

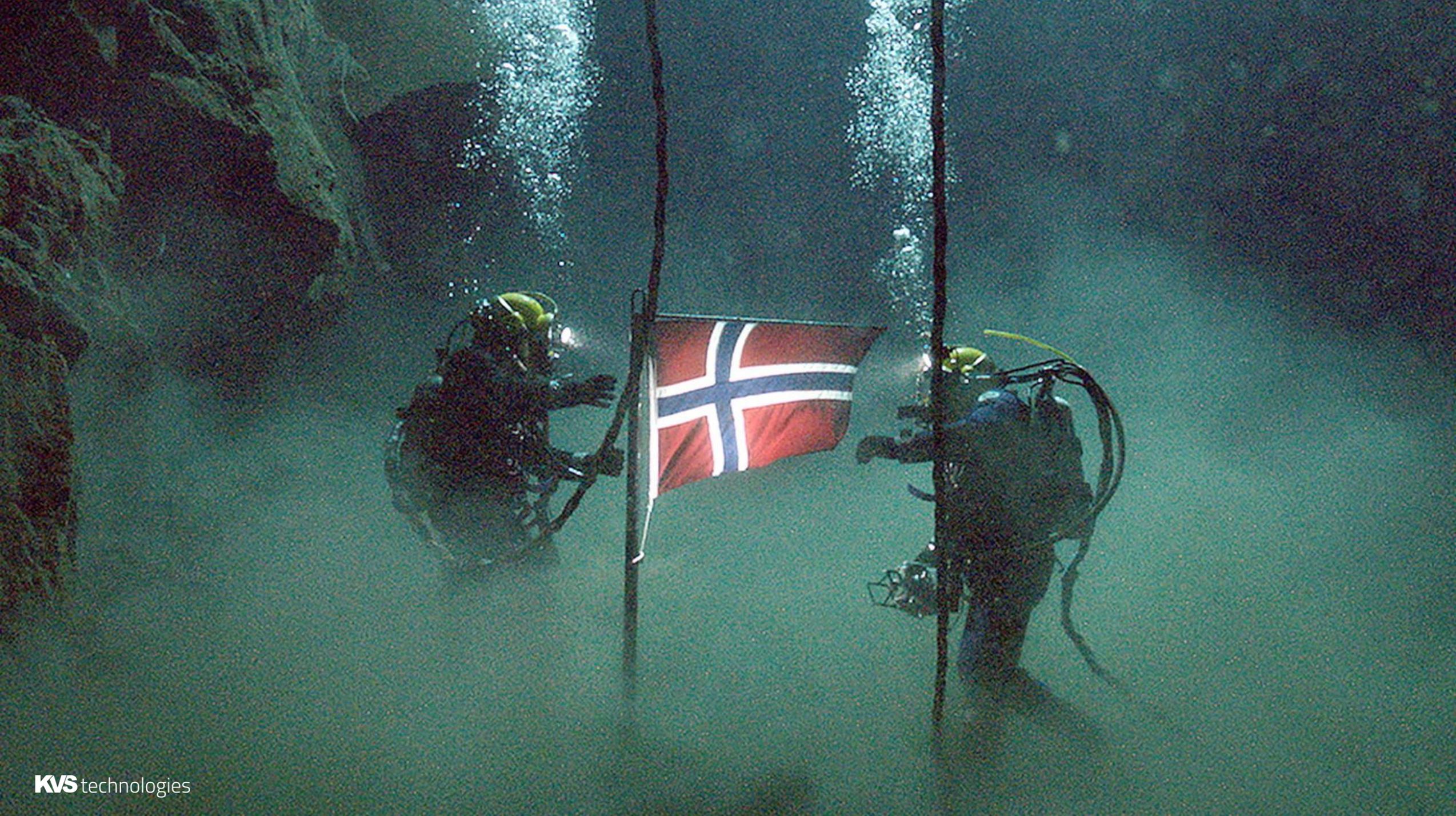
# Automatic inspection of Statnett's critical infrastructure

Drones in Healthcare, Hamar, June 2018

**KVS** technologies

Steffen Solberg, CTO







# Statnett

## INVITATION TO TENDER KON - 003642 Automatic flight and inspection on local and remote substations

Drones can today be regarded as a mature technology and an advanced sensor for automatic retrieval of many types of information, related to our facilities.

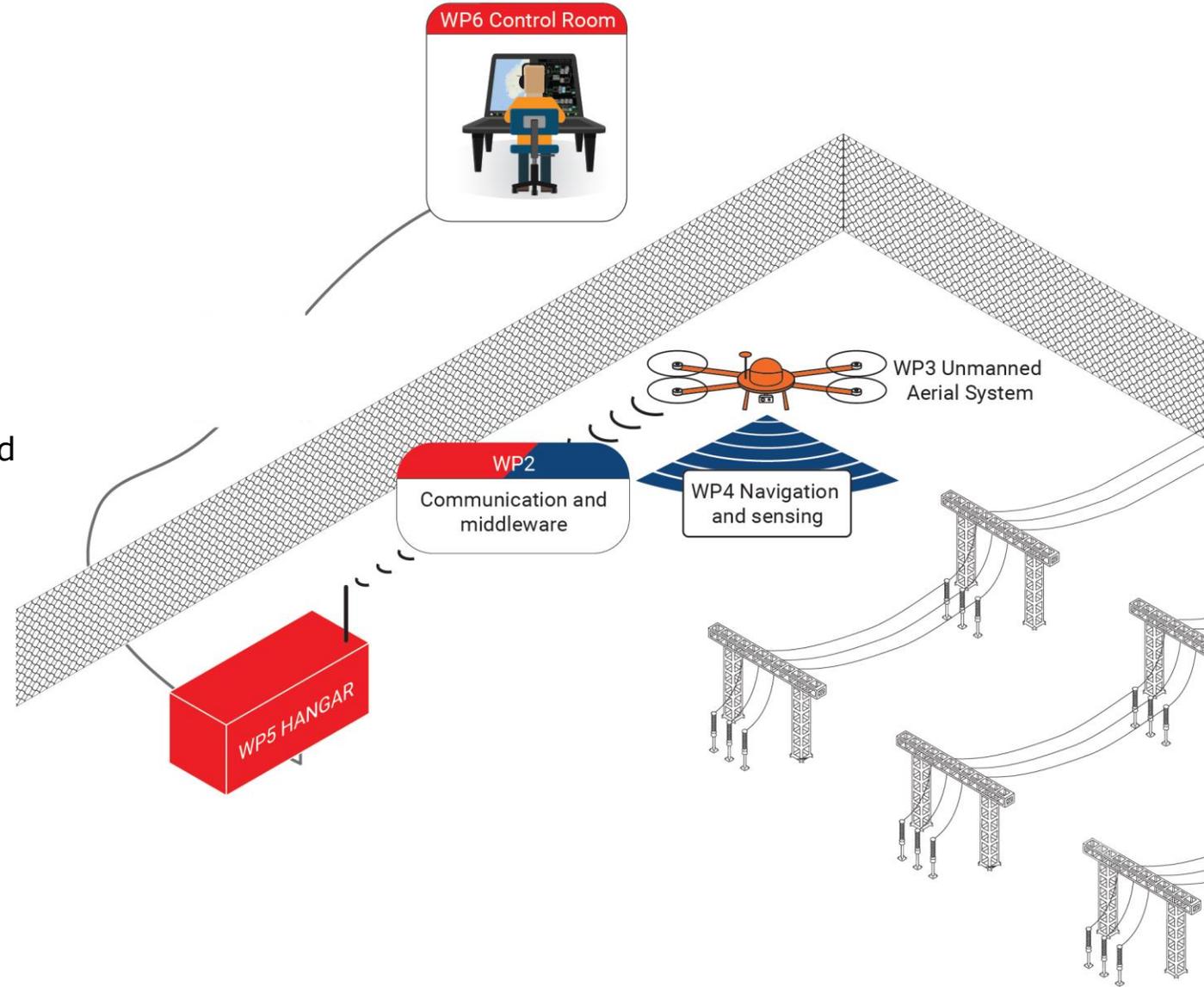
Despite its maturity, currently **no commercial systems** combine:

- automatic flight
- collection and utilization of information

in a holistic concept that fits Statnett's purpose and needs.

# Solution overview

- Streamlined & Digitalized system for
  - Routine inspections
  - Perimeter control
  - Crisis management
- Automatic flight
- Hangar with launch and recovery system
- Automatic or streamlined analysis
- Automatic transfer of data to maintenance and ERP systems





BATTERY 68% | SIGNAL 7 | SATELLITES 7 | RTK ACCURACY 2 cm | ACTIVE UNIT AURA-001 | 14:37:25 | 08.05.18

PLAN | SCHEDULE | HANGAR | FLY | REVIEW

16:37  
FLIGHT TIME

148 m  
ALTITUDE

182°  
HEADING

3.2 m/s  
VERT SPEED

12.7 m/s  
GND SPEED



WARNINGS

WIND | ALTITUDE | HANGAR | LOCATION | VERT SPEED

DRONE

Arm system | Take-off | Previous WP | Next WP | Go to hangar | Land now | Pause | Abort

FLIGHT MODE

- Manual
- Auto
- Waypoints

CAMERA & GIMBAL

Exposure | Gimbal position

CAMERA MODE

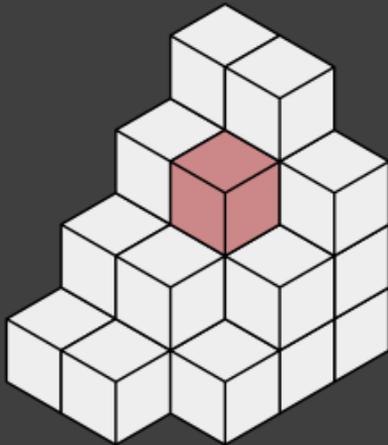
- Manual
- Auto

GIMBAL MODE

- Manual
- Heading lock
- Waypoint lock

# The challenges

Automatic flight



Communication

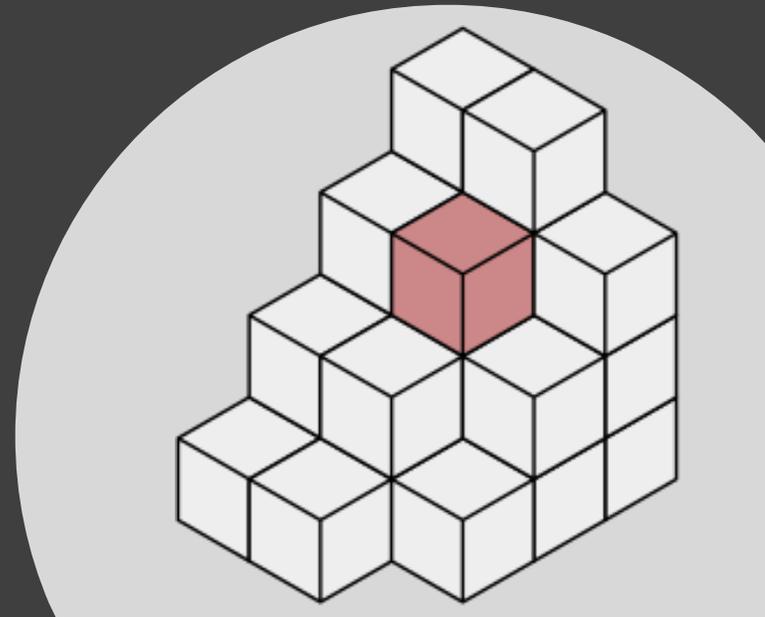
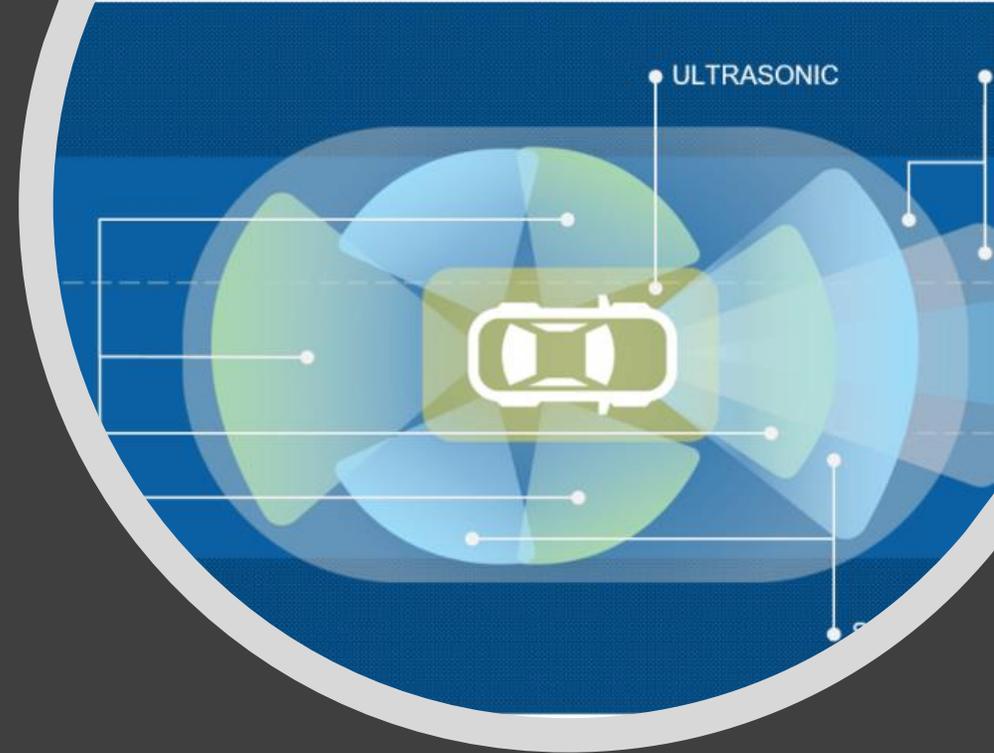


Hangar



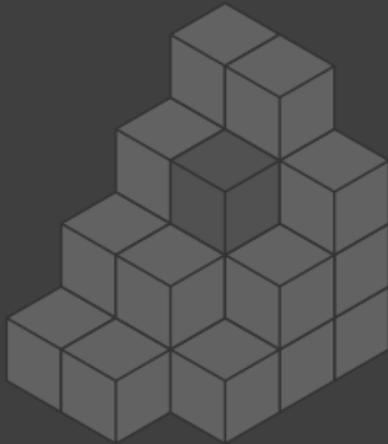
# Automatic flight

- Obstacle avoidance
  - Any weather
  - Thin wires
  - Cluttered environment
- GPS at high inclination
- Sensor fusion
- Free space observation

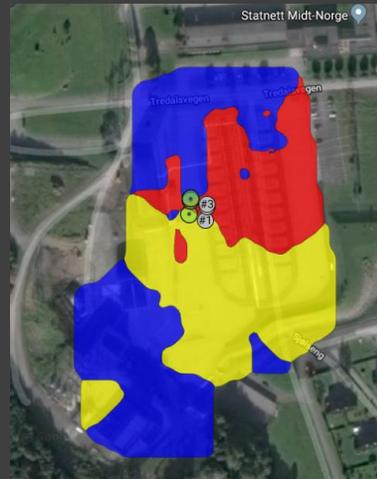


# The challenges

Automatic flight



Communication



Hangar



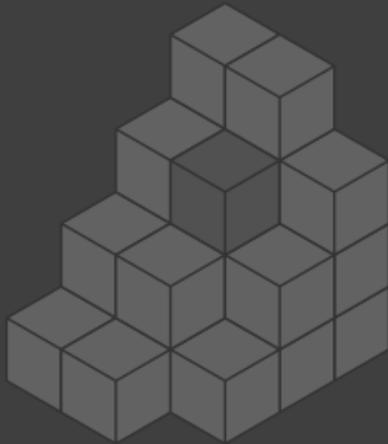
# Communications

- Substation Area under the regulations of NVE
- Multi-location viewing of data
- Seamless transition between base-stations
- Implemented as a secure system on Statnett internal network



# The challenges

Automatic flight



Communication

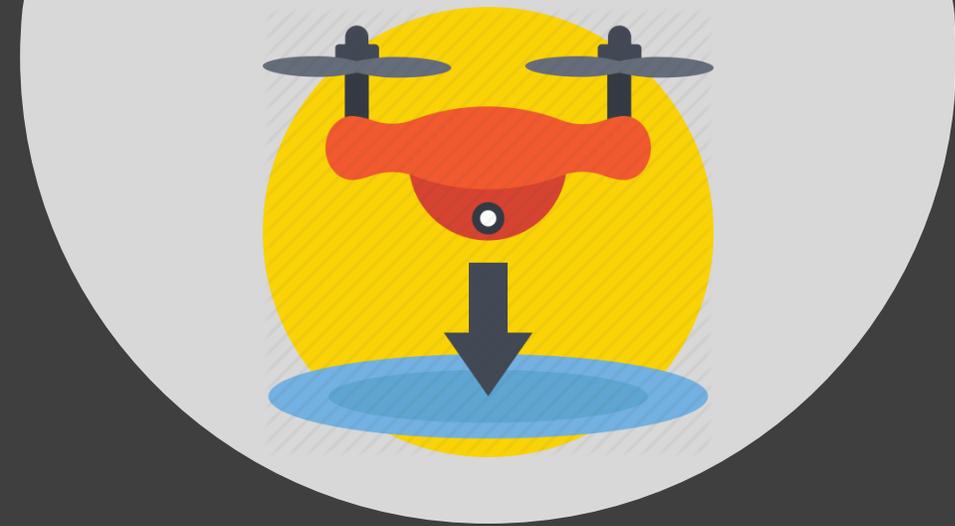


Hangar



# Hangar

- Safe haven
- Easily transportable
- Preflight inspection
- System that works in all weather
- Provide good working space during maintenance
- Automatic Charging
- Easily adaptable to other vehicles



# Thanks

- Questions?

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