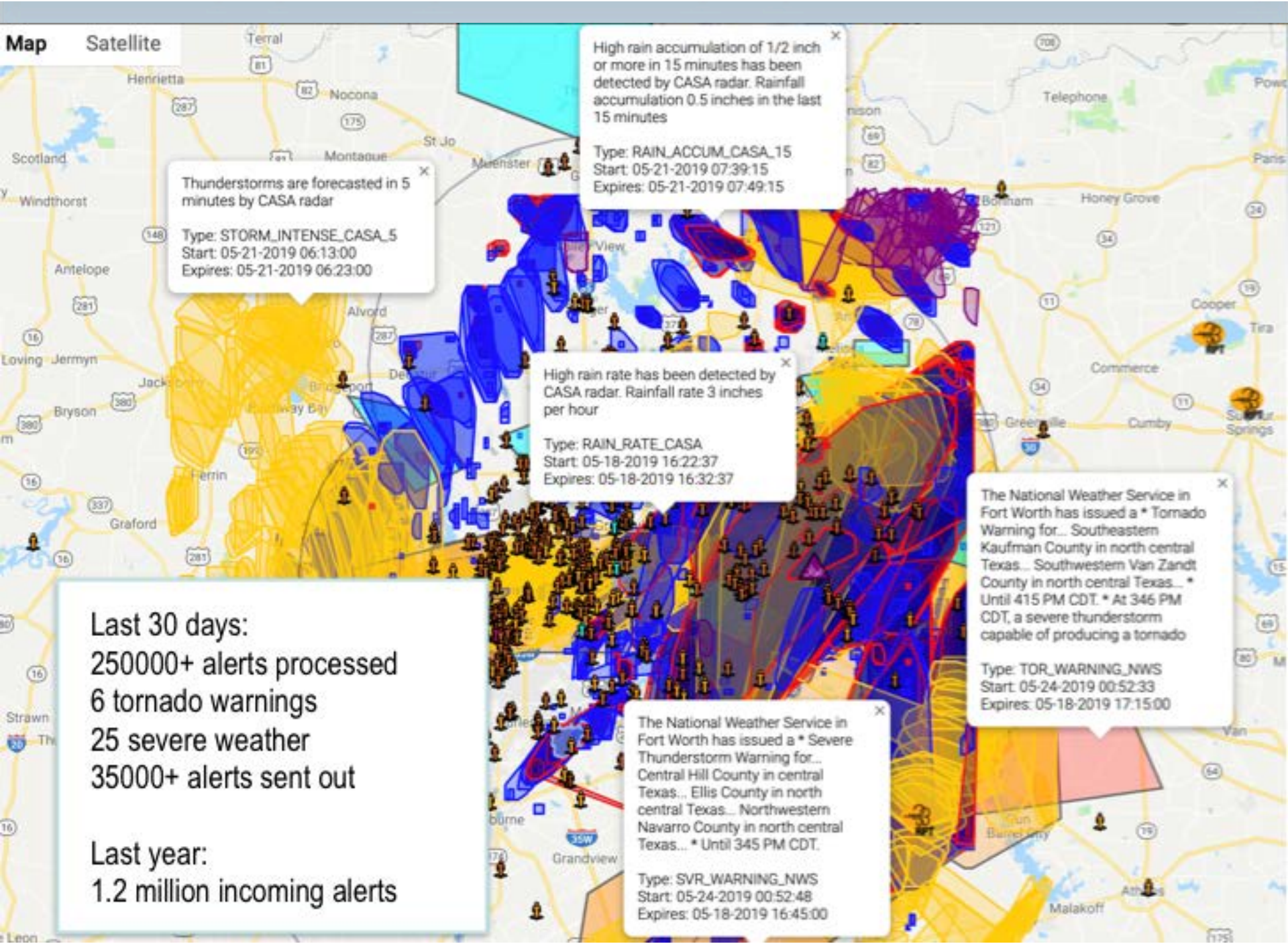
Alerts delivered on mobile app or via email/text messages







Users can decide what they want to be warned about, when and over what locations.


Map
Satellite
High rain accumulation of 1/2 inch or more in 15 minutes has been detected by CASA radar. Rainfall accumulation 0.5 inches in the last 15 minutes
Type: RAIN_ACCUM_CASA_15
Start: 05-21-2019 07:39:15
Expires: 05-21-2019 07:49:15
Thunderstorms are forecasted in 5 minutes by CASA radar
Type: STORM_INTENSE_CASA_5
Start: 05-21-2019 06:13:00
Expires: 05-21-2019 06:23:00
High rain rate has been detected by CASA radar. Rainfall rate 3 inches per hour
Type: RAIN_RATE_CASA
Start: 05-18-2019 16:22:37
Expires: 05-18-2019 16:32:37
The National Weather Service in Fort Worth has issued a * Tornado Warning for... Southeastern Kaufman County in north central Texas... Southwestern Van Zandt County in north central Texas... * Until 415 PM CDT. * At 346 PM CDT, a severe thunderstorm capable of producing a tornado
Type: TOR_WARNING_NWS
Start: 05-24-2019 00:52:33
Expires: 05-18-2019 17:15:00
The National Weather Service in Fort Worth has issued a * Severe Thunderstorm Warning for... Central Hill County in central Texas... Ellis County in north central Texas... Northwestern Navarro County in north central Texas... * Until 345 PM CDT.
Type: SVR_WARNING_NWS
Start: 05-24-2019 00:52:48
Expires: 05-18-2019 16:45:00
Last 30 days:
250000+ alerts processed
6 tornado warnings
25 severe weather
35000+ alerts sent out
Last year:
1.2 million incoming alerts

Features of CASA's Weather Avoidance Software

- **Platform technology**
  - Large number of vehicles
  - Customized to individual vehicle performance characteristics
  - Customized to mission risk criteria

- Novel sources of **low-altitude** weather

- **Targeted**, route-specific weather alerts

- **Automated** weather guidance for integration into command and control systems

→ Builds on our existing **City Warn™ Hazard Notification System** technology for motorists and emergency managers.

casa

Action Items for the Task Force

- Gather weather **requirements** for air taxis and drones
- Create **Inventory** of local weather observation and forecasting assets
- Conduct regional weather **Gap Analysis**
- Develop strategy for creating a **Common Operating Picture**
- Plan for future **Autonomous Operations**

Contact:

Apoorva Bajaj, CASA, bajaj@ecs.umass.edu

Brenda Philips, V. Chandrasekar, E. Lyons, D. Westbrook (CASA)

Amanda Everly, CASA WX Executive Council, amanda.everly@fortworthtexas.gov

Alayna Payne, NCTCOG, apayne@nctcog.org

casa

UPCOMING SCHEDULE

- **July 3rd** – Working Group Meetings, Conference Call with Leaders – Conference Call, 888-909-7654, Participant PIN: 504571
- NCTCOG's first floor will be going through construction from July 15th to September 30th. Because of this we have had to make some changes to the schedule
  - **July 23rd** ,UAS Safety and Integration Task Force meeting – Building 3 Tejas Room
  - **July 31st** ,UAS and Safety and Integration Task Force Working Group meeting – Conference Call, 888-909-7654, Participant PIN: 504571
  - **August 13th** 9:00 AM to 12:00 PM, UAS Safety and Integration Task Force Day in Corpus Christi for the NASA TCL4 event ran by Lone Star UAS Center of Excellence & Innovation. (more details to follow)
  - **August 27th** , UAS Safety and Integration Task Force meeting – Cancelled
  - **September 3rd** , UAS and Safety and Integration Task Force Working Group meeting – Cancelled