# The Latest Surveying Technology & Solution for terrestrial, aerial & maritime application



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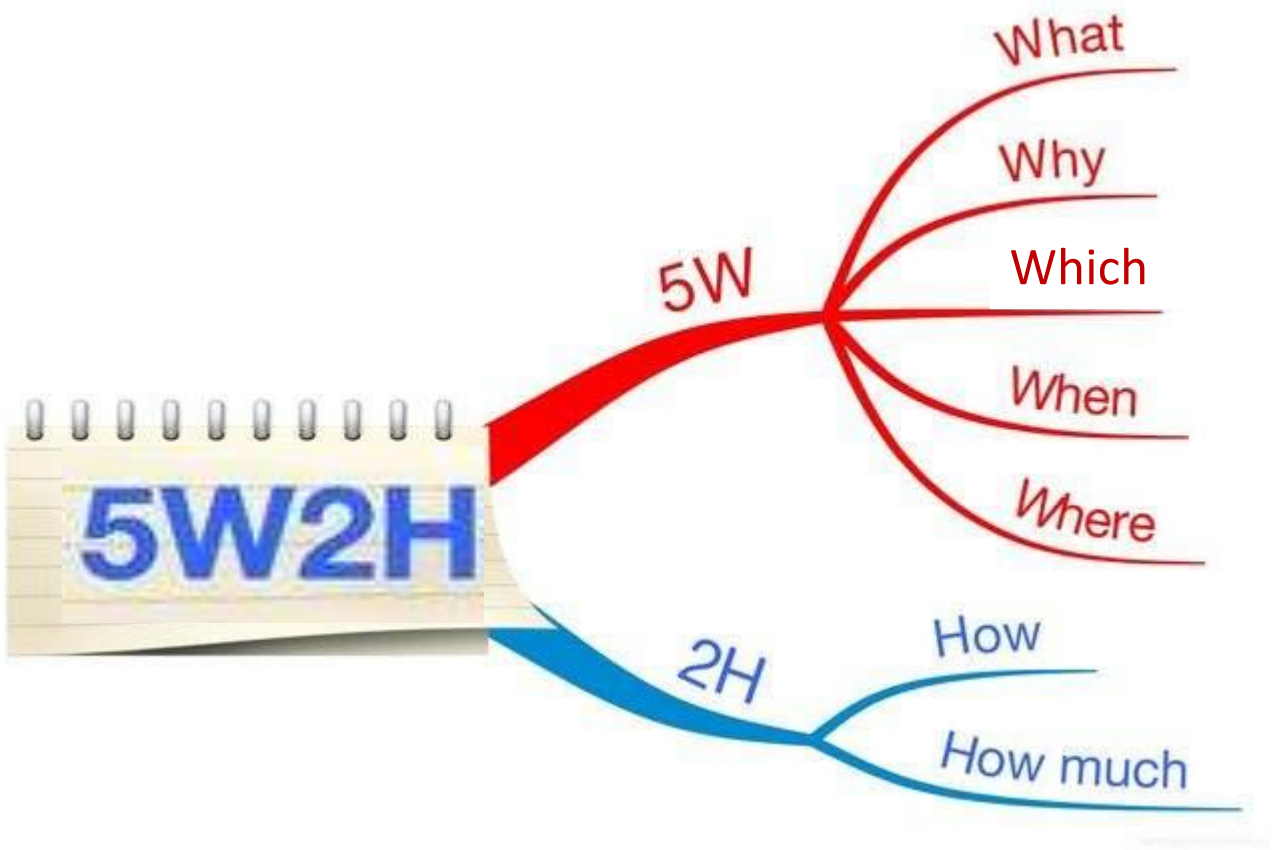
## A Consolidated View of Aerial & Underground

# Part 1: Underground View





***One-stop Metro Tunnel Mobile Scanning & Automated Detection System***

# 1.1. Why metro tunnel inspection is a must?

https://youtu.be/LDiWWdZcSkY

Damages to metro tunnel structure and surfaces frequently occur mainly because of

- surrounding environment changes
- train-induced vibration
- human interference (eg. earthwork projects nearby)

No replay button in reality! Which will come first, Accident or Tomorrow?

construction stage – monitoring needed
operational stage – monitoring + inspection needed

# 1.2. Which headaches? Which contents to inspect? Which existing methodologies?

**Headaches:**
- limited time window
- dim site and dusty air
- apparent movement hazards
- stuffy environments with few vents

**To inspect:**
- tunnel structural deformation
- tunnel inwall defects

**Existing Methodologies:**
- visual inspection
- photography
- robotic total station monitoring
- terrestrial laser scanning

*Labor-intensive? Scientific and traceable records?*
*Complete data for assessment?*

https://youtu.be/xbxDywi7ob8

# 1.3. What's new solution and what's included?

**Mobile Scanning:**

- motorized trolley-based laser scanning
- mobile platform instead of tripod-mounted
- software-driven settings and data capture
- on-site realtime display geared by industrial computer built in trolley body

*Scientific. Traceable. Efficient.*
*Visualized. Uniform. Complete.*

**MS100 system includes,**

- all-in-one software Tunnel Scan&Go
- TrolleyAuto (with inbuilt industrial computer)
- laser scanner with Automation function
- full-life cycle control software MT-GIS (option)

https://youtu.be/VsK7TuZszJg

# 1.4. How does the software work?

**Process Workflow:**

*(fieldwork setting → on-site display →)*
*data import → data analysis →*
*sectional data computation →*
*defects detection (by algorithm) →*
*manual review → final report*

**Automated Detection**

- *mega database reference*
- *computer vision*
- *machine learning & deep learning*
- *artificial intelligence*

**Full-life Cycle Control**

- *historical data management*
- *statistics, analysis and comparison*
- *out-of-tolerance alerts*

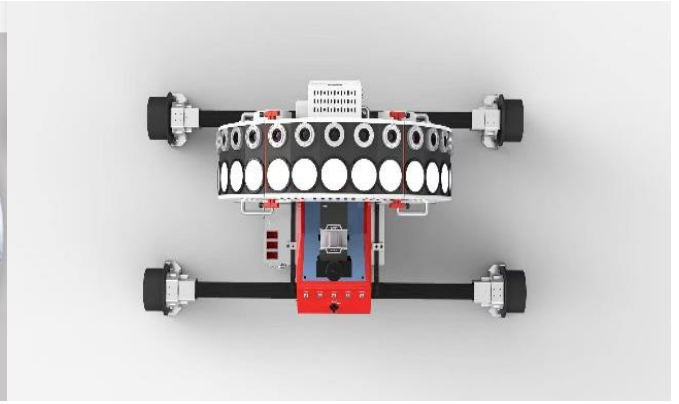

https://youtu.be/AM7wcpk4C1U

# 1.5. When to use this system in metro tunnel operation?

**Suited Stage:**

- tracks not laid ✗ (no way to slide)
- tracks already laid ✓ (for structural monitoring)
- as-built survey ✓ (for track mid-line, by 6th gen)
- operational stage ✓ (for regular inspection)


6th generation



7th generation

**Suited Environment:**

① bore tunnel
② shield tunnel
③ open-cut to shield structure session
④ open-cut structure station




# 1.6. Where has this system been used in real job practice?

**Deals (with rail authorities and contractors both):**

- ✓ Shenzhen
- ✓ Guangzhou x3 nos.
- ✓ Shanghai x4 nos.
- ✓ Harbin x2 nos.
- ✓ Nanjing
- ✓ Hangzhou

**Services:**

- ➢ 62 jobs (in recent 3 years)
- ➢ approx. 337 km in total (all inside mainland)


https://youtu.be/nO-i5hn2og4

# 1.7. How much…?

**before**

+

+

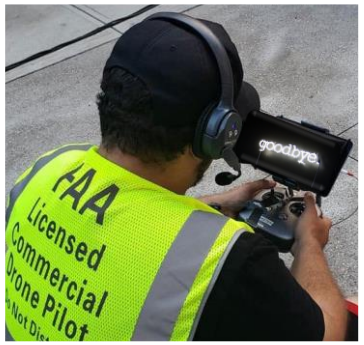

+


**now**

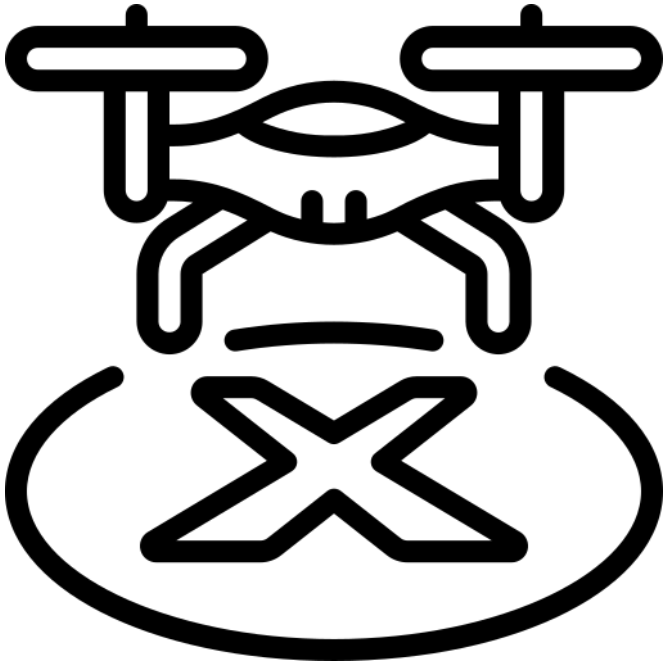
+

# Part 2: Aerial View

## Farewell Pilot!




## 100% Unmanned.



***Autonomous UAV System***

# 2.1. Why autonomous…?

- *lack of professional drone pilots for aerial jobs…*
- *wanna check site conditions but stay indoors…*
- *hard to arrange timely missions in emergency…*
- *expect to make decisions in no time…*

https://youtu.be/Q1tlGLwafLI

# 2.2. How does the Automation work…?



- *automated flight operation (by pre-set planning)*
- *automated battery replacement (by robot hand)*
- *automated battery recharge*
- *24x7 stand-by for reatime monitoring*

# 2.3. What are included?

## COMPONENTS ▶▶▶

① UAV (different payloads to meet diverse needs, and drone models available upon request)

③ AI-unit (helps to control automated flight, automated photography/videography, automated precise landing, etc.)

⑤ SkyView (functions include base management, UAV management, map management, skyway management, flight control, operation command, business routine, data analysis, weather monitoring, etc.)

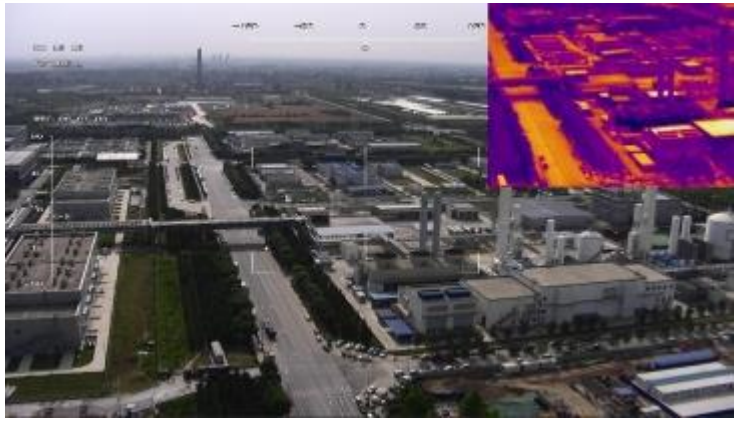
② BaseAuto (includes UAV base, robot hand, recharge station, power supply system, telecom system, internal CCTV, etc.)

④ environitor (monitors the environment conditions via thermometer, humidometer, anemometer, rain/snow sensor, radio signal detector, telecom repeater, CCTV, etc.)

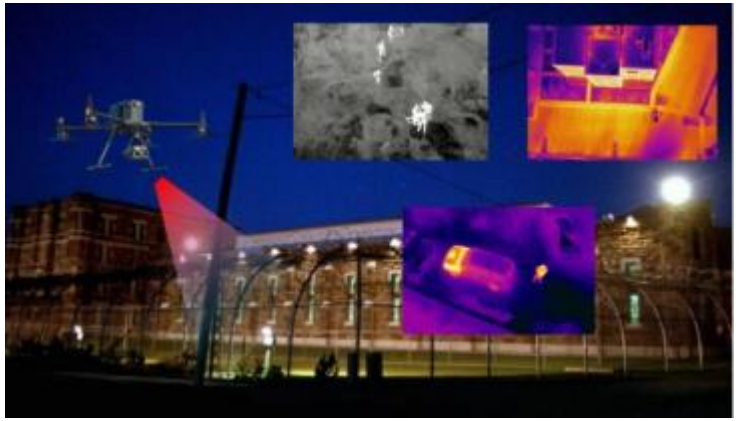
client's hardware (includes exclusive server, LED screen in control center)

⑥

# 2.4. Which scenes are suited?



restricted workplace security



police birdview patrol

water resources monitoring

power grid inspection

mining engineering

petrochemical engineering

A BETTER TOMORROW