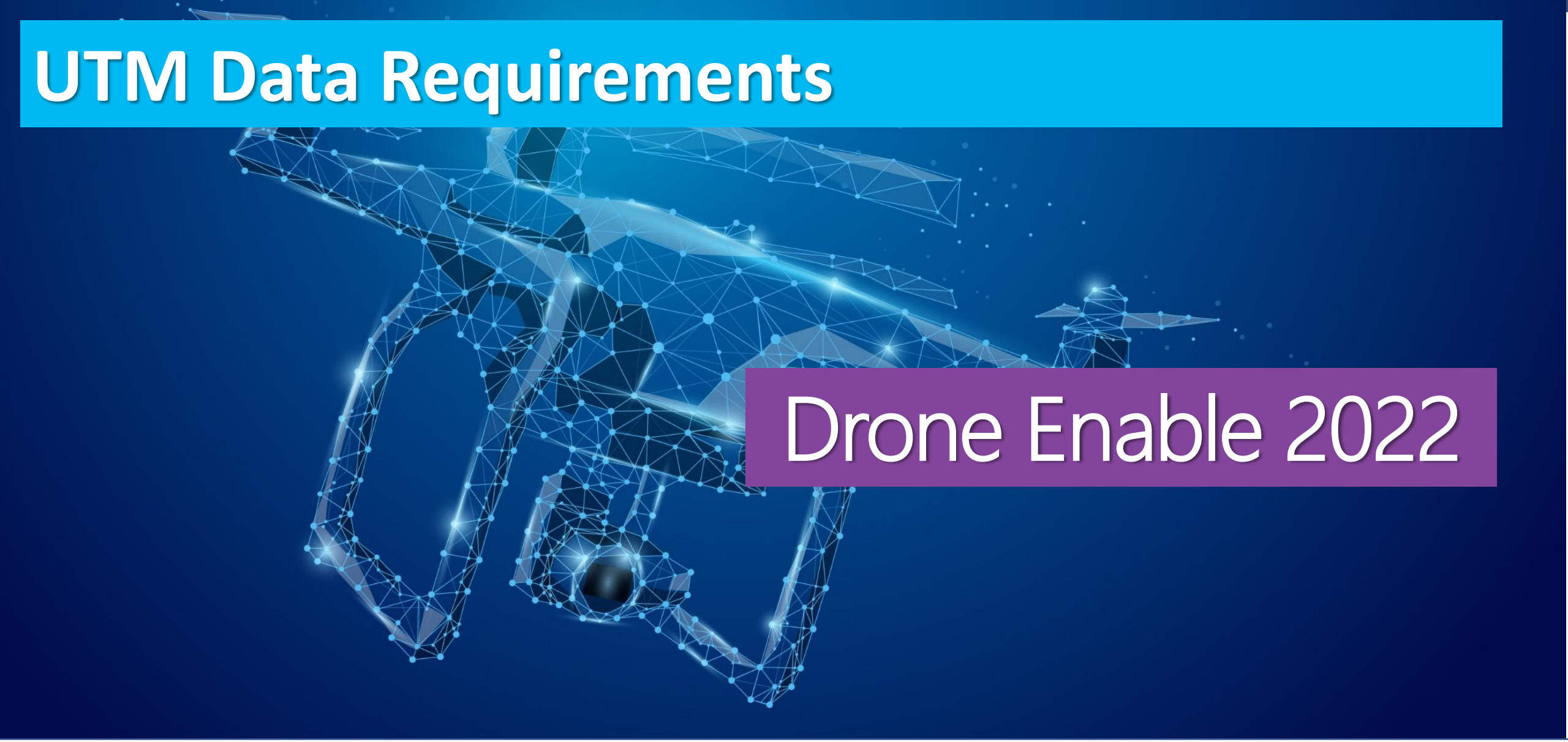
UTM Data Requirements



Drone Enable 2022

רשות החדשנות
Israel Innovation Authority

Israel
CENTRE FOR THE FOURTH INDUSTRIAL REVOLUTION
A Partner of the World Economic Forum Network for Global Technology Governance

רט"א CAAI

AYALON HIGHWAYS

MINISTRY OF TRANSPORT & ROAD SAFETY

INDI
Israel National Drones Initiative

Agenda

01 Introduction

02 INDI Project background & regulatory aspects

03 INDI Project technical aspects and lessons learned

04 Next steps & Conclusions

05 Open Discussion/Q&A

Project Principles

- Based on U-space CONOP and European Regulatory Framework (EU 2021/664 665 666)
  - NPA 2021-14
  - ASTM 3548-21
  - ASTM 3411-22a
- Adapt international regulation to the Israeli environment (EASA services vs. ICAO)
- 8 quarterly very large-scale demonstration (VLD) (2 weeks per quarter)
- Data collection and detailed debriefing to serve effective data driven regulation
- Government support in expenses and enabling the project operations (CAAI as a partner)
- Centralized project management

Israeli Airspace

- Extremely Heterogenic
  - Intense Civil-Military interface
  - Contribution of Civil Aviation in trade, tourism and economic growth
  - Unproportionally large UAS industry
- Relatively large number of Prohibited/Restricted/Danger Areas
- IAF (Military ATM) is the ANSP for the majority of domestic traffic
- Airspace Risk Assessment – assistance from EuroControl (STS)

Setbacks:

Weather minimum conditions – impact on safety

Data Driven Regulation – defining critical information and data collection processes

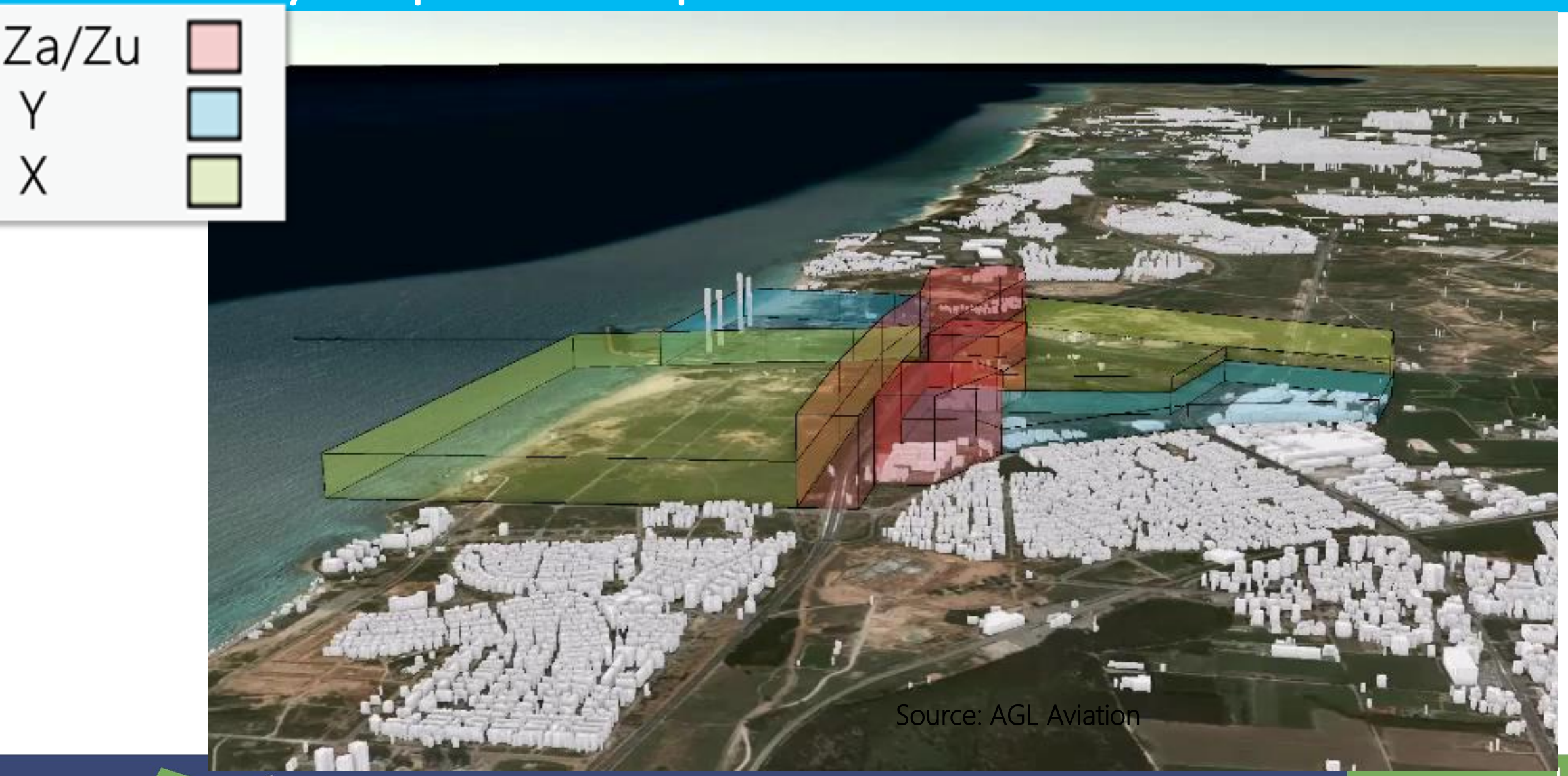
Integration with National Air Defense (procedural/integrative)
* ANSP (IAA) (AIXM?)

Common Altitude Reference System (CARS/CORA) – significant differences between platforms, impacts vertical separation;

N-RID – based on multiple cellular networks;
CTR and proximity alerts;

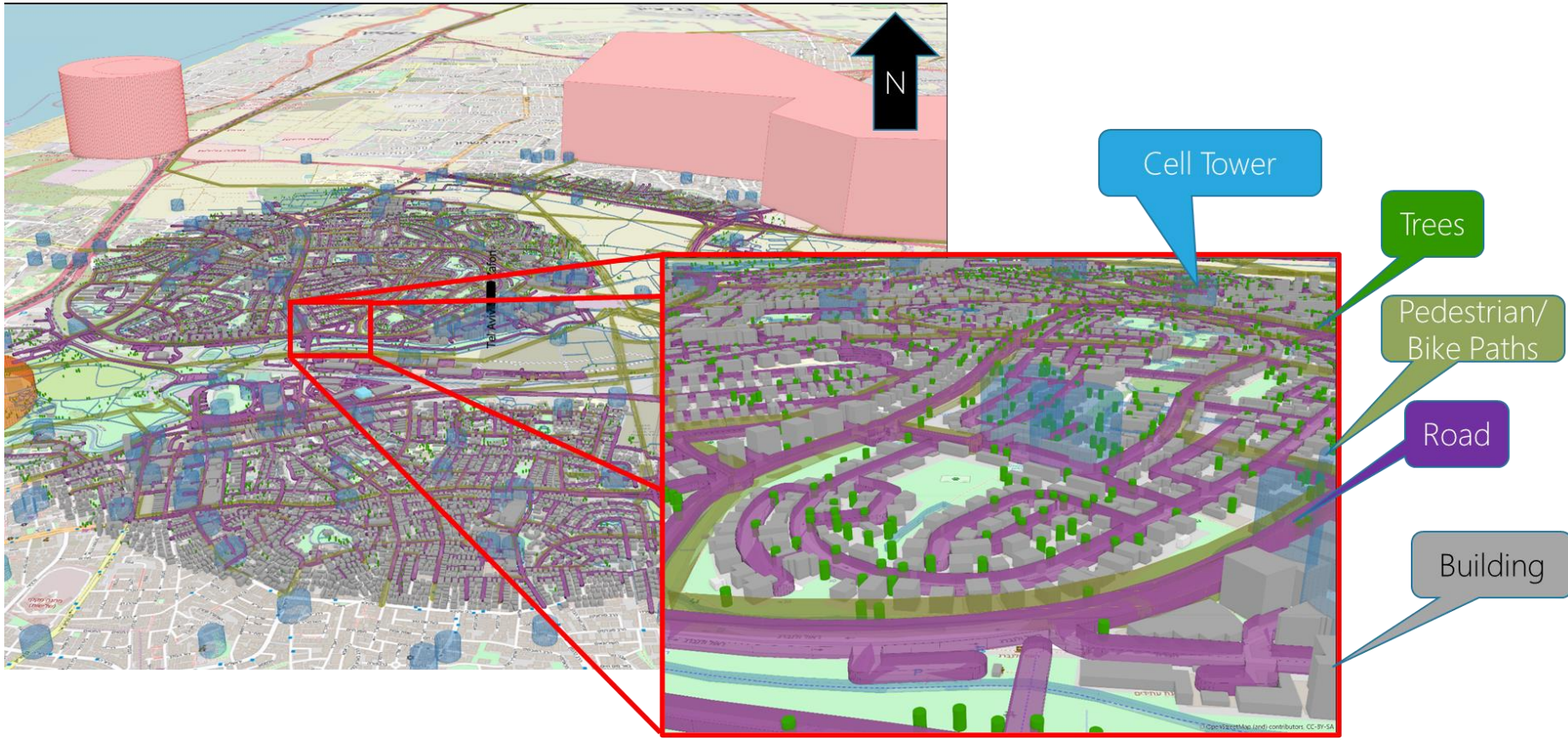
GNSS SiS Interference – significant concern, several potential solutions (RTK, visual reference navigation, LTE)

Hadera city U-Space – airspace classification & assessment



Obstacle and Sensitive Land Uses Mapping

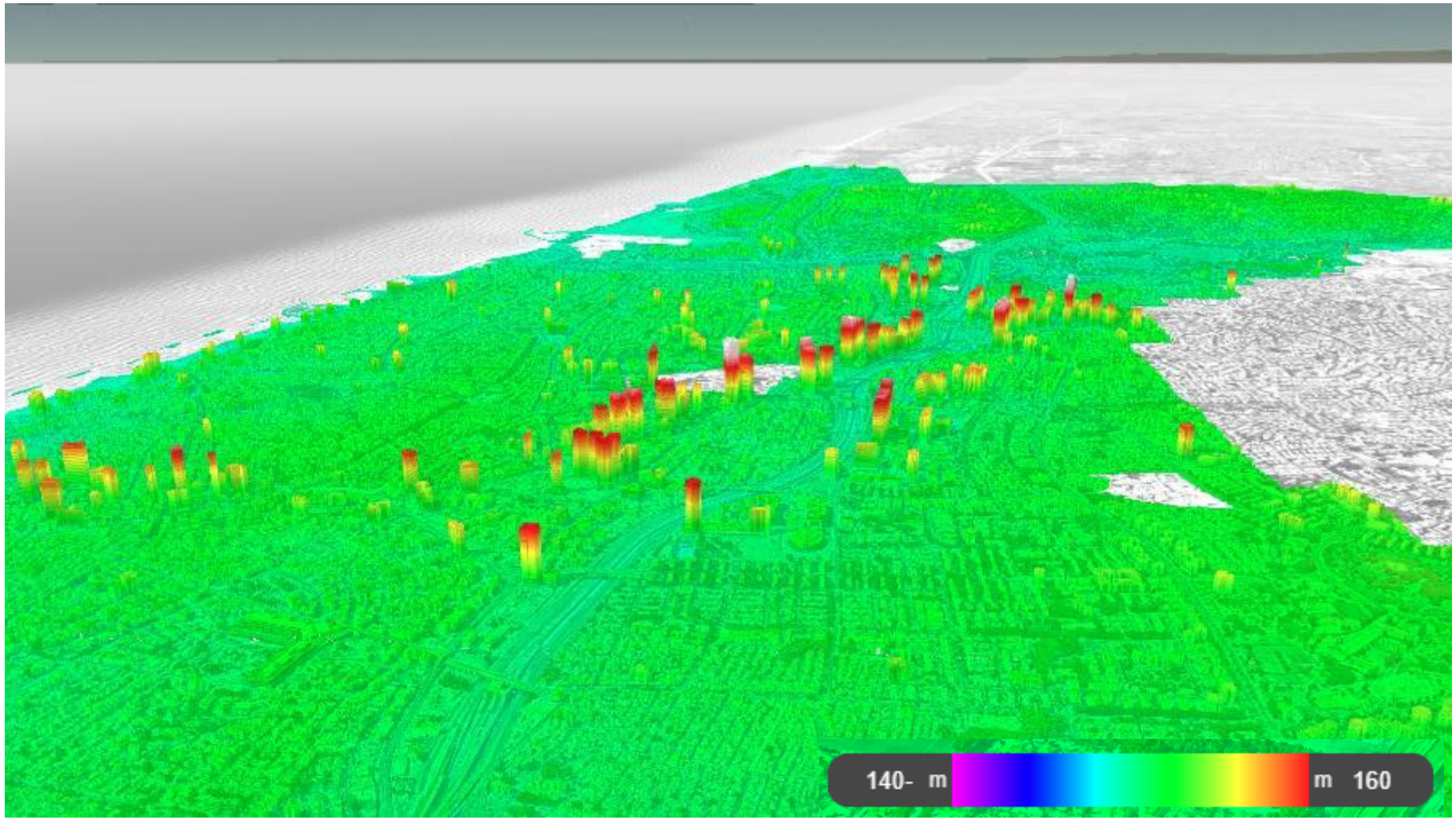
- Existing Databases were identified and studied (format, quality, integrity, accuracy, timeliness)
- Building Contours
- Cellular Towers
- Electricity Poles/Lines
- Trees
- Etc..



Source: AGL Aviation

Obstacle and Sensitive Land Uses Mapping (1)

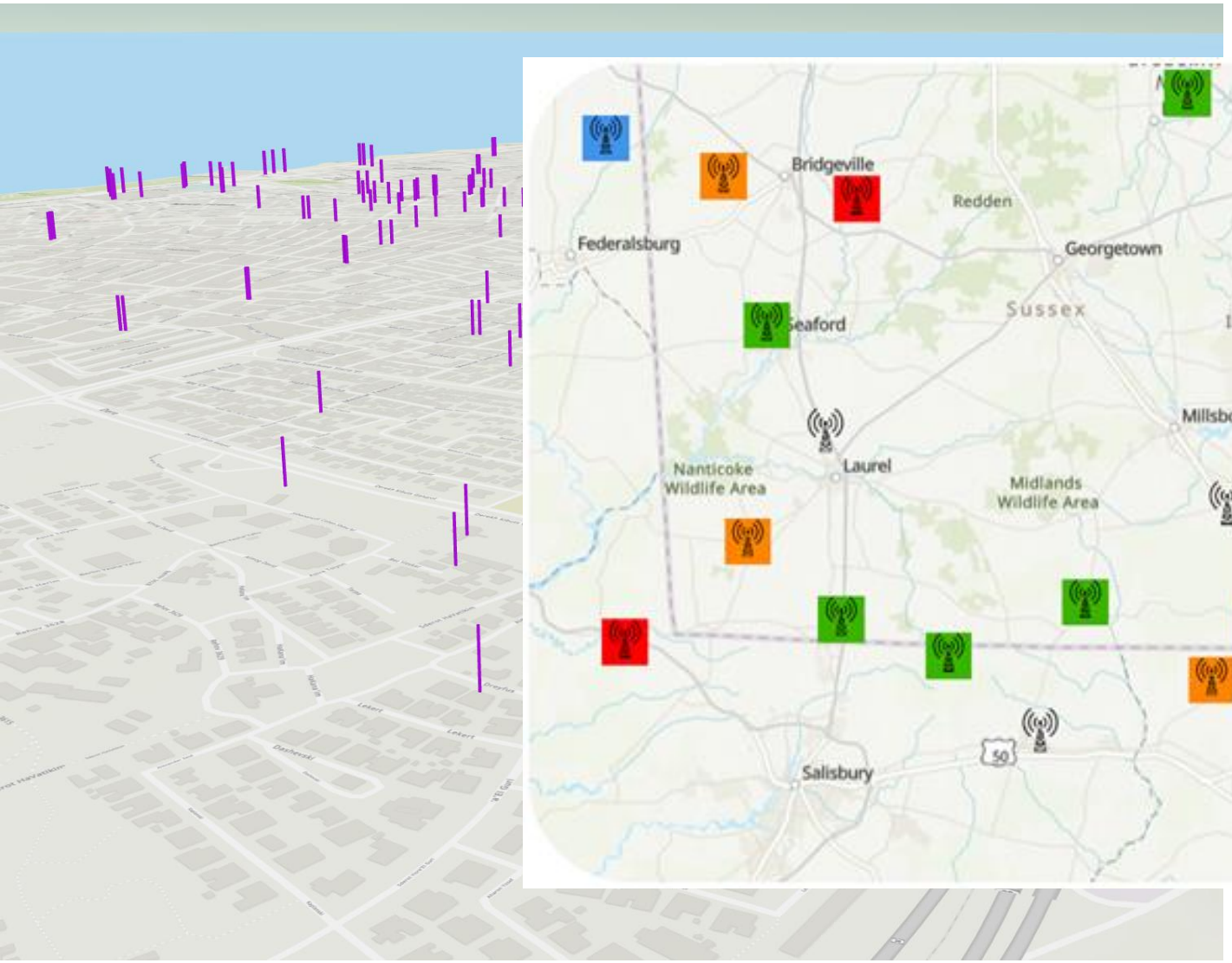
- Existing 3D high-resolution mapping databases were used to identify potential obstacles
- Digital databases can be embedded simply in UTM

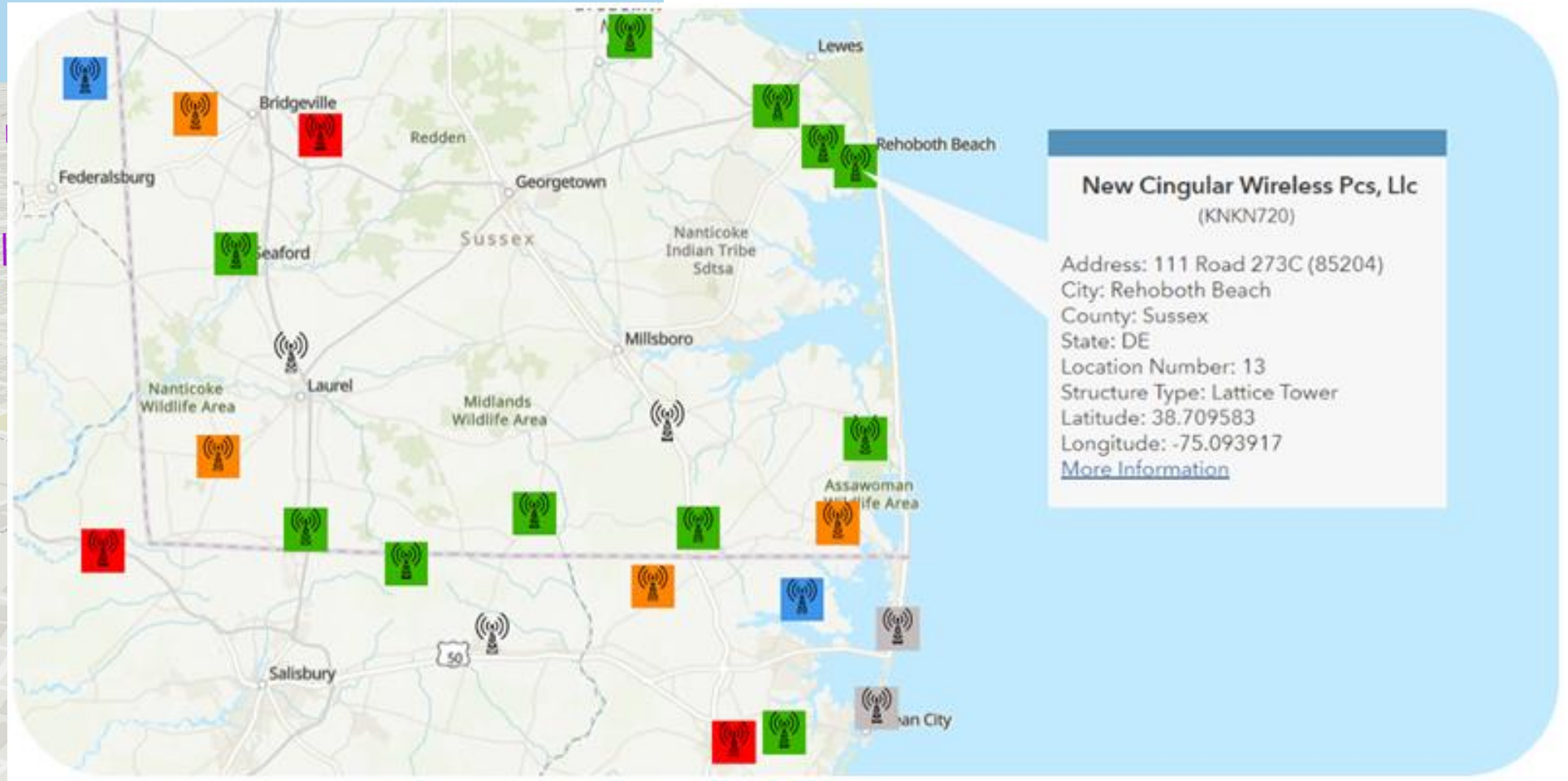


Source: Simplex 3D Model, Tel Aviv Yaffo

Tel Aviv city U-Space – Development of Shielding Model

Obstacle and Sensitive Land Uses Mapping – Cell Towers





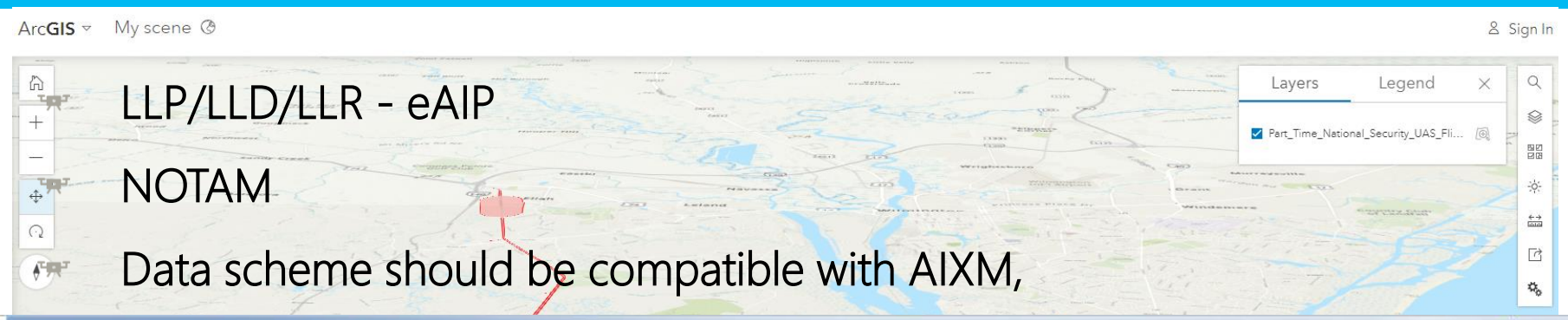
Source: FCC, USA Cell Towers DB (GIS)

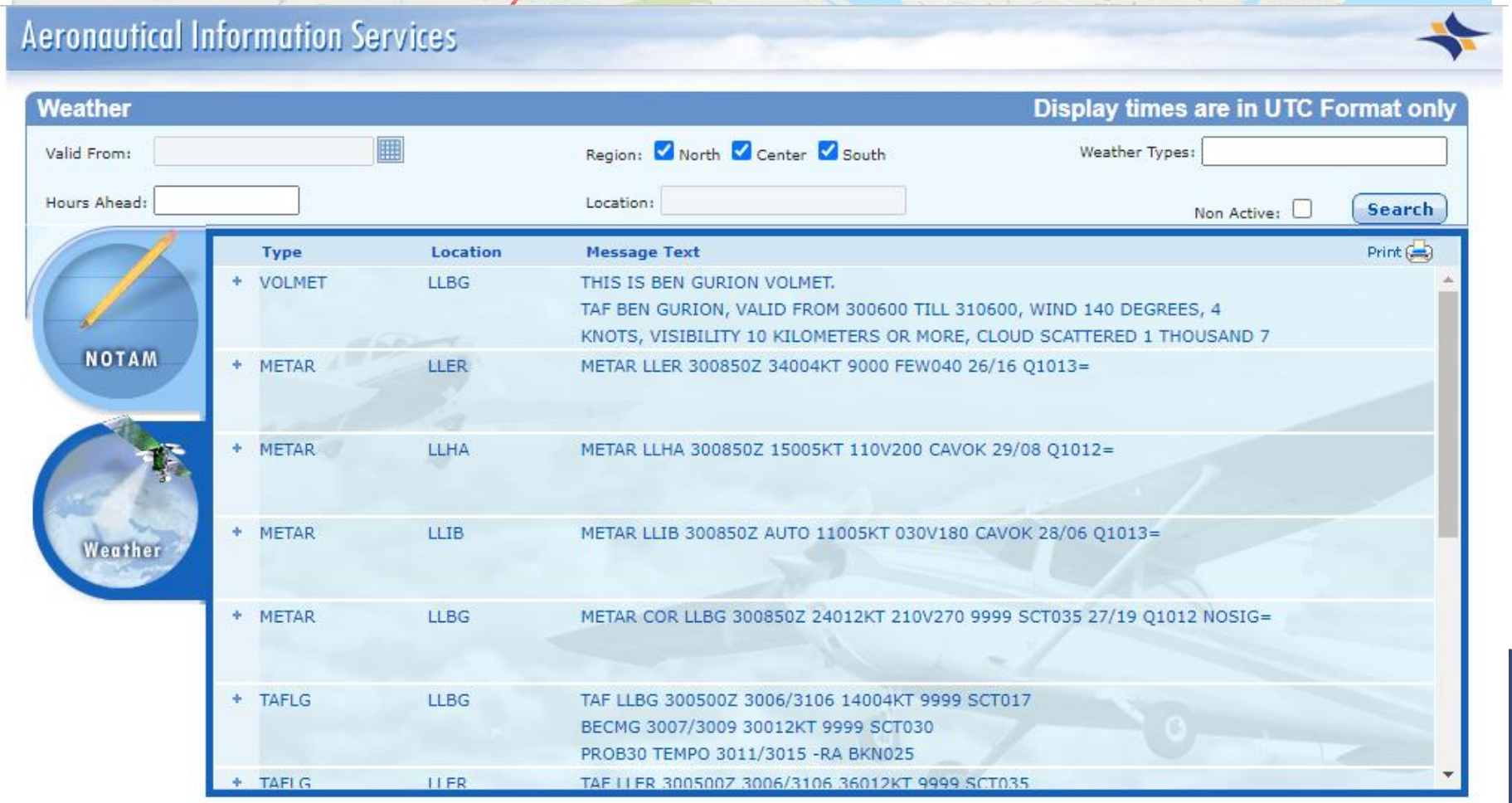
Constant / Temporary National Security Restrictions

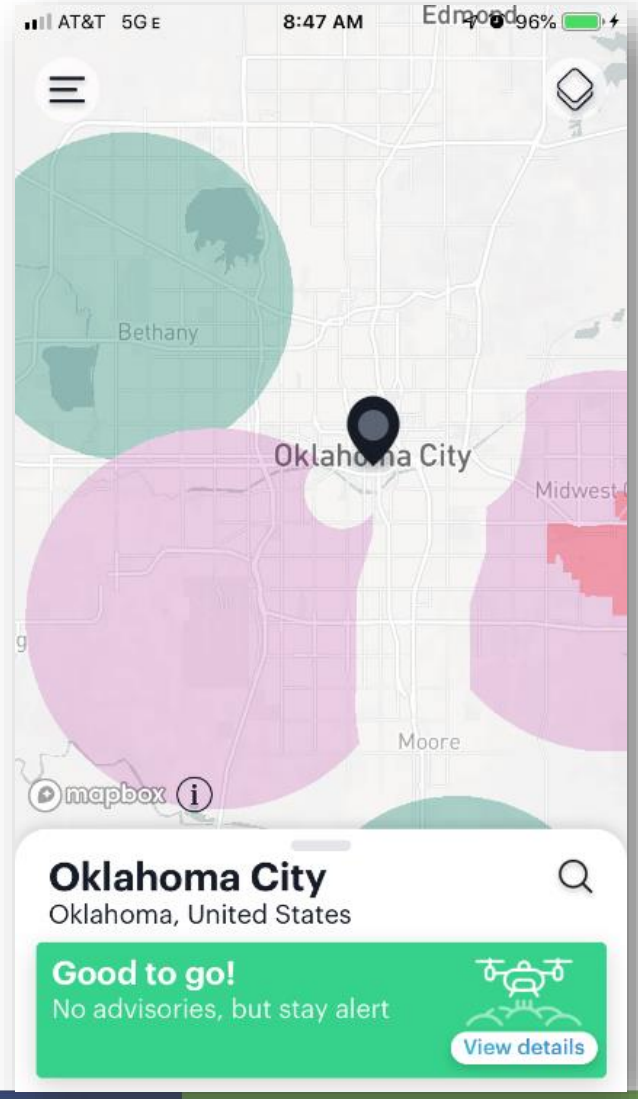
LLP/LLD/LLR - eAIP

NOTAM

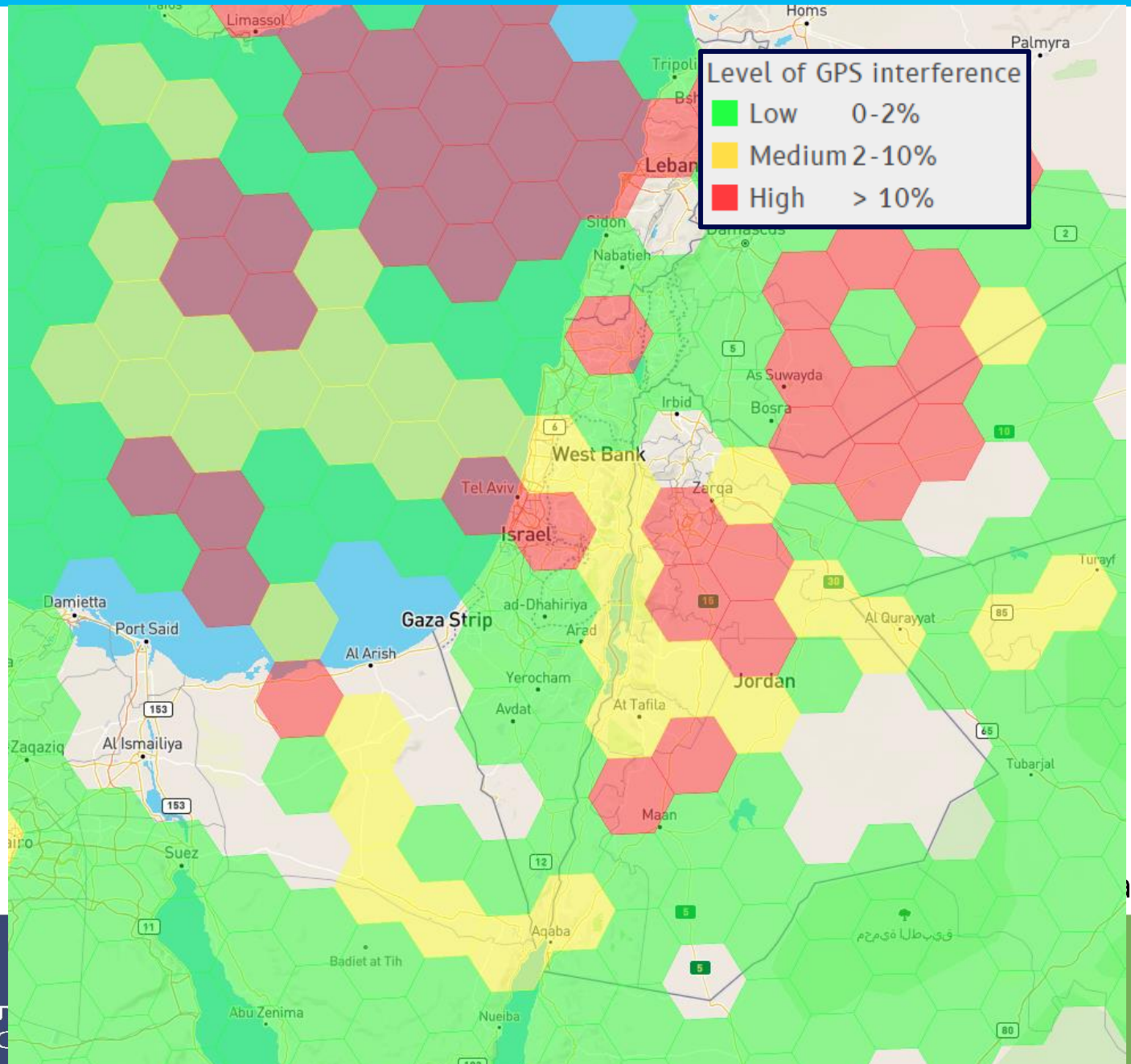
Data scheme should be compatible with AIXM,







GNSS – SiS Performance – data collection



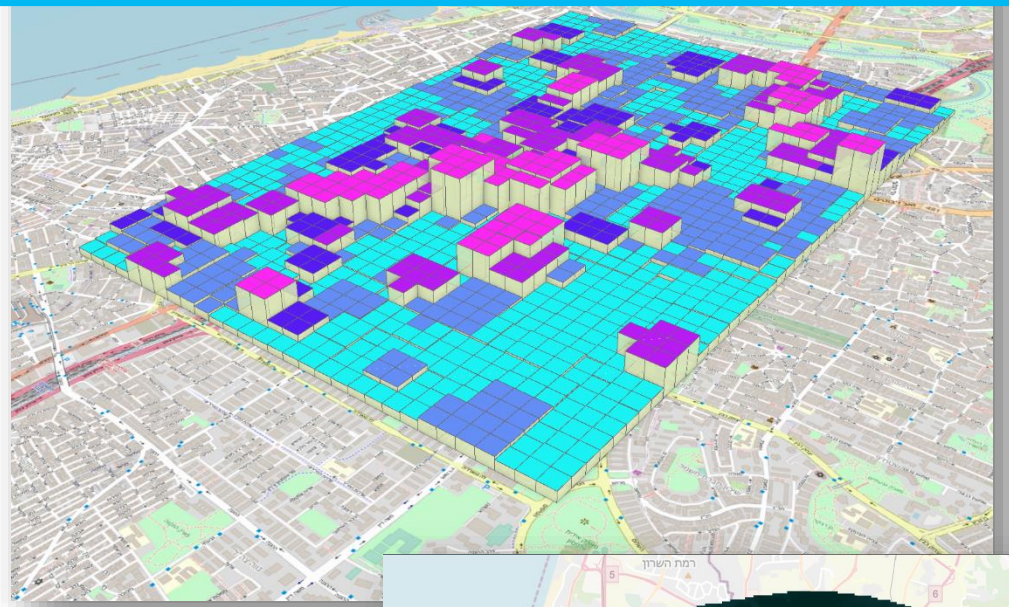
ange.com

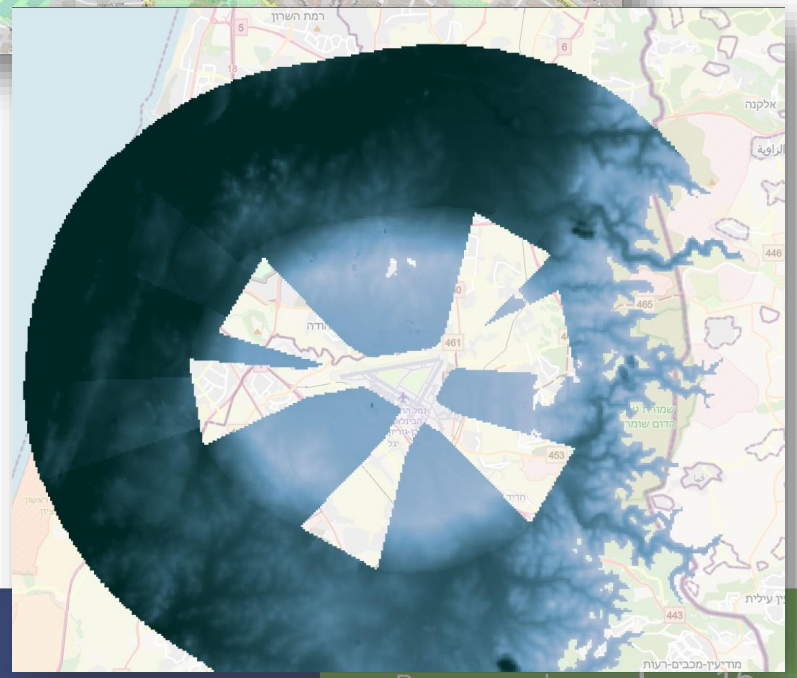
Data collection – 15,000 flights ☹

- Mata Data – data source (internal reports? external sensors?)
- UAV – type, weight, GNSS reception, Battery status
- Breakdowns of:
  - Route length
  - Horizontal and vertical accuracy (planned v. actual)

Next Steps

- long distance ops (eVTOL), UAM
- Expanding to more U-Spaces – operating several USSPs simultaneously
- Shielded & Monitored Operations (UTM) – Reduced coordination and transparency to manned traffic & ATM
- Further develop the ecosystem – CIS, ANSP, Manned Aviation integration, UAM
- No soup for you! (mainly government)

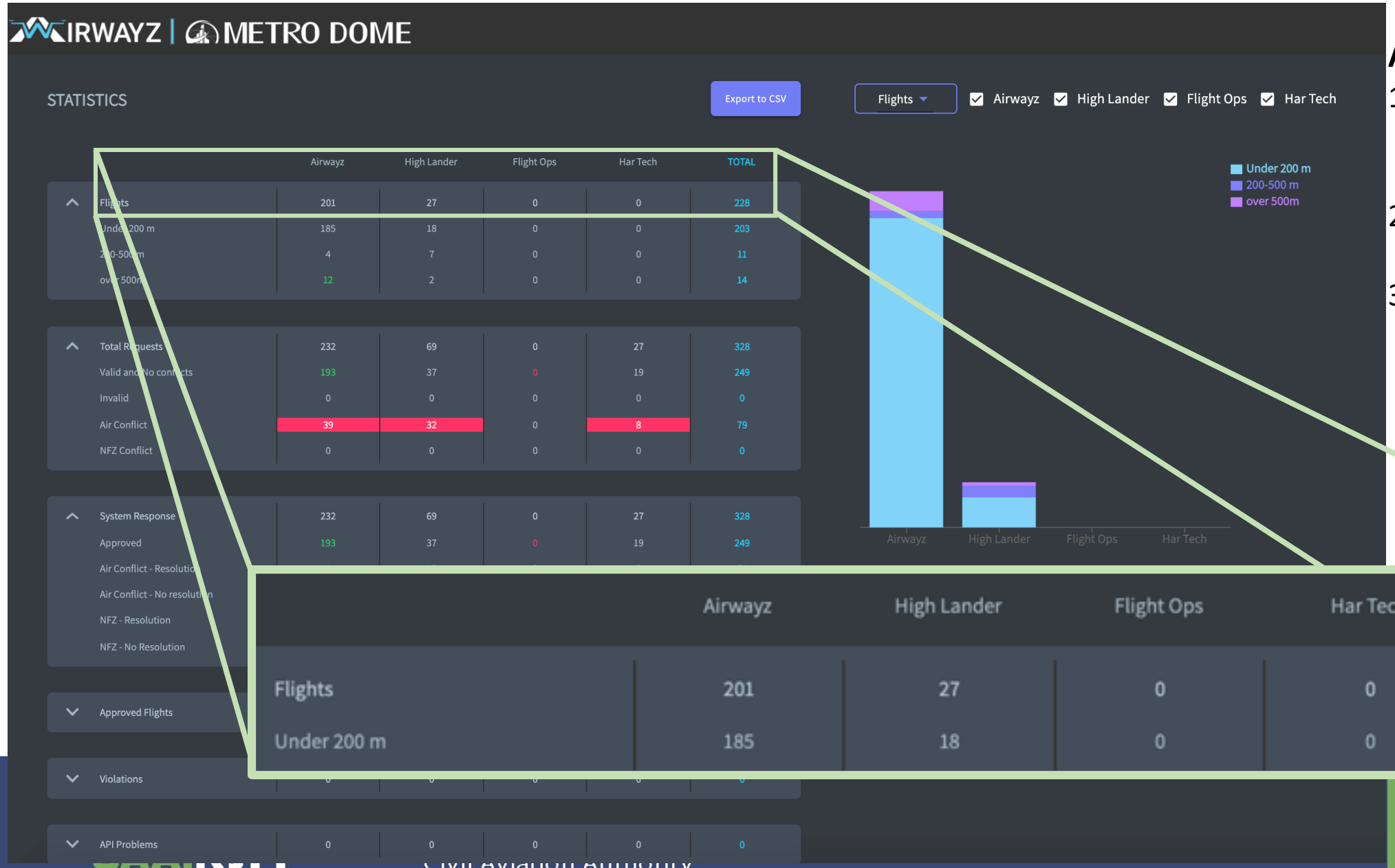




רשות התעופה האזרחית
Civil Aviation Authority

Purposes only

Lessons Learned – Data Driven Regulation



	Airwayz	High Lander	Flight Ops	Har Tech	TOTAL
Flights	201	27	0	0	228
Under 200 m	185	18	0	0	203

Accuracy:

1. Useful for determining separation? (PBS)
2. Can it be measured at reasonable cost?
3. Necessary in the foreseen future?

Lessons Learned – Data Driven Regulation

NAAMA Pilot – Data Driven Regulation Approach

[© Airwayz Drones Ltd.]

[NAAMA Pilot = INDI]

Performance Table : Hadera-2 Weeks 1-2

DSOS	50 - 200M	200 - 500 M	>500M	Total Flights	Flight-Dist(km)	Service-Dist(km)	Service/Flight %
Airwayz	347	980	573	1902	1138.0	755.6	150.6
Hartech	21	232	90	343	158.7	76.4	207.5
HighLander	110	162	209	481	239.2	185.3	129.1
Simplex	121	88	381	590	429.0	389.6	110.1
Total	599	1462	1253	3316	1964.9	1407.0	139.6

DSOS	Avg - Deviation(m)	100m< deviation cases	Avg Horz. Deviation	100m< horz. Deviations
Airwayz	9.3	22.0	7.4	19.0
Hartech	11.8	7.0	6.0	5.0
HighLander	15.1	2.0	1.7	2.0
Simplex	12.6	2.0	8.8	2.0
Total	10.9	33.0	6.8	28.0

(X – Number of flights reported manually by DSOS, Compared to flights counted by the USSP Data systems)

Lessons Learned – Data Driven Regulation

[© Airwayz Drones Ltd.]

Horizontal deviations (X-Y) from Path, Frequencies and Averages

Deviation(m)	Count	%	Average(m)	Analysis
<5	2343	70.7%	0.9	Measurement Inaccuracies
5 - 20	443	13.4%	10.1	Few manual/post missions maneuvers
20 - 50	121	3.6%	29.6	p. mission maneuvers + temp deviation from path (e.g. changing path)
50 - 200	49	1.5%	92.6	deviation from path (e.g. changing path), or path errors
200 - 1000	13	0.4%	432.6	Mainly path errors (sending a wrong path)
>= 1000	347	10.5%	9977.6	No path
Total	3316	100.0%		

3D deviations (X-Y-Z) from Path, Frequencies and Averages

Deviation(m)	Count	%	Average(m)	Analysis
<5	1675	50.5%	1.39	Measurement Inaccuracies
5 - 20	969	29.2%	11.30	Few manual/post missions maneuvers
20 - 50	243	7.3%	29.43	p. mission maneuvers + temp deviation from path (e.g. changing path)
50 - 200	69	2.1%	92.59	deviation from path (e.g. changing path), or path errors
200 - 1000	13	0.4%	433.04	Mainly path errors (sending a wrong path)
>= 1000	347	10.5%	9977.60	No path
Total	3316			

Pre-VLD Data collection

- Obstacles + Terrain – Israel Mapping agency, ANSP, CAA (eTOD), municipalities
  - Before VLD flights – visual scanning of every route and landing location.
- NFZ/sensitive locations – Aviation stakeholders - AIP, ANSP, air force.

  Non aviation – municipalities, government agencies.

Standard: PANS AIM (DOC10066) Annex 15

- Weather – local company (dust devils…) [+ comparison to tomorrow.io NowCast]
- Separation
  - Drones – N-RID **Standard: ASTM 3411-22a (NPA2021-14)**
  - Manned – trials with cellular applications (+human interface) [VLD movie:]

Manned and Unmanned Aircraft Separation via UTM

Conclusions/debate/issues

- Are the standards appropriate, too prescriptive or not, flexible or not, etc.?
  - Pro – safety (?). simple oversight/certification.
  - Con – scalability/business case/costs. Slow to advance with technology.
- Test case – manned aviation data via cellular apps.:
  - General apps. widespread usage by LSA (light sport aviation) [easy implementation]
  - ALOS for LSA? Private Heli? HEMS? GA? Regional air carriers?
- Findings on the relationship between data requirements (accuracy, availability, refresh rates, etc.) and USS/UTM performance (500ft/500m)

Q&A