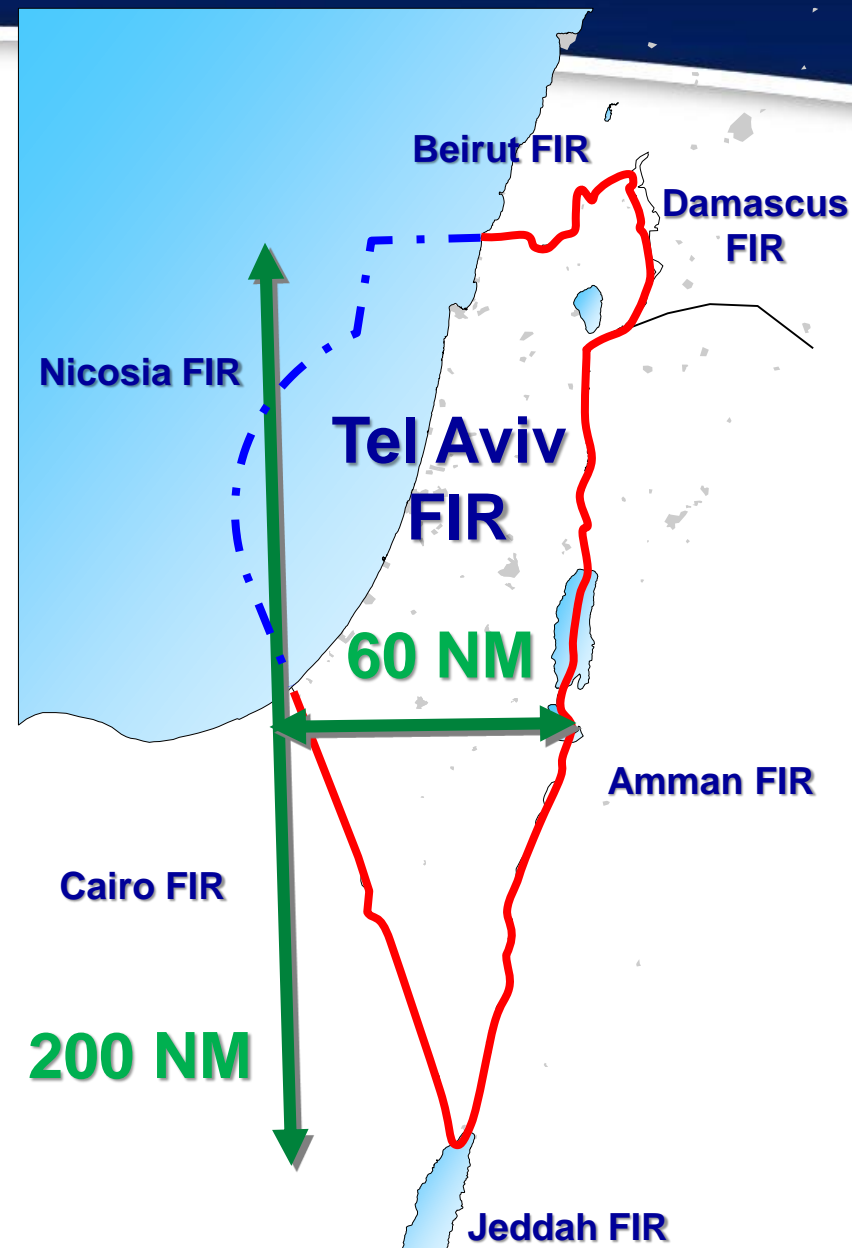
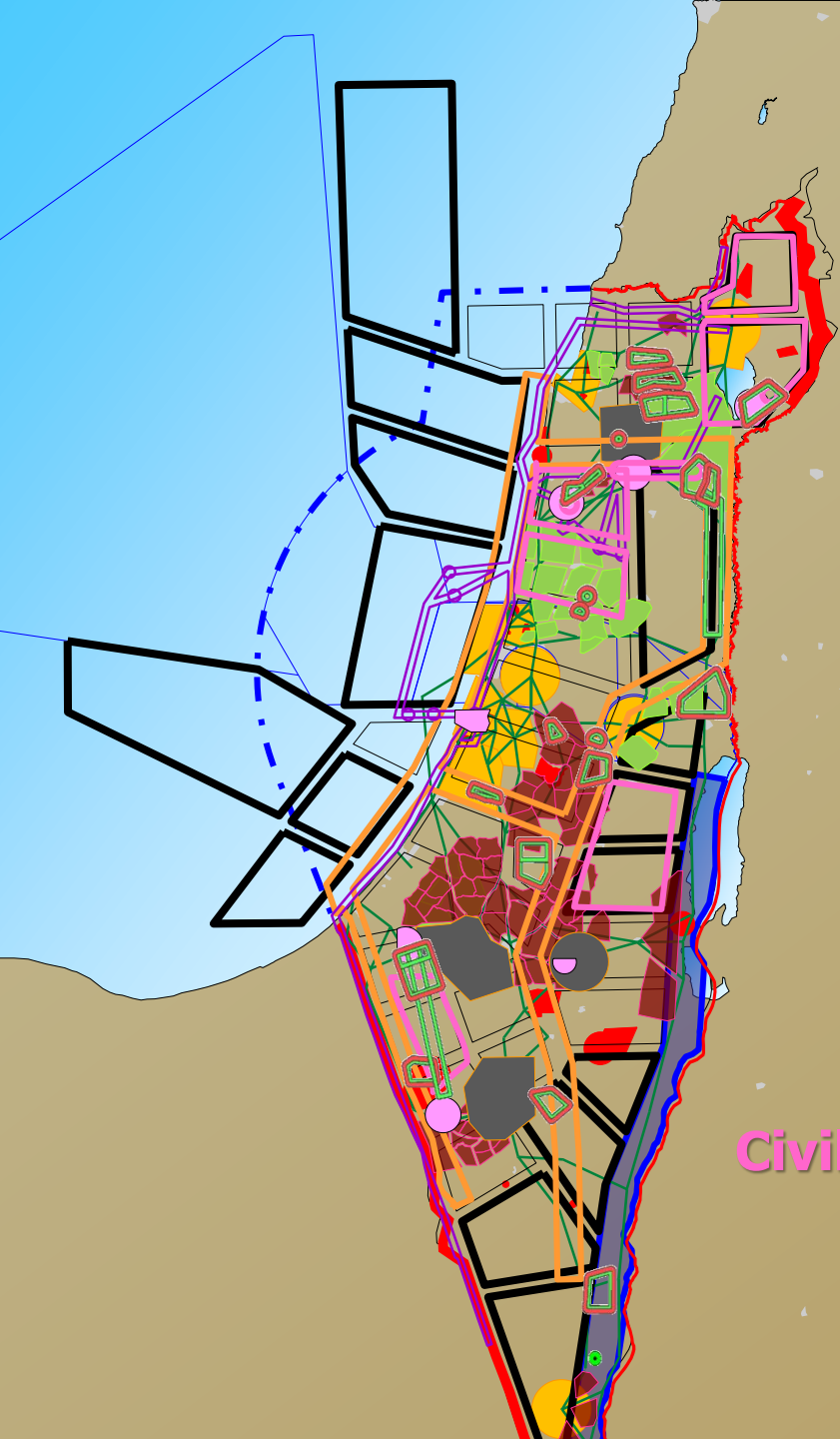


# Full UAS Integration to State's Airspace

Operating UAS Safely within a Congested  
Airspace: Regulation, Airspace Design and  
Safety Assessment

- Small Airspace: **1/3** the size of Hong Kong TMA
- Complex “neighborhood”
- Aviation is the **only bridge** to the world
- Israeli Air Force (IAF) similar in size to German Air Force
- More than 50% of IAF sorties are unmanned
- **VERY** congested airspace





**FIR**

**Terminal Area, Int. Airport LLBG**

**ATS Airway to the south**

**Civilian Domestic Airports CTR**

**Prohibited, Restricted and Danger**

**Military CTR**

**Fighters Airway**

**Military Fighters Training Areas**

**Controlled VFR Routes**

**Civilian General Aviation Areas**

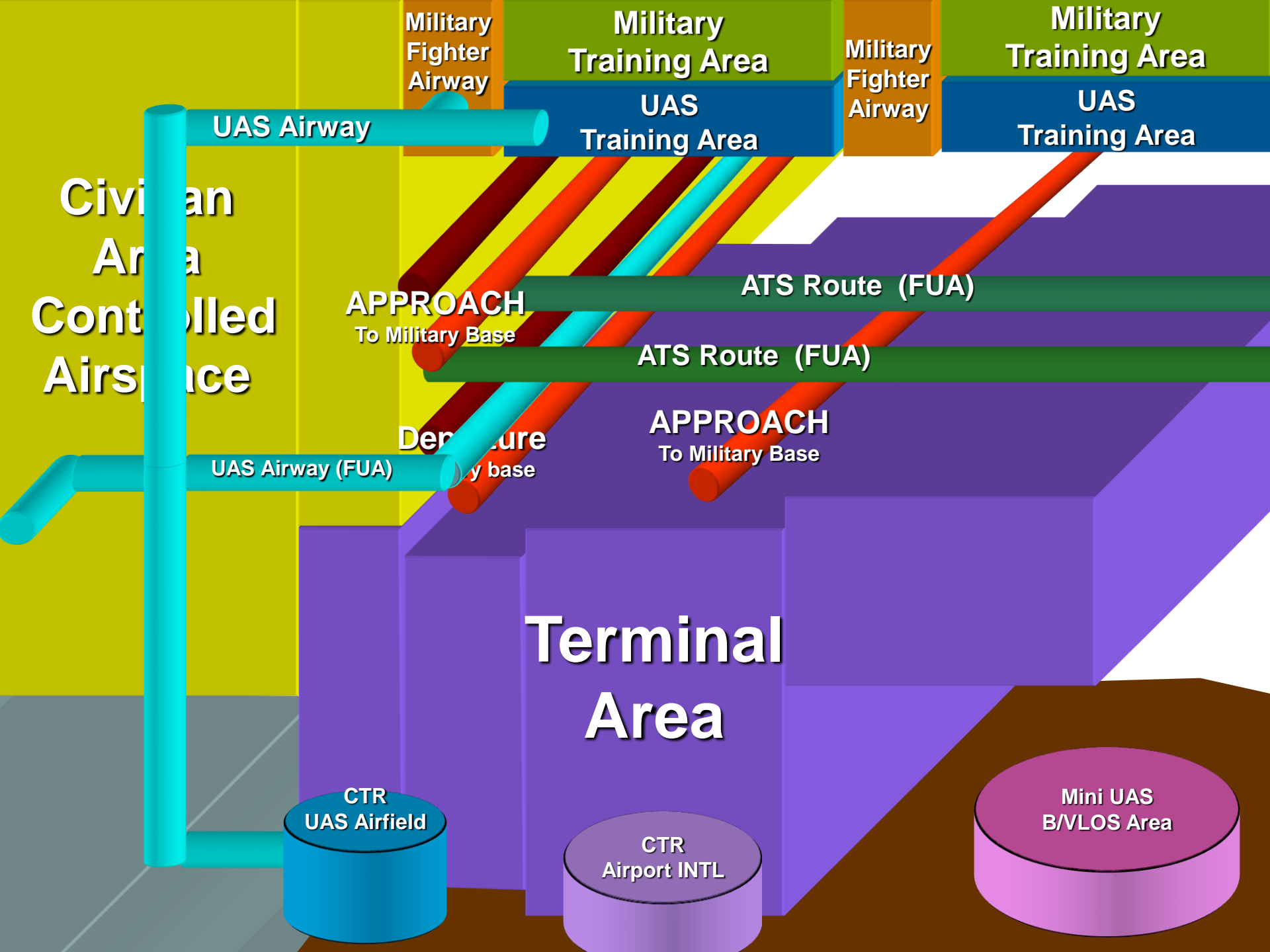
**Helicopter Training Areas**

**Civilian UAS Airfields & Test Sites**

**Civilian UAS BVLOS Areas (Military/Civil)**

**UAS Routes (Military/Civil)**

**Mini UAS B/VLOS Areas (Civilian)**



# Israeli UAS Industry

- 1970's - US made military drones
- Today
  - More than 20 local UAS manufactures
  - $0.1\text{kg} < \text{MTOW} < +2000\text{kg}$
  - Development, Testing, **Maturing**, Demos, Customer Training, Crowd Control, Police, HLS and more...
- 10% of worldwide UAS sales in 2011 (Teal Group)
- Largest UAS exporter in 2001-13 Worldwide (SIPRI, Frost & Sullivan, Jane's iHS)
- Dozens (!) of unmanned flights daily
- Exporting airspace – training and development







**Heron 1 IAI**  
Operational Altitude: 30,000 feet  
Wingspan: 16.6m  
Max Payload Weight: 250Kg  
Endurance: 45h



**Dominator UAV Aeronautics**  
Operational Altitude: 30,000 feet  
Wingspan: 13.5m  
Endurance: 28h



**Heron TP IAI**  
Operational Altitude: 45,000 feet  
Wingspan: 26m  
Max Payload Weight: 1000+Kg  
Endurance: 36h



**Hermes 900 Elbit**  
Operational Altitude: 33,000 feet  
Wingspan: 15m  
Max Payload Weight: 300Kg  
Endurance: 40h



**Aerostar UAV Aeronautics**  
Operational Altitude: 18,000 feet  
Wingspan: 7.5m  
Max Payload Weight: 50Kg  
Endurance: 12h



**Hunter IAI**  
Operational Altitude: 20,000 feet  
Wingspan: 10.5m  
Max Payload Weight: 100Kg  
Endurance: 21h



**Ranger IAI**  
Operational Altitude: 18,000 feet  
Wingspan: 5.71m  
Max Payload Weight: 45Kg  
Endurance: 6h



**Searcher III IAI**  
Operational Altitude: 23,000 feet  
Wingspan: 8.55m  
Max Payload Weight: 120Kg  
Endurance: 18h



**Blue Horizon UVision**  
Operational Altitude: 15,000 feet  
Wingspan: 6.5m  
Max Payload Weight: 37Kg  
Endurance: 8h



**MiniFalcon 2 Innocon**  
Operational Altitude: 18,000 feet  
MTOW: 150kg  
Wingspan: 5.5 meter  
Endurance: <15 hours  
Max. Payload weight: <35kg



**Searcher II IAI**  
Operational Altitude: 20,000 feet  
Wingspan: 8.55m  
Max Payload Weight: 100Kg  
Endurance: 15h



**Orbiter 3 Aeronautics**  
Operational Altitude: 18,000 feet  
Wingspan: 4.2m  
Max Payload Weight: 4Kg  
Endurance: 7h



**MiniFalcon 1 Innocon**  
Operational Altitude: 18,000 feet  
MTOW: 90kg  
Wingspan: 5 meter  
Endurance: <15 hours  
Max. Payload weight: <14kg



**Hermes 450 Elbit**  
Operational Altitude: 18,000 feet  
Wingspan: 10.5m  
Max Payload Weight: 150Kg  
Endurance: 20h



**Orbiter 2 Aeronautics**  
Operational Altitude: 500-18,000 feet  
Wingspan: 3m  
Max Payload Weight: 1.5Kg  
Endurance: 4h



**Picador VTOL UAV Aeronautics**  
Operational Altitude: 12,000 feet  
Max Payload Weight: 180Kg  
Endurance: 8h



**I-view MK 50 IAI**  
Operational Altitude: 15,000 feet  
Wingspan: 5.3m  
Max Payload Weight: 10Kg  
Endurance: 6h



**Skylark 2 Elbit**  
Operational Altitude: 5,000-15,000 feet  
Wingspan: 6.5m  
Max Payload Weight: 9Kg  
Endurance: 4h



**Boomerang Bluebird**  
Operational Altitude: 500-15,000 feet  
Wingspan: 275cm  
Max Payload Weight: 2Kg  
Endurance: 15h



**NRUAV IAI**  
Operational Altitude: 15,000 feet  
Max Payload Weight: 220Kg  
Endurance: 6h



**AlrMule Urban Aeronautics**  
Operational Altitude: 12,000 feet  
Max Payload Weight: 560Kg  
Endurance: 6h



**Sparrow UVision**  
Operational Altitude: 10,000 feet  
Wingspan: 2.4m  
Max Payload Weight: 12Kg  
Endurance: 7h



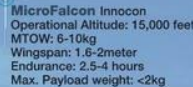
**MicroB Bluebird**  
Operational Altitude: 500-15,000 feet  
Wingspan: 99cm  
Max Payload Weight: 200g  
Endurance: 1h



**Skylark 1LE Elbit**  
Operational Altitude: 500-15,000 feet  
Wingspan: 2.9m  
Max Payload Weight: 990g  
Endurance: 3h



**Orbiter Aeronautics**  
Operational Altitude: 500-18,000 feet  
Wingspan: 2.2m  
Max Payload Weight: 1.5Kg  
Endurance: 3h



**MicroFalcon Innocon**  
Operational Altitude: 15,000 feet  
MTOW: 6-10kg  
Wingspan: 1.6-2meter  
Endurance: 2.5-4 hours  
Max. Payload weight: <2kg



**Pioneer IAI**  
Operational Altitude: 4,600 feet  
Wingspan: 5.2m  
Max Payload Weight: 35Kg  
Endurance: 5h



**Mosquito IAI**  
Operational Altitude: 150m-1,200 feet  
Wingspan: 35cm  
Max Payload Weight: 150g  
Endurance: 40min



**BIRD EYE 650 IAI**  
Operational Altitude: 3,000 feet  
Wingspan: 3m  
Max Payload Weight: 1.2Kg  
Endurance: 3h



**Hermes 90 Elbit**  
Operational Altitude: 5,000 feet  
Wingspan: 5m  
Max Payload Weight: 55Kg  
Endurance: 15h



**Mini Panther IAI**  
Operational Altitude: 2,000 feet  
Wingspan: 2.5-3.5m  
Max Payload Weight: 2Kg  
Endurance: 1.5h



**Ghost IAI**  
Max Altitude: Dozens of meters  
Dimensions: 145 cm  
Max Payload: ~ 4 Kg  
Hovering Time: Up to 30 min



**ETOP IAI**  
Electrical Tethered  
Observation Platform  
Max Altitude: 100 m  
Dimensions [cm]: 160L x 160W x 20H  
Max Payload: 20 Kg  
\*Hovering Time: Unlimited



**SpyLite Bluebird**  
Operational Altitude: 500-30,000 feet  
Wingspan: 240cm  
Max Payload Weight: 1.3Kg  
Endurance: 4h



**Marabu UVision**  
Operational Altitude: 10,000 feet  
Wingspan: 2.8m  
Max Payload Weight: 2Kg  
Endurance: 3h



**Panther IAI**  
Operational Altitude: 5,000 feet  
Wingspan: 8m  
Max Payload Weight: 10Kg  
Endurance: 6h



**BIRD EYE 400 IAI**  
Operational Altitude: 1,000 feet  
Wingspan: 2.2m  
Max Payload Weight: 1.2Kg  
Endurance: 1h



**Harop IAI**  
Wingspan: 3m



**Harpy IAI**  
Wingspan: 2.1m

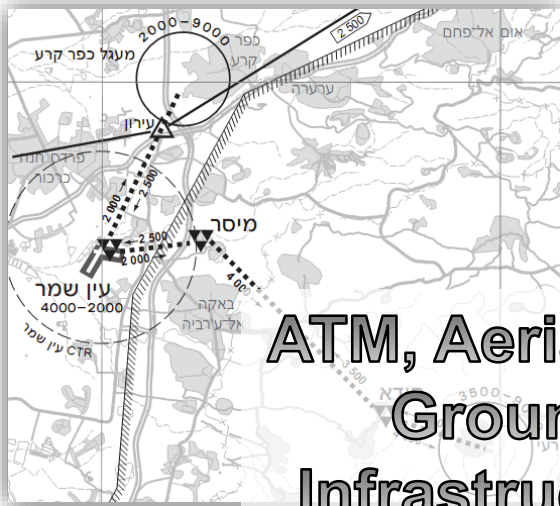
# The beginning

- Until 2003 unmanned vehicles were ignored, flights were military or development for military purpose
- 2003 - Military-Civilian Committee established
- 2007 - National Committee for certification of UAS
- 2010 - CAA takes full responsibility for UAS regulation

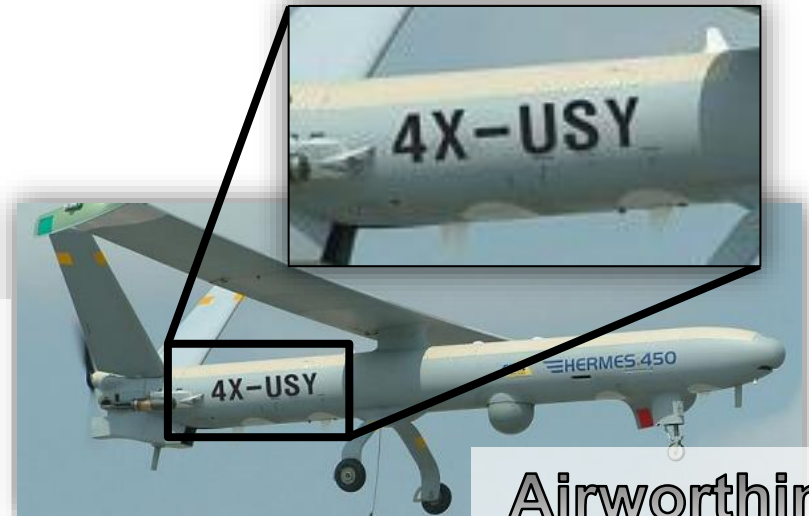
**10 years of experience,  
Encouraging Innovation while Serving  
the Public Interest**



# Existing Framework and Regulation in Israel



ATM, Aerial and Ground Infrastructure



Airworthiness



Personal Licensing

Operator & Service Provider certification, Accident reporting, Security





# ATM - Framework

- Dedicated AIP chapter
  - Definitions
  - Separation
  - Flight Rules and Procedures (DAY & NIGHT)
- Aerial & Ground Infrastructure
  - Aerial Infrastructure for all platforms, Controlled and approved (SID, STAR, Airspace operation)
  - Operational Procedures & Requirements for Test Sites, Airfields, Airports



# ATM - Rules and Regulations

- RT Procedures
- Malfunctions – Com. Loss & Return Home requirements
- Procedures for special operations (Time, Airspace)
- Adapted Flight-plan form and coordination requirements
- Integration to the state's Flow Control system
- Security procedures

# Personal Licensing & Operator Certificate

- Requirements for Remote Pilot License
  - Approx. 150 licenses issued
  - 5 Knowledge Tests (CAA), Medical, Checkride
- Certification
  - Commercial Manufacture
  - Service Providers for Aerial Work
  - Training Organization
- Operational Manuals Templates



# Airworthiness and Technical Req.

- Airworthiness Certificate
  - UAS Registration procedures
- Technical articles and Advisory Pamphlets
  - C&C, Comm. Requirements from RPS
  - Operations Manuals
  - Approval of Training Organization
  - Safety Guidelines for the Development and Operation of UAS

# Incident & Accident Reporting and Investigation

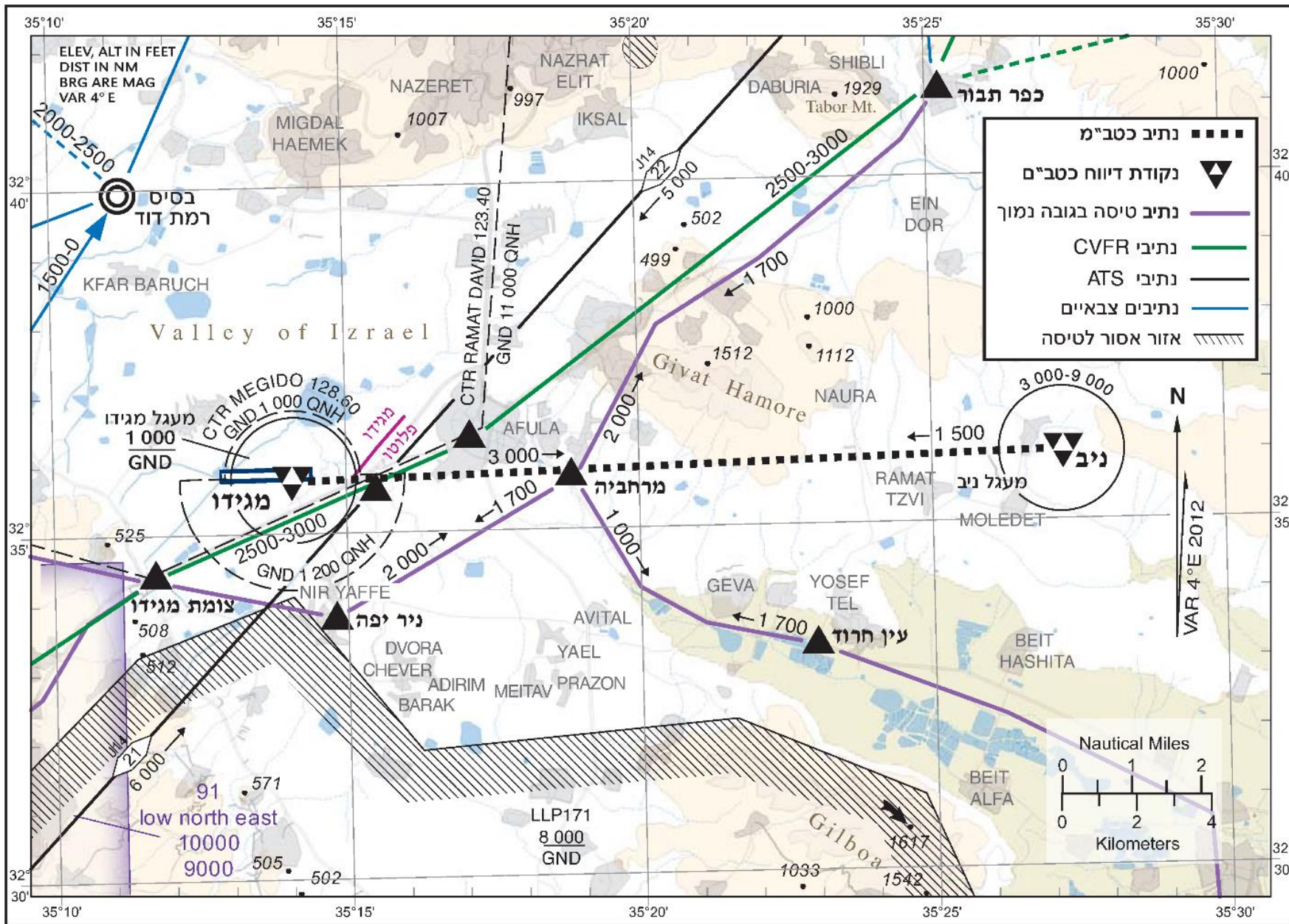
- Incident and Accident reporting procedures
  - Published requirements for the operators
  - Published investigations of several severe incidents
- AIAI is developing a group of experts in the field of UAS operation
- Detailed statistics, leading to a clear picture of safety status

# Airspace Integration – Every-Day Reality

2013 מאי 30

רשות התעופה האזרחית

עדכון 1/13



האטרופות ועזיבה - כטב"ם

AD ELEV 200 ft

פלוטיו 127.10

MEGIDO

נספח ה'

מגידו

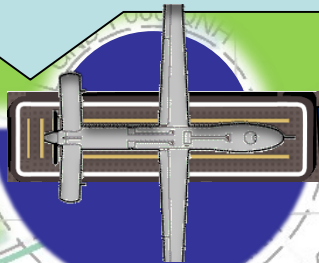
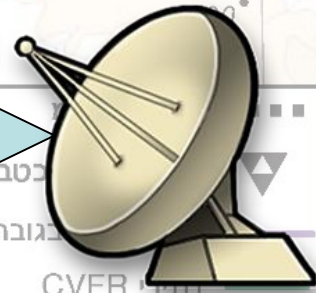


# Climbing to Operative Altitude

## Pre-Flight Procedures:

- Specially Adapted FP
- Com. Check Procedures
- Coordination with other users of Airfield
- Taxi & Ground Op. Procedures

- Adapted Circling Procedure
- Coordination with Military Base Tower (Radio)
- Coordination with Area Control Center (Radio)
- Transponder Check
- Prohibited/Danger Areas



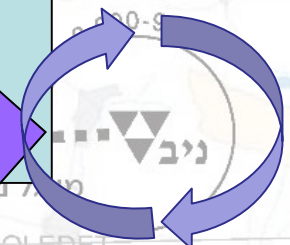
## Departure Procedures:

- SID with adapted parameters
- Com. Procedures
- Com. Loss Procedures
- Procedures from GA & L
- ATS route vector separated

## Airspace Operation Procedures:

- Separation from manned-aviation routes and other infrastructure
- Connect to route network and reach working area
- Working area procedures

**Prohib**

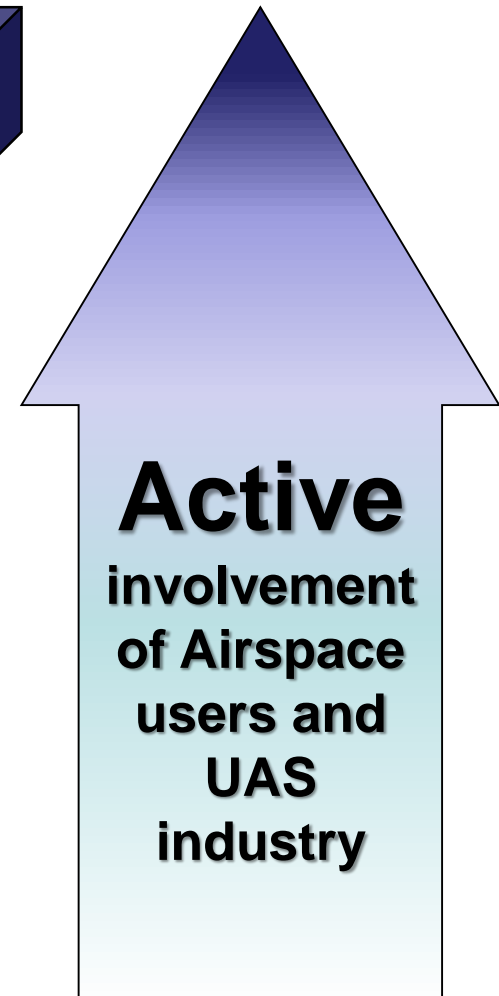
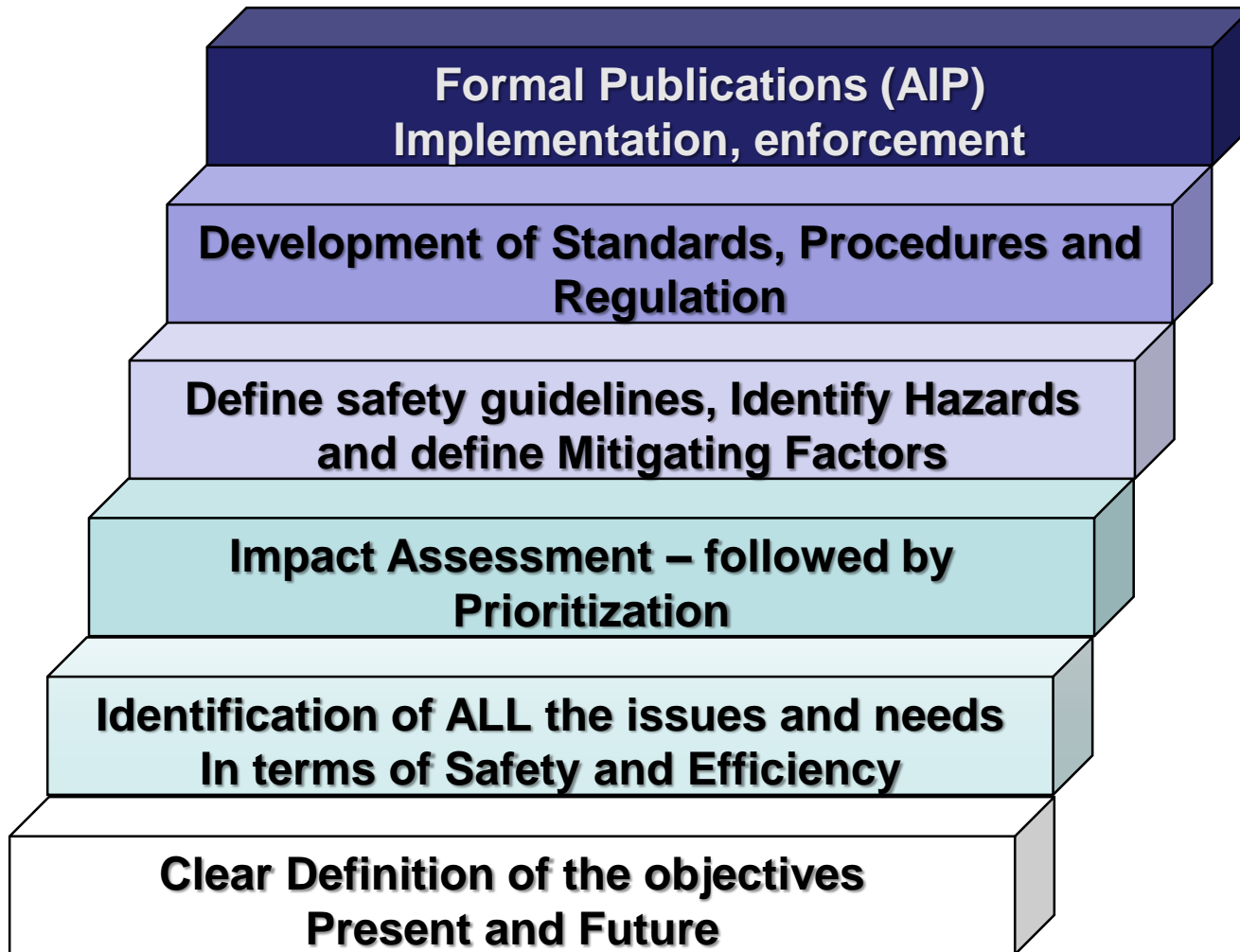




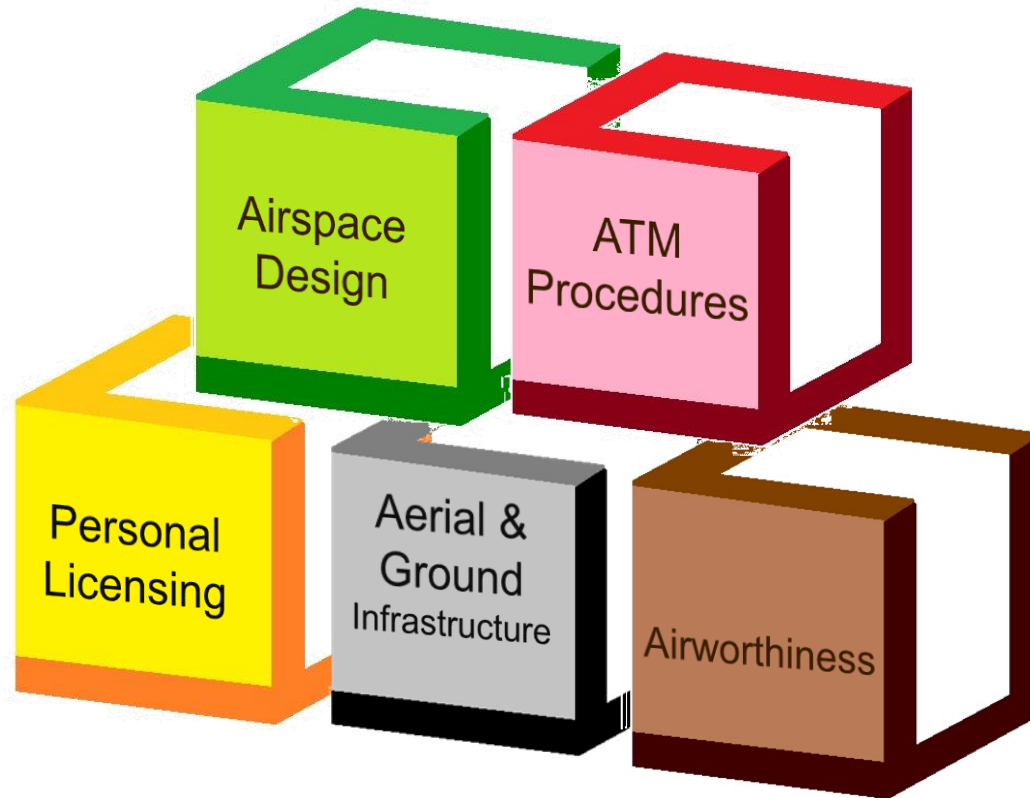
# Main Lessons Learned

- Complicated? Yes – **Achievable?** Definitely
- Analysis of **Present & Future** is the Key to Success
- **Policy Guidance** and Prioritization - Limited Resource, Needs are Conflicting
- **Involvement** of all Stakeholders in Centralized Process Ensures Coherence and Effectiveness
- **Security** is an integral part of the solution
- **Flexible Use of Airspace**, unique application
- Process Should be based on well-defined **Safety Guidelines** and **integration objectives**

# Steps Along the Road



# Strategic approach: bringing the pieces together



# Services

- Detailed Airspace Analysis, Impact Assessment
- Airspace Design – Infrastructure (Air & Ground)
- Proposed Regulation & Procedures
- Safety Analysis (SMS)
- Training of ATM personnel and UAS operators to comply with procedures
- UAS State Implementation Plan



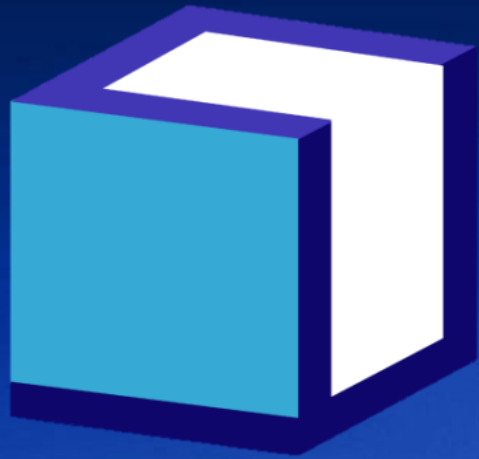
# The benefits of a complete regulative framework

- **Productive industry**, advancing efficiently
- Developing Aerial Work **Service Providers**
- Allow the State the economical **benefits of UAS services**
- **Free the regulator** to improve and enforce regulation
- Decrease in illegal & unsafe operation

You  Tube



... And most important: **SAFETY**



# Opening The Sky to Unmanned Aircraft: Safe and Efficient Airspace Integration

**Contact us - [info@uaspace.net](mailto:info@uaspace.net)**

# UASPACE

[www.uaspace.net](http://www.uaspace.net)