# Maximizing the Benefits of Hybrid Geospatial Technologies

Presented by **CHC Navigation** (FIG Platinum Member)

Chair: Roderick MA

Rachel WONG

Jax FU

Presented at the FIG Working Week 2025 in Brisbane, Australia
6-10 April 2025 in Brisbane, Australia

# The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG

2nd relevant SDG

3rd relevant SDG

SUSTAINABLE DEVELOPMENT GOALS

International Federation of Surveyors supports the Sustainable Development Goals

# Maximizing the Benefits of Hybrid Geospatial Technologies

**Qin Yan**

Vice President of FIG

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**JOIN THE CHC NAVIGATION JOURNEY**


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# 01 CORPORATE OVERVIEW

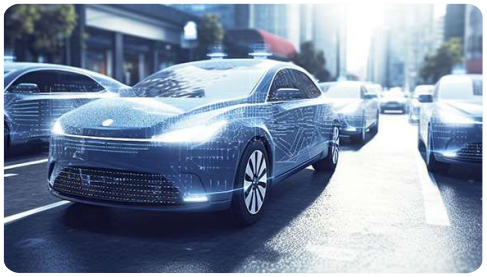
CHC Navigation is a technology-driven company providing hundreds of precise mapping, positioning and navigation solutions.

# CHC NAVIGATION TODAY

SERVING MAPPING, POSITIONING AND NAVIGATION APPLICATIONS WORLDWIDE

Recognized as one of the fastest-growing companies in the geospatial industry, CHC Navigation delivers precise mapping, positioning, and navigation solutions to **4 major industries** across **over 130 countries.**

Geospatial | Machine Control | Navigation | Agriculture



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# CHC NAVIGATION TODAY

A PREMIER PROVIDER OF PRECISE MAPPING, POSITIONING AND NAVIGATION SOLUTIONS

## VISION

BUILDING A SMARTER WORLD WITH PRECISE SPATIO-TEMPORAL INFORMATION.

## MISSION

FOCUS ON THE CHALLENGES AND BENEFITS THAT MATTER TO OUR CUSTOMERS.
PROVIDE COMPETITIVE ACCURATE GEOSPATIAL INFORMATION SOLUTIONS AND SERVICES.
CREATE MAXIMUM VALUE FOR OUR CLIENTS.

# CHC NAVIGATION TODAY

A PREMIER PROVIDER OF PRECISE MAPPING, POSITIONING AND NAVIGATION SOLUTIONS

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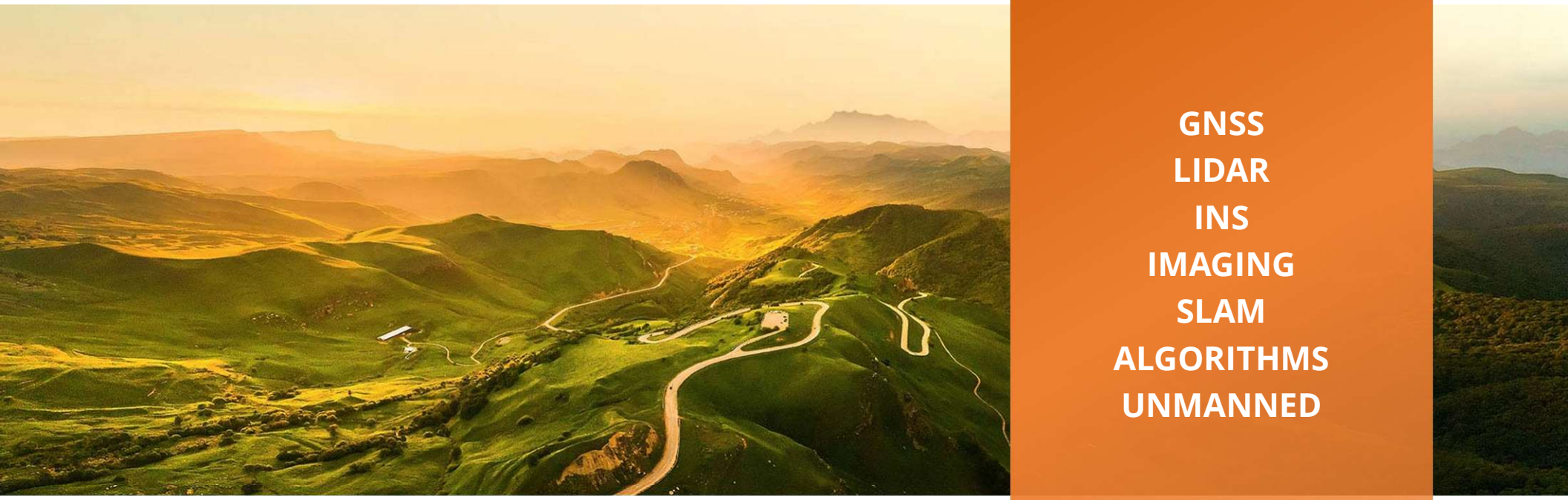
# CONTINUOUS TECHNOLOGICAL JOURNEY

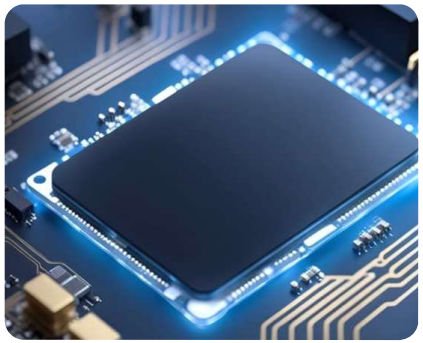
TECHNOLOGY OWNERSHIP IS THE FOUNDATION OF OUR GROWTH



**GNSS**
**LIDAR**
**INS**
**IMAGING**
**SLAM**
**ALGORITHMS**
**UNMANNED**

# INVESTING 18% IN R&D YEAR-ON-YEAR

DEVELOPING « PNT » + « AUTONOMY » AS CORE TECHNOLOGIES



## GNSS + INS Signal Processing & Chipset

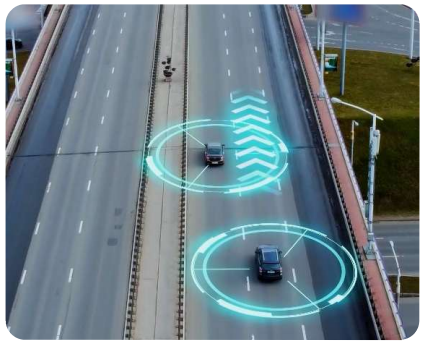
DISCHn Signal Reception
Super Anti-Jamming
Digital-Analog Integrated IC

## Algorithms

Tightly Coupled GNSS/INS
Positioning TrueVRS Network
RTK Ionospheric Modeling
High Precision Positioning

## 3D Reality Capture

Long Range LiDAR
Automated Point Cloud Extraction
GCP Free Aerial Survey
Automated Precision Calibration



## Autonomous Driving & Intelligent Control

Autonomous Driving
Environment Sensing
Autonomous Driving Navigation
Decision Making
Precision Execution Control

# ROBUST MANUFACTURING AND SUPPLY CHAIN

OPTIMAL, RESPONSIVE LEAD TIMES SUPPORTED BY COMPREHENSIVE QUALITY CONTROL

## UNMANNED WAREHOUSE

## AUTOMOTIVE GRADE MANUFACTURING

## LIDAR CALIBRATION

## CLIMATIC CHAMBER

## ENVIRONMENTAL

## VIBRATION + SHOCK

## KEY LIFE TEST

## AGING TEST

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# HUNDREDS OF SOLUTIONS FOR OUR CLIENTS

1M+ USERS, 100+ SOLUTIONS, 1 000+ APPLICATIONS

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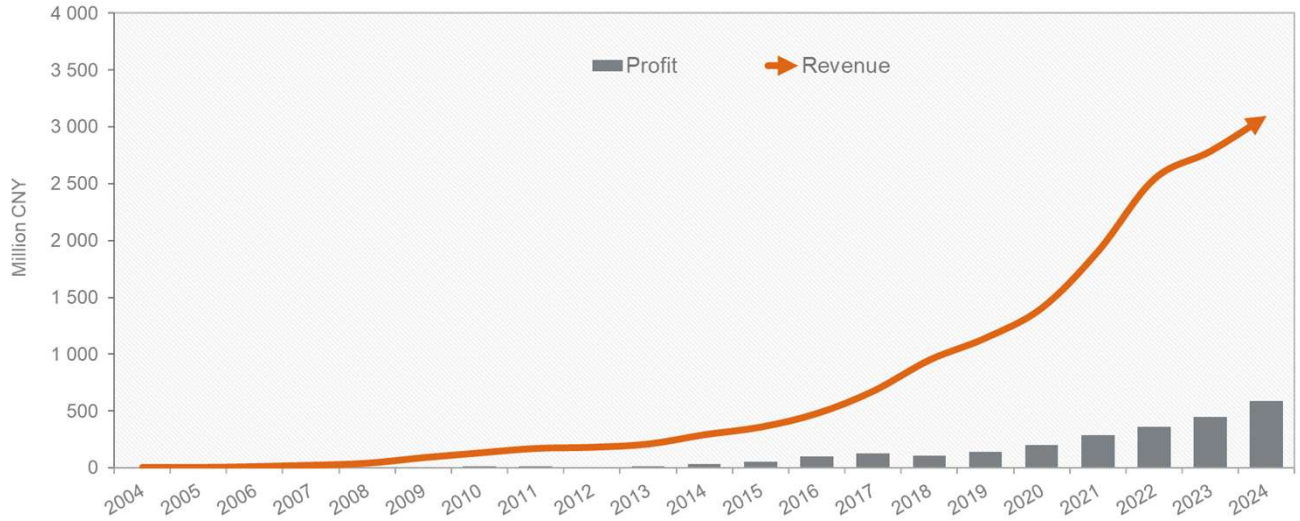
# CHC NAVIGATION TIMELINE

A BRIEF HISTORY AND MAJOR MILESTONES




## ROBUST GROWTH

**2003**

**START UP**
Develop first GNSS products
Enter domestic markets
Build up the core team

**2008**

**CONSOLIDATION**
Extend marketing reach
Construct the supply chain
Long term R&D plans
Financial management

**2013**

**DIVERSIFICATION**
Develop new product portfolio
Manage the structure evolution
Overseas business development
IPO in Shenzhen Stock Exchange (2017)

**2020**

**GROWTH**
Accelerate growth in new verticals in domestic and international markets

**2022-**

**EXPANSION**
New headquarters in Shanghai
New R&D Center in Wuhan
Rapid International expansion

# 2024 KEY FINANCIAL DATA SUMMARY

+17 %
Revenue CAGR (5Y)

15-20 %
EBITDA

+18 %
R&D Investments

3,1B USD
Market Capitalization

2,000 +
Employees, including 1000+ R&D engineers



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# GLOBAL SUPPORT. ANYTIME, ANYWHERE

MARKETING AND SUPPORT CENTERS FOR PARTNERS AND USERS

## China

**29** Branches
**3000+** Partners

## International

**11** Subsidiaries / Rep Offices
**750+** Partners & Resellers

## Research

**5** R&D Centers

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# 02

# OUR SURVEYING & ENGINEERING SOLUTIONS

CHCNAV technology boosts efficiency and affordability, enabling geospatial professionals to achieve unmatched precision in every project.

# SURVEYING & ENGINEERING

GNSS + IMU + AR VISUAL + 3D TECHNOLOGY ENABLE SURVEYING. ANYTIME, ANYWHERE

**GNSS SMART ANTENNAS**

**-**

**FIELD SOFTWARE**

**-**

**GEODETIC RECEIVERS**

**-**

**TOTAL STATION**

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# 2024 SURVEY & ENGINEERING HIGHLIGHTS

ENABLE GNSS RTK ANYWHERE, GET IT RIGHT EVERY TIME

# COMPLETE SOLUTIONS FOR GNSS SURVEYING

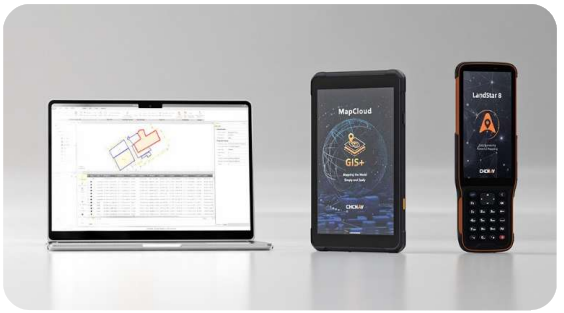
FROM GEODETIC SURVEY TO CONSTRUCTION SITES

## GNSS RECEIVERS

Efficient and advanced with latest GNSS, Auto-IMU and Visual technology fusion

## DATA CONTROLLER

Rugged for any field work in any conditions




## SURVEYING & MAPPING SOFTWARE

User-Friendly and Feature-Rich All-in-One Workflow from Field to Office

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# POWERED BY THE iSTAR PVT ALGORITHM

BOOST SPEED AND ACCURACY IN DIFFICULT ENVIRONMENT

## RTK FIX RATE INCREASED BY 20%

In complex environment such as urban and solar-active areas

## RTK TIME TO FIX REDUCED

Enhance GNSS survey productivity in areas with tree canopies and building obstructions

## WRONG FIX REJECTION ENHANCED

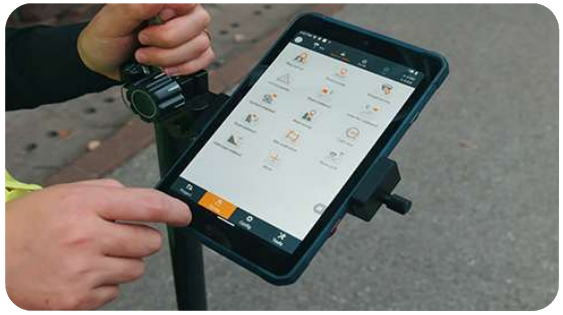
Under tree canopy,
Wrong fix > 50 cm are eliminated.
Accuracy < 10 cm increased by 15%

# RUGGED ANDROID TABLETS & SMARTPHONES

BOOST PRODUCTIVITY OF MOBILE WORKFORCE

## ANDROID TABLETS

Rugged Android tablet for professional data collection and asset management



## HIGH-ACCURACY

Bring centimeter accuracy at users' fingertips for mapping and surveying

## GNSS RTK SMARTPHONE

Enable cm-level data collection for precision GIS

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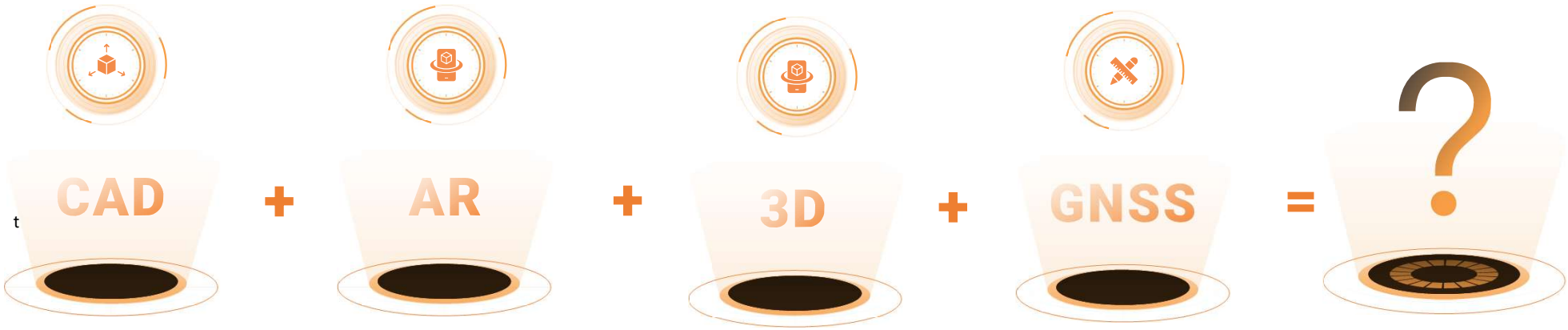
# CHCNAV SURVEY & ENGINEERING SOLUTIONS

ENABLE GNSS RTK ANYWHERE, GET IT RIGHT EVERY TIME

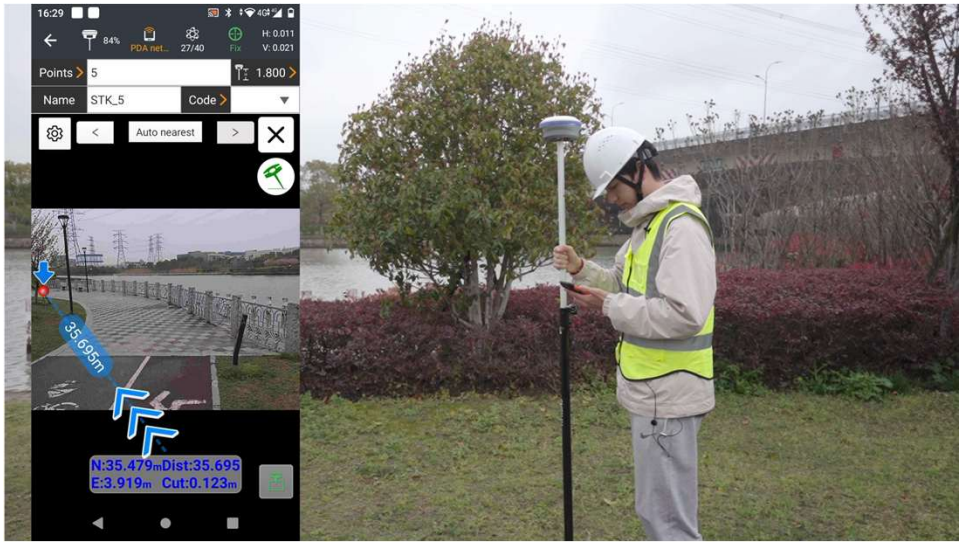


# VISUAL NAVIGATION AND STAKEOUT

EFFORTLESS ONE-STEP STAKEOUT AT A GLANCE

## STAKEOUT EFFICIENCY INCREASED BY 50%

| FEATURES | BENEFITS |
|---|---|
| **Visual navigation and visual stakeout** provides an immersive 3D visual experience, guided by a clear, eye-catching directional arrow and real-time distance. | Simplify the stakeout process, allowing for quick completion in seconds and increasing efficiency by up to **50%** for less experienced field operators. |



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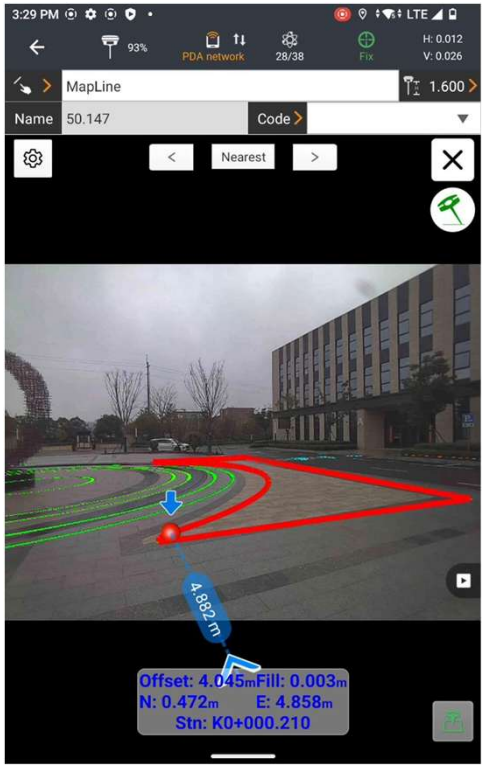
# CAD-AR VISUAL NAVIGATION & STAKEOUT

BOOST OVERALL EFFICIENCY BY 40%

## CAD integrated into AR reality

- ✓ 50% faster dense point stakeout without constant interface switching
- ✓ Real-time CAD AR stakeout, precision without detours
- ✓ Smart construction path prediction, enhance 40% overall stakeout efficiency



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# CASE 1:
# AR OVERLAY SIMPLIFIES ROADS REDLINES REVIEW & VERIFY CENTRELINES

# CASE 2:
# SMART ASSISTANCE PREDICTS PIPELINE DIRECTION: +60% EFFICIENCY

# VISUAL SURVEY W/ VIDEO PHOTOGRAMMETRY

ACCURACY COMES INTO VIEW: MEASURE ANY POINT WITH EASE

## BEYOND GNSS RTK SURVEY

| FEATURES | BENEFITS |
| --- | --- |
| Enable **visual survey** with the premium camera, delivering survey-grade 3D coordinates from real-world video in seconds. | Measuring previously hard-to-reach, signal-obstructed and hazardous points has become a breeze. |

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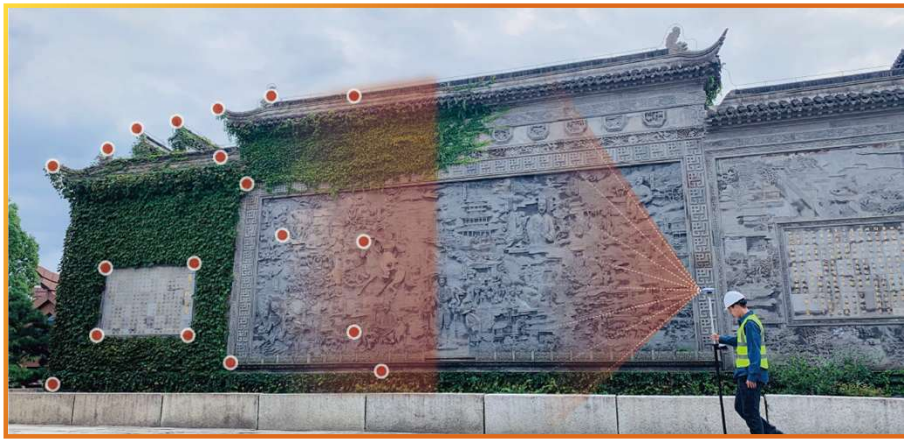
# 3D MODELING BOOST YOUR JOB

COMPLEMENT AERIAL SURVEYS VIA UAV+I93

## DOUBLE THE EFFICIENCY OF FIELD AND

| FEATURES | BENEFITS |
| --- | --- |
| The i93 GNSS can be used to complement aerial surveys by integrating **UAV and i93 RTK data** for joint modeling. | Enhance aerial surveys and replace traditional photo-based modeling, removing distortion, gaps, and blurs caused by drone-mounted camera angles, especially in occluded areas. |
| Compatible with **popular 3D modeling software**, such as ContextCapture/ Smart3D. | Use your existing software without additional expenses to optimize your 3D models. |





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SOLUTION

# OPTIMIZE MODEL WITH UAV + VISUAL RTK JOINT MODELING

# SINGLE OBJECT MODELING WITH VISUAL RTK ONLY

# RTK Perfect Partner: LandStar Field Survey APP

**CAD + 3D upgrades in graphics performance**

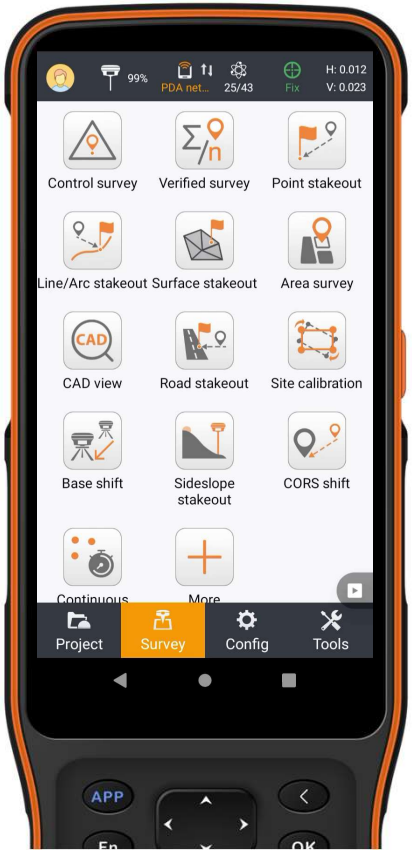
**Application versatility**

PART 01

# 3TH GEN METACAD GRAPHIC ENGINE, 30-50% FASTER WITH CAD

## Smoothly open 20 MB DWG/ 200 MB DXF CAD base maps in just 8 seconds

Data source: CHCNAV laboratory test results



PART 02

# EFFICIENT 3D SURFACE STAKE-OUT

## Supports 5 major surface

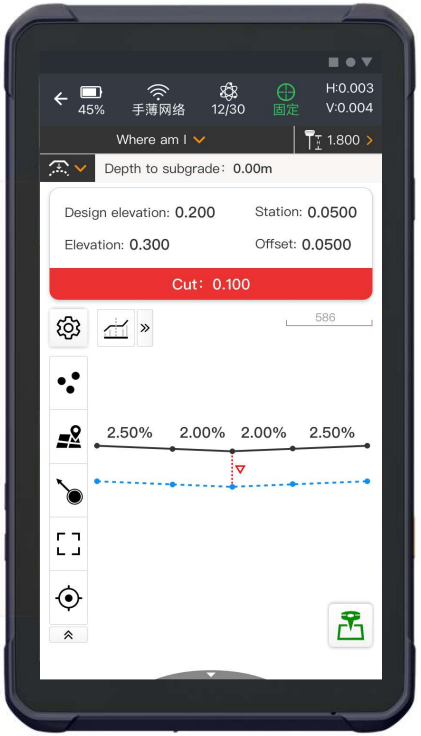
- Support elevation plane, single slope, XY slope, 3 points slope, surface.
- Make your surface stake-out work more efficient.

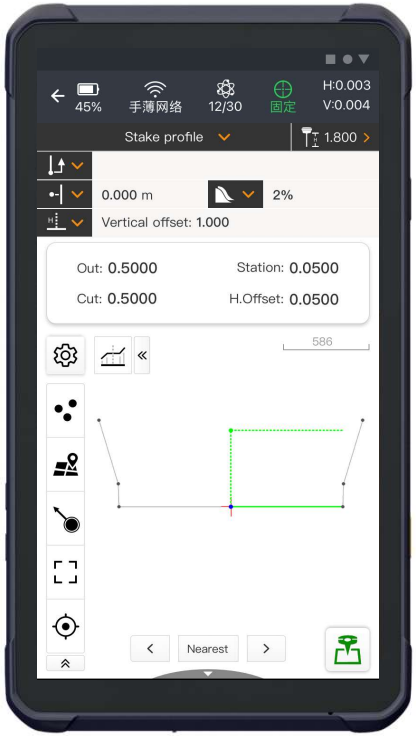
PART 03

# EFFICIENT 3D ROAD STAKE-OUT

## Supports the stake-out of various road elements

- Stake-out profile, slope, etc...
- “Where am I” function
- Customized navigation information.



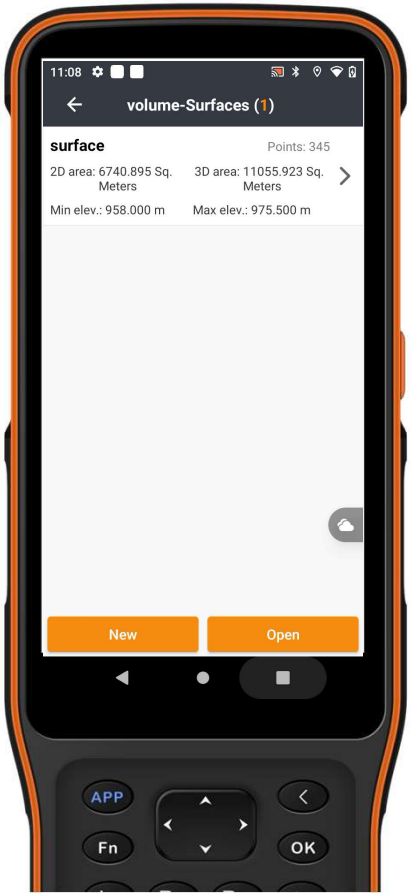



PART 04

# 3D EARTHWORK VOLUME CALCULATION

**Refining TIN mesh with terrain-based line constraints**

**Earth volume calculation accuracy is as high as 99.98%**



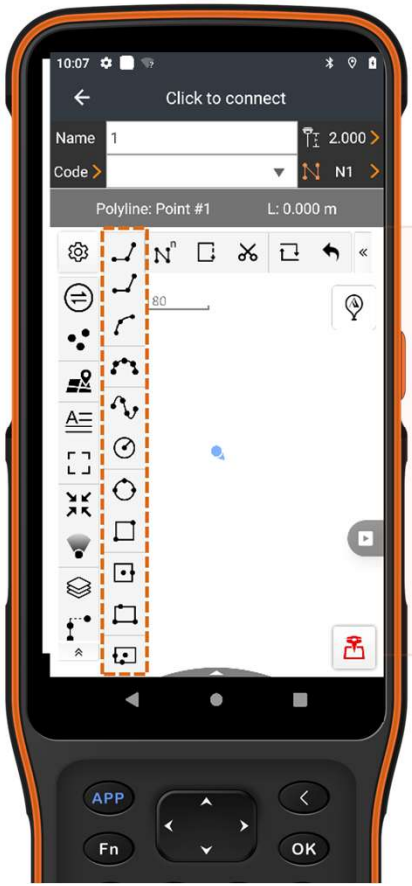

**Support 3D view**

**Preview, build TIN and edit directly via 3D view**

**Improve earthwork calculation accuracy and work efficiency**

PART 05

# CONVENIENT MAP SURVEY




## CORRESPONDING LINE TYPES FOR ALL TERRAINS

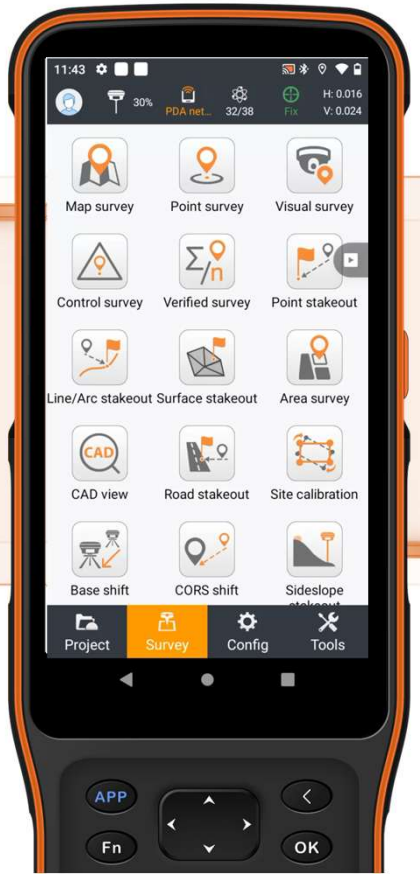
### Supports 12 major line types

- No need to select the code, only need to switch the line type to continuously collect data.

PART 06

# CONVENIENT ZIP-ZAG SURVEY

"A single person can survey and map multiple road lanes at the same time"




"Streamline road surveys with multiple lanes"

PART 07

# EXPORT SITE CALIBRATION FILES

## Export site calibration data to your MC system easier

## Supports Multiple Formats

- Calson LOC file (.loc)
- COT file (.cot)
- Trimble CAL file (.cal)

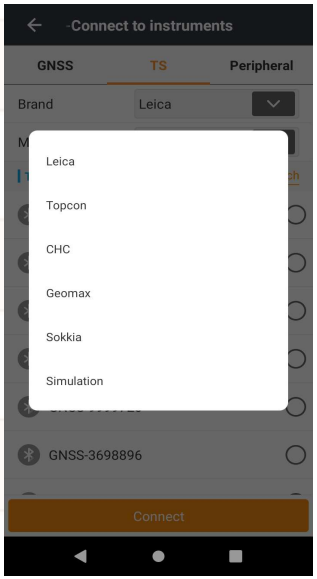
PART 08

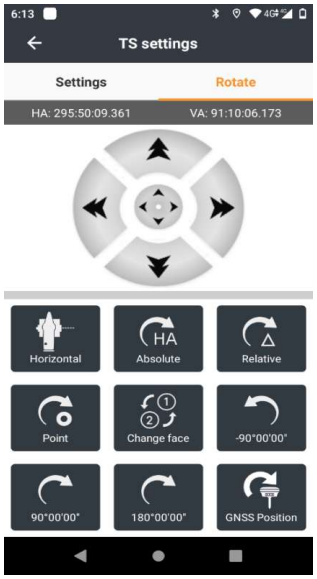
# RTK + TOTAL STATION, ALL IN ONE LANDSTAR SOFTWARE

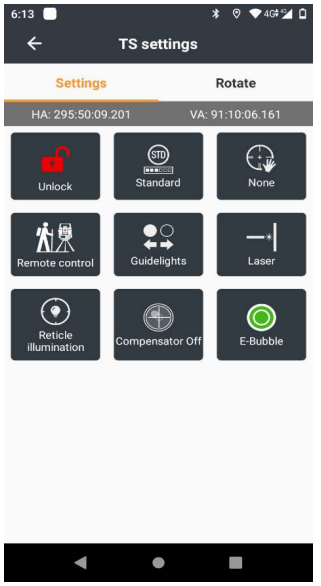
LandStar directly controls the total station

A single person can control the total station to measure and stakeout

Once you learn the LandStar software, you can learn how to measure and stakeout with total stations



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# 03

# INTELLIGENT 3D REALITY CAPTURE SOLUTIONS

CHCNAV technology boosts efficiency and affordability, enabling geospatial professionals to achieve unmatched precision in every project.

# 3D REALITY CAPTURE PRODUCTS

GROUND AND AIRBORNE LiDAR AND DRONES FOR 3D DATA ACQUISITION

**Handhold Scan System**

**RS10**

**Aerial LiDAR System**

AlphaAir 9

AlphaAir 10

AlphaAir 15

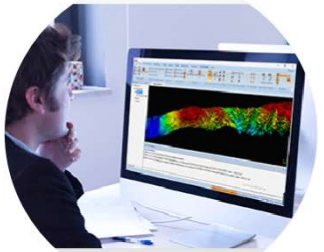
**Mobile Mapping System**

AP7 Single Head

AP7 Dual Head

**UAV**

X500



**Software Packages**

CoProcess

CoCloud

# HANDHOLD SCAN SYSTEM

DEEPLY INTEGRATED OF PRECISE RTK AND SLAM

The RS10 brings a new approach to geospatial surveying by integrating GNSS RTK, laser scanning and visual SLAM technologies into a single platform designed to improve the efficiency and accuracy of indoor and outdoor 3D scanning and surveying tasks.

RS10 looks like standard handheld SLAM device, but it’s more than just it. This innovative design cleverly addresses the challenge of RTK's inability to measure in areas with weak or fully lost GNSS signals, while giving the RS10 the ability to efficiently survey in areas that are difficult to reach manually, making field job simpler and more reliable.

# HANDHOLD SCAN SYSTEM

HOW RS10 CAN REACH THE MOST PRECISE RESULT

## Forth Generation

Air dielectric Circular GNSS antenna

## 20%

Improve Low-elevation angle
satellite signal quality

## Accuracy less than 3cm

Improve GNSS positioning accuracy
in challenging environments

# HANDHOLD SCAN SYSTEM

OFFER TWO OPTIONS DEPENDS ON REQUIREMENTS

RS10

RS10 (32 lines)

| Specification | RS10 | RS10 (32 lines) |
|---|---|---|
| Accuracy | Absolute: 5cm<br>Relative: 1cm | Absolute: **2cm**<br>Relative: 1cm |
| Point frequency | 320,000 pts | **640,000 pts** |
| Scan range | Max 120m | **Max 300m** |
| FOV | 360*270 | 360*270 |
| Resolution | 15MP | 15MP |
| Temperature | -20-50 | -20-50 |
| Duration | 1h | 1h |
| Weight | <1.9kg | **<1.7kg** |

# HANDHOLD SCAN SYSTEM

ADVANCED HPC COLORIZATION ALGORITHM

Colorization effect based on three 5MP camera sensors with HPC algorithm

# HANDHOLD SCAN SYSTEM

HPM MODELING FUNCTION, READY FOR DRAWING

# HANDHOLD SCAN SYSTEM

3DGS: REPRESENTING 3D SCENES & RENDERING NEW PERSPECTIVES

# HANDHOLD SCAN SYSTEM

BE PROVED AND TRUSTED BY GLOBAL CUSTOMER

- Hesai **No.1** LiDAR partner
- Global delivered units: **2000+**
  - Domestic: **1200+**
  - Oversea: **800+**
- 2024 China domestic SLAM market share: **No.1**
- Global partners: **500+**

# 3D REALITY CAPTURE PRODUCTS

GROUND AND AIRBORNE LiDAR AND DRONES FOR 3D DATA ACQUISITION

**Handhold Scan System**

RS10

**Aerial LiDAR System**

**AlphaAir 9**

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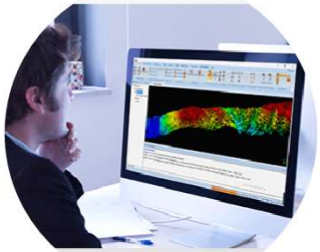
**Mobile Mapping System**

AP7 Single Head

AP7 Dual Head

**UAV**

X500



**Software Packages**

CoProcess

CoCloud

# WHAT IS AN AIRBORNE LIDAR

## LIDAR BENEFITS FOR HIGH PRECISION & EFFICIENT SURVEY

- LiDAR is a laser scanning remote sensing technique which stand for Light Detection and Ranging.

- It is especially suited for topographic surveys of vegetation, rugged, or hard to access zones, which help surveyors to shift from the exhausting practice of mapping with heavy Differential GPS tools & ETS (Electronic Total Stations) to the time-saving method of utilizing UAVs/drones equipped with high powered technology.

# COMPARE WITH PHOTOGRAMMETRY

LIMITATIONS AND PAIN POINTS OF TRADITIONAL SOLUTION

## More limitations

Especially in forest or dense vegetation area, dark environment or bad weather etc

## Need GCP control

Surveryer need go on-site to prepare in advance

## Slow data processing

Dense vegetation, bright sunlight etc

# AERIAL LIDAR SYSTEM

ALPHAAIR SERIES: FROM MID RANGE TO HIGH END SOLUTIONS

### ALPHAAIR 9

—

Max range **600m** (80%)

Max **500** kHz & **6** returns

FOV **75** degree

Internal **26MP** camera

Weight **1.45kg**

### ALPHAAIR 10

—

Max range **800m** (80%)

Max **500** kHz & **8** returns

FOV **75** degree

Internal **45MP** camera

Weight **1.55kg**

### ALPHAAIR 15

—

Max range **2400m** (80%)

Max **2000** kHz & **16** returns

FOV **75** degree

External camera

Weight **2.5kg**

# ADVANTAGES OF CHCNAV LIDAR

## NO.1: PREMIUM LASER SCANNER HEAD FOR HIGH PRECISION

Tilted column prism scanning patented technology

证书号第15391251号

实用新型专利证书

实用新型名称：一种倾斜柱体棱镜扫描装置

发 明 人：肖亮;姚立;刘守军

专 利 号：ZL 2021 2 1169764.5

专利申请日：2021年05月28日

专 利 权 人：武汉徕得智能技术有限公司

地 址：430014 湖北省武汉市东湖新技术开发区光谷二路219号鼎杰现代机电信息孵化园一期14栋2层01号

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局长
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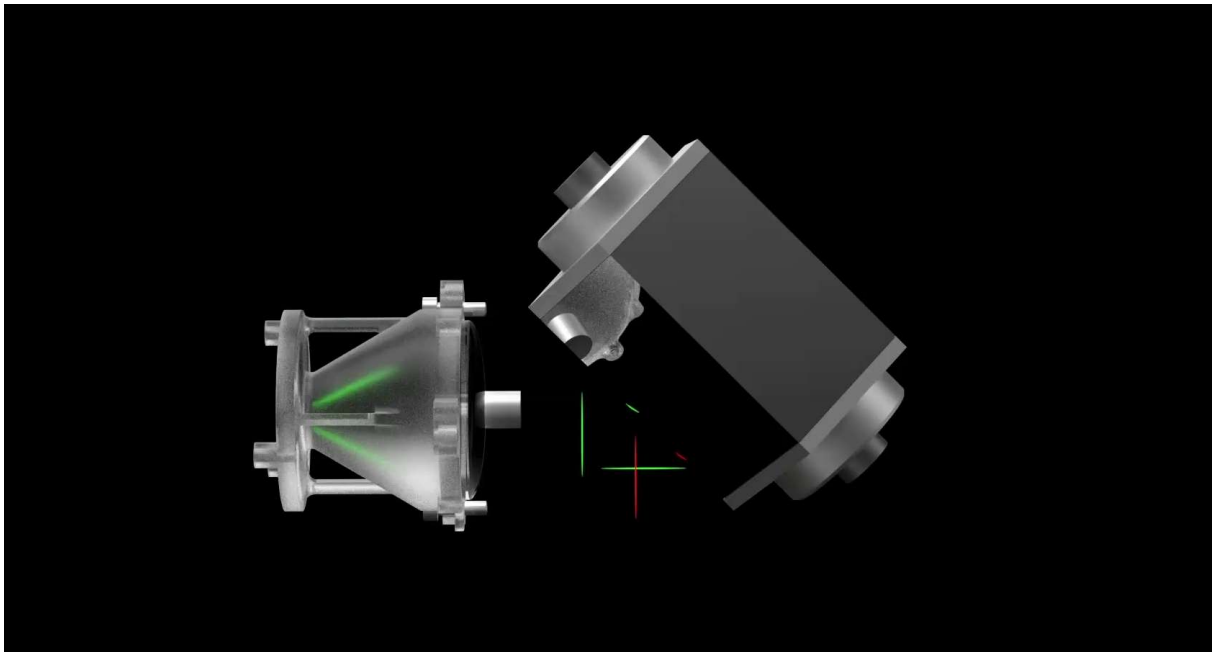
其他事项参见续页



# ADVANTAGES OF CHCNAV LIDAR

NO.2: ALL-IN-ONE HIGHLY INTEGRATED

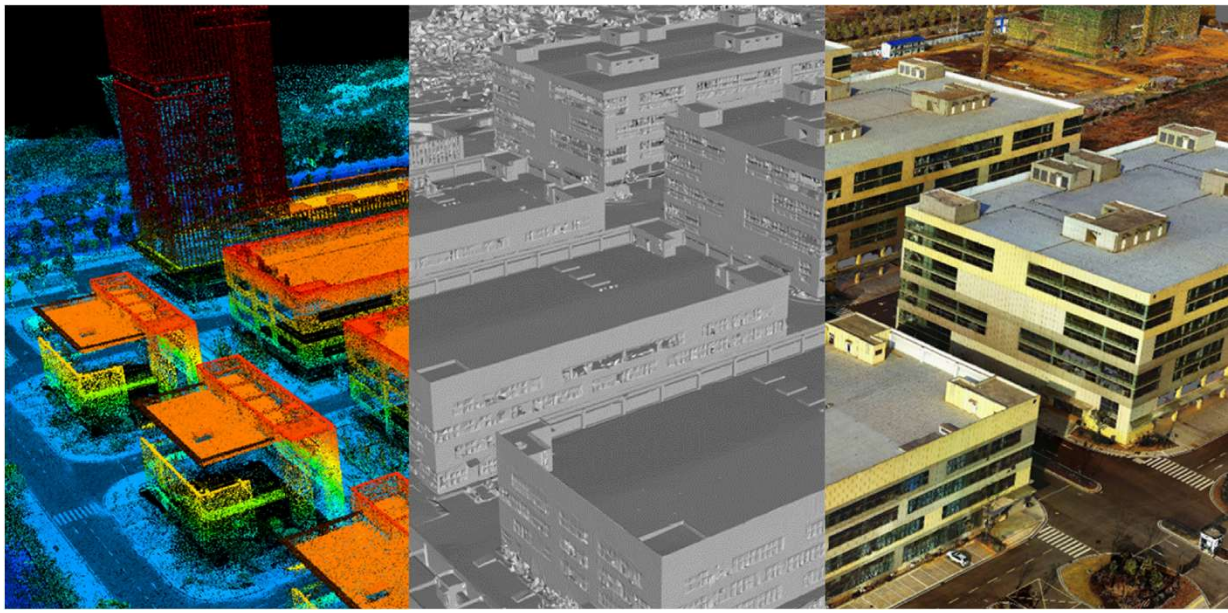
- Survey grade laser scanner head;
- Full frame industry level camera sensor;
- High precision IMU system;
- AA9/AA10 with X500 UAV: max **50 minutes** flight duration;
- AA15 with X500 UAV: max **40 minutes** flight duration;

# ADVANTAGES OF CHCNAV LIDAR

NO.3: PIONEERING POINT CLOUD AND IMAGE FUSION MODELING

**Workflow:**

- Step1: Generate triangular mesh based on point clouds;
- Step2: Create mesh models without textures;
- Step3: Merge the colors and textures with the mesh mesh models;



# 3D REALITY CAPTURE PRODUCTS

GROUND AND AIRBORNE LiDAR AND DRONES FOR 3D DATA ACQUISITION

**Handhold Scan System**

RS10

**Aerial LiDAR System**

AlphaAir 9

AlphaAir 10

AlphaAir 15

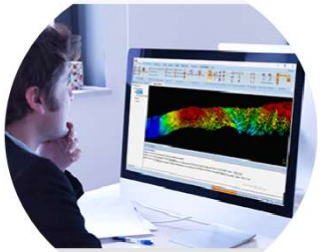
**Mobile Mapping System**

**AP7 Single Head**

**AP7 Dual Head**

**UAV**

X500



**Software Packages**

CoProcess

CoCloud

# MOBILE MAPPING SYSTEM

AU20+AP7 MMS KIT FOR EVERYTHING

| | |
|---|---|
| Weight | 2.82kg |
| Range | 1.5-250m (80%) |
| Max PRR | 200kHz |
| Max speed | 200 scans/sec |

# MOBILE MAPPING SYSTEM

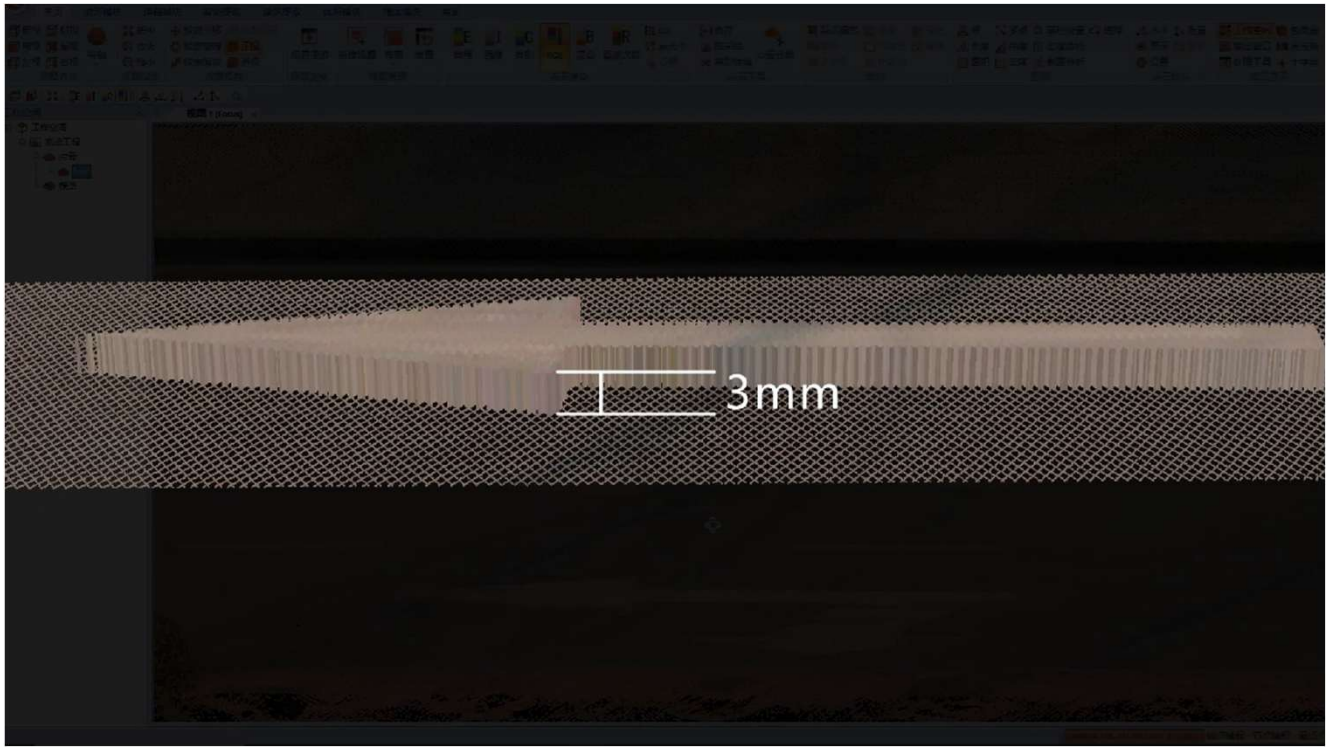
ADVANCED POINT CLOUD QUALITY & THICKNESS

**5mm**

Ranging accuracy

**3mm**

Repeat accuracy

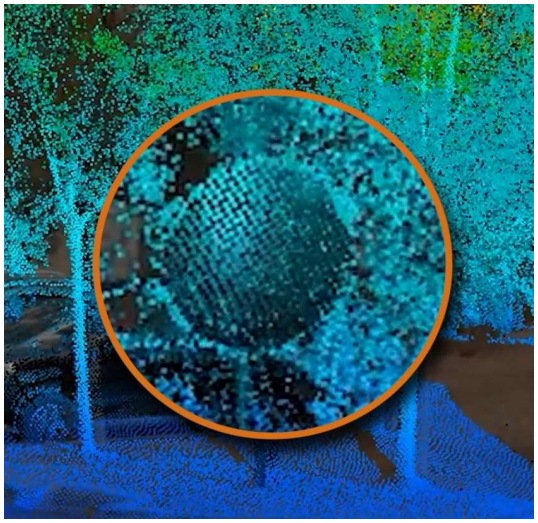


# MOBILE MAPPING SYSTEM

ADVANCED POINT CLOUD QUALITY & THICKNESS

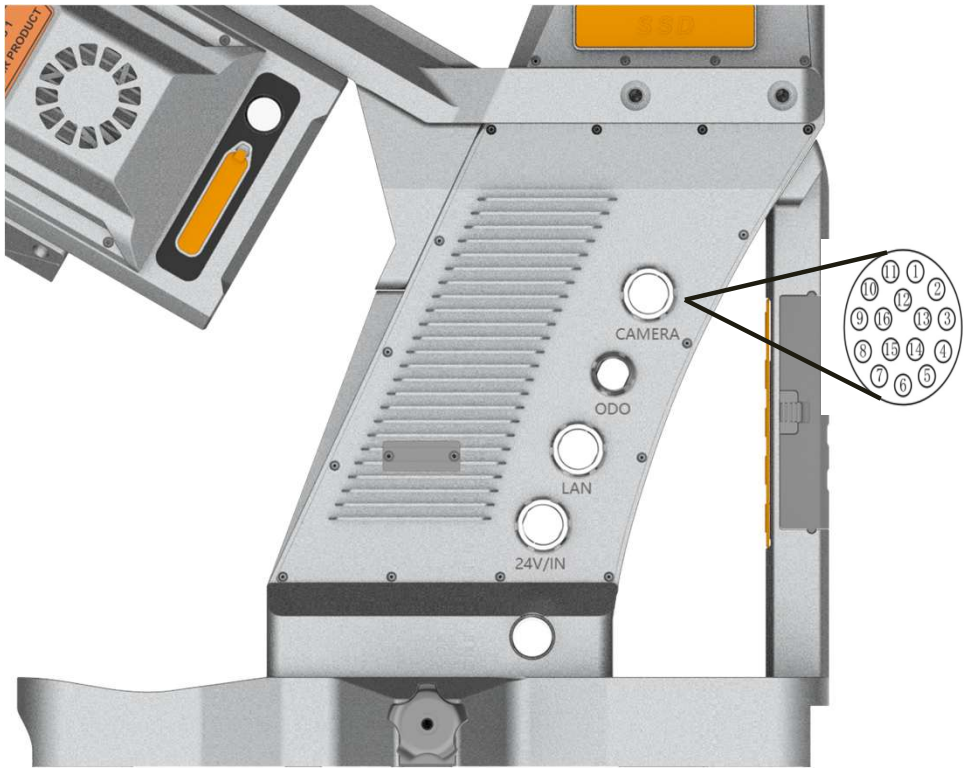
# MOBILE MAPPING SYSTEM

LASER SENSING & RANGING TECHNOLOGY FOR MIRROR



# MOBILE MAPPING SYSTEM

READY PORT FOR EXTERNAL CAMERA



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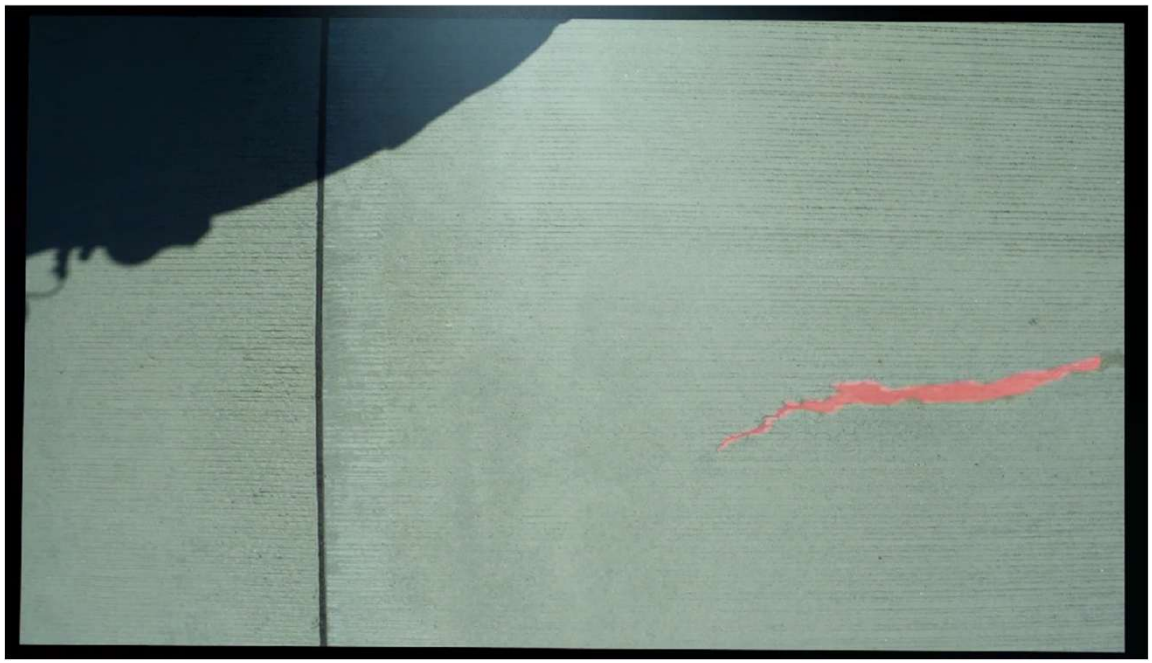

- Binocular camera with **120MP** resolution;
- Support 80km/h capture speed with less than **1cm** accuracy;

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RS10

**Aerial LiDAR System**

AlphaAir 9

AlphaAir 10

AlphaAir 15

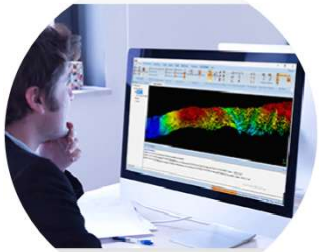
**Mobile Mapping System**

AP7 Single Head

AP7 Dual Head

**UAV**

**X500**



**Software Packages**

CoProcess

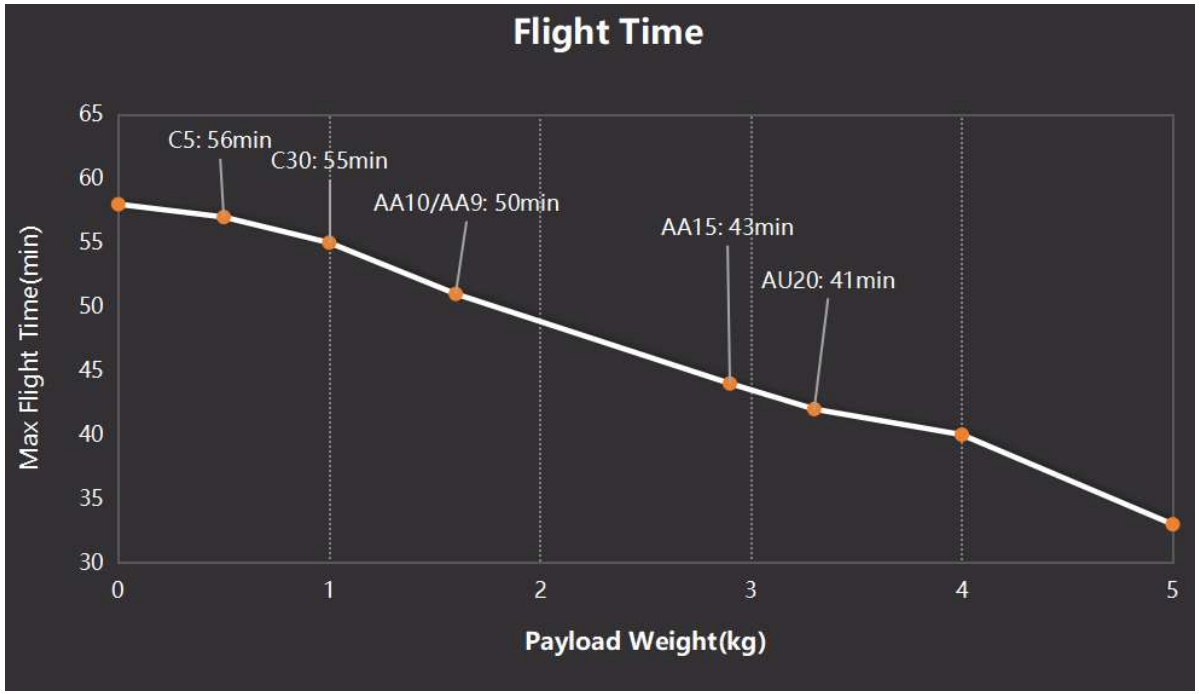
CoCloud

# X500 UAV PLATFORM

HIGH-PERFORMANCE

## High payload capacity & long endurance

- 8.9 kg empty weight (with 2 batteries)
- Max **5kg** payload, covering the weight of mainstream payloads
- 58 minutes with no payload
- **52 minutes** with 2kg payload
- 40 minutes with 4kg payload



# X500 UAV PLATFORM

HIGH PERFORMANCE

dual redundant GNSS

triple redundant IMU

**IP55** protection level

**12 m/s** wind resistance rating

**7000m** max. flight altitude

millimeter wave obstacle avoidance radar

high-definition FPV camera

# X500 UAV PLATFORM

STRONG IN CHALLENGING ENVIRONMENTS

- Extreme cold temperature testing:

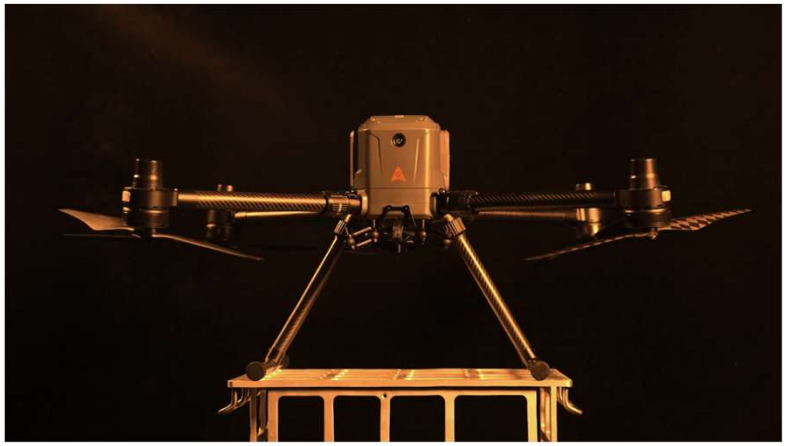
**-35℃** low temperature testing, February 2024

Mohe, China

- High temperature testing:

**50℃** High temperature testing, July 2024

Turpan, China



# X500 UAV PLATFORM

QR CODE MOBILE LANDING

## Vision-based positioning system

- Vision-guided landing on moving objects;
- Supports mobile vehicles and vessels;

# X500 UAV PLATFORM

TRIPLE ROTOR SPIN PROTECTION

**Reliable, impact & interference-resistant**

- safe operations and worry-free
- adjust flight attitude rapidly
- avoid crash accidents
- advanced fault-tolerant control
- safe landing

# X500 UAV PLATFORM

OPEN SDK, MULTIPLE PAYLOADS, FOCUS ON INDUSTRY APPLICATIONS

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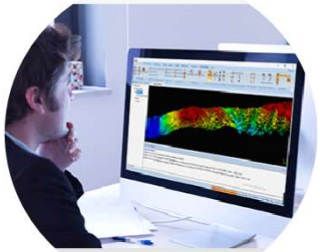


**Software Packages**

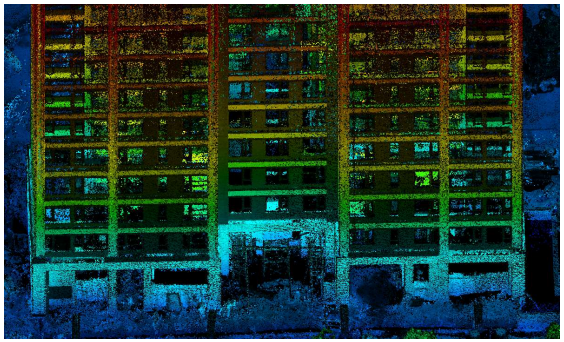
**CoProcess**

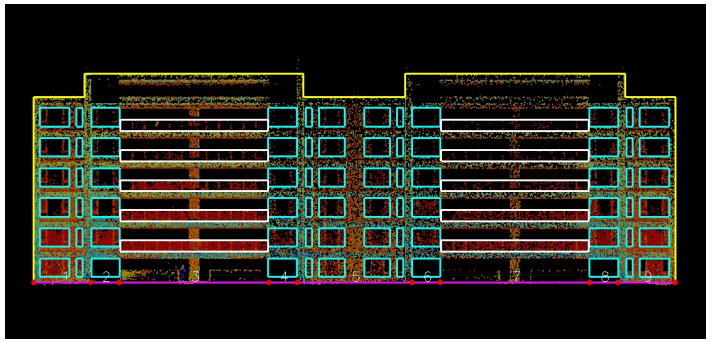
**CoCloud**

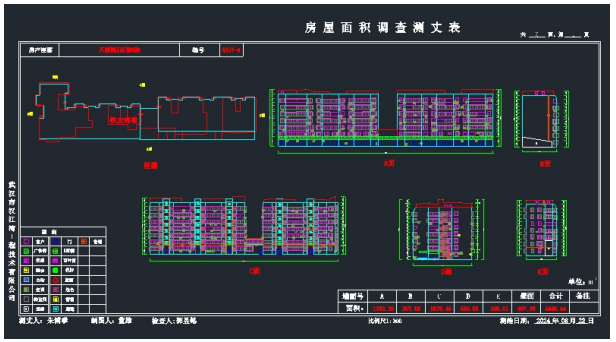
# CHCNAV COPROCESS

POWERFUL, USER FREINDLY AND INTELLIGENCE

## One step solution, from data to final output



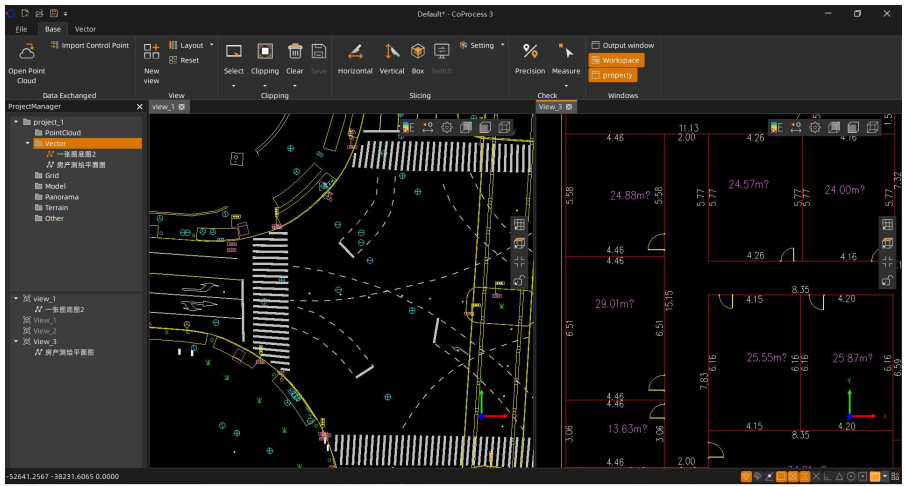


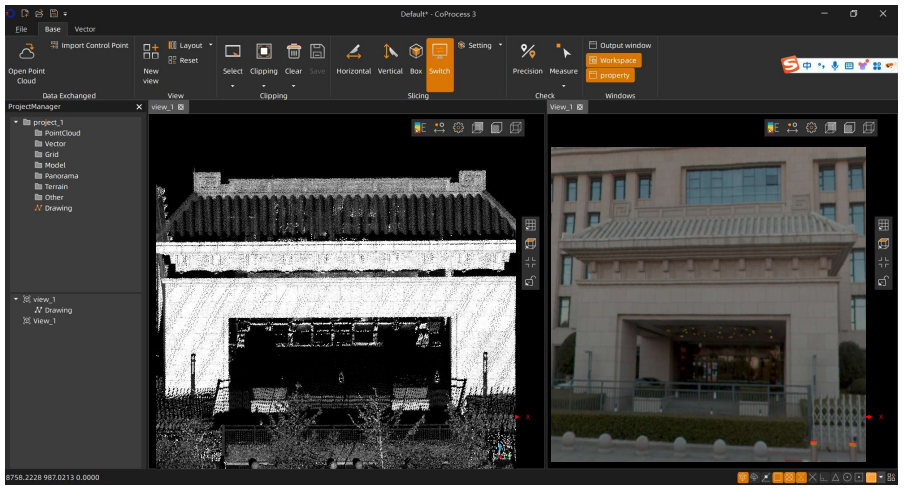


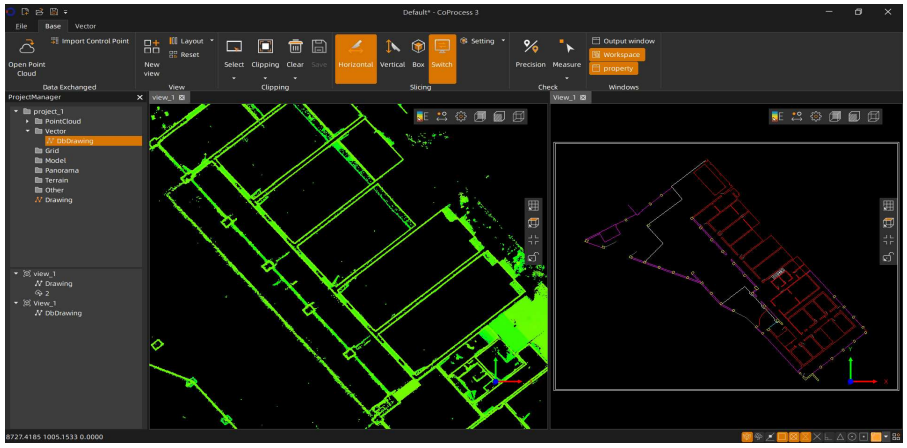

Las Model DOM → Vector Data → DLG Result

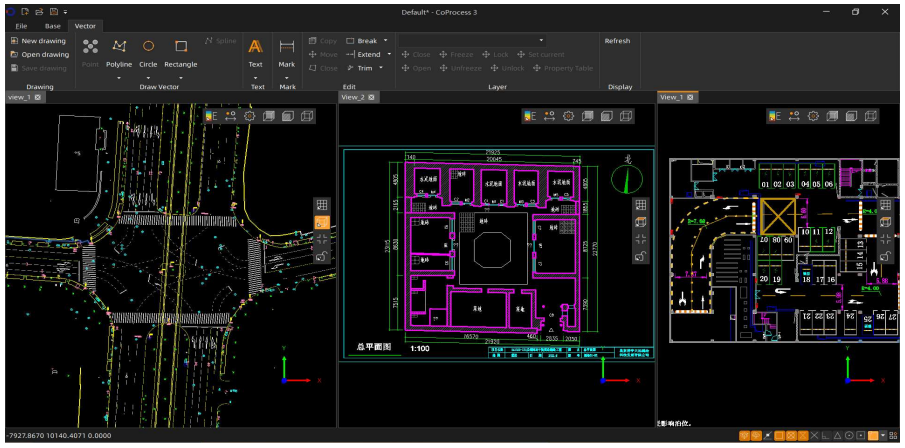
# CHCNAV COPROCESS

POWERFUL, USER FREINDLY AND INTELLIGENCE



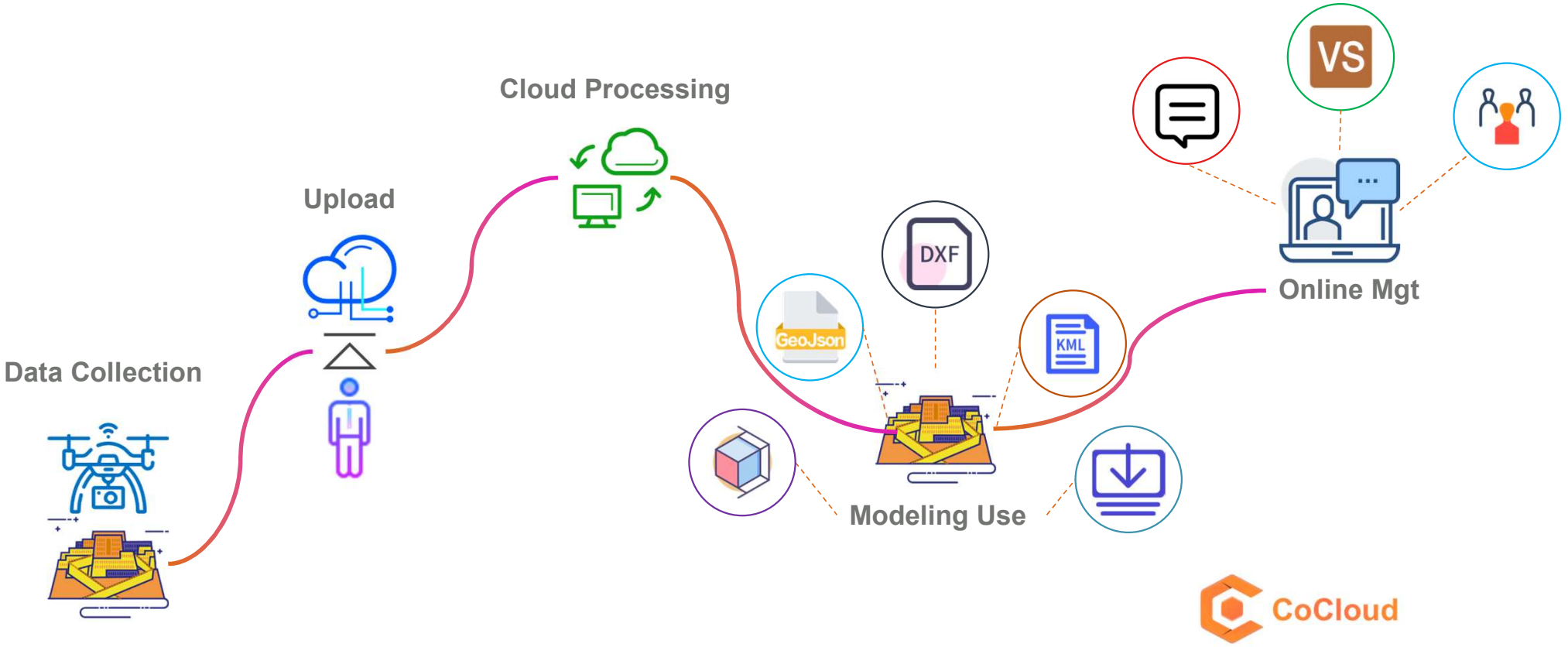






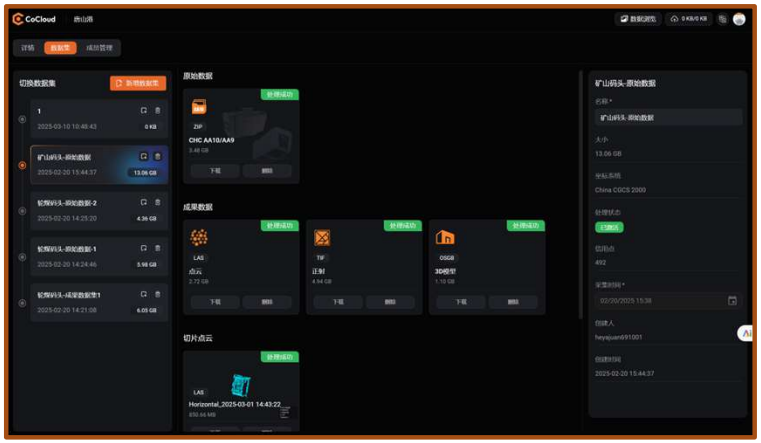
# CHCNAV COCLOUD

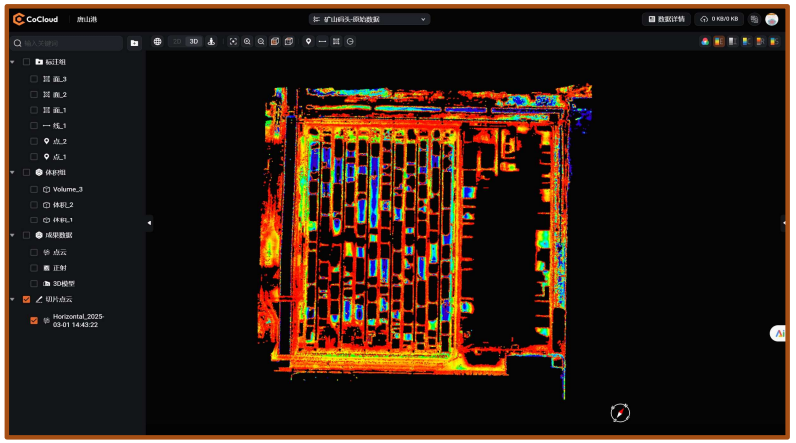
ONLINE PROCESSING & MANAGEMENT PLATFORM

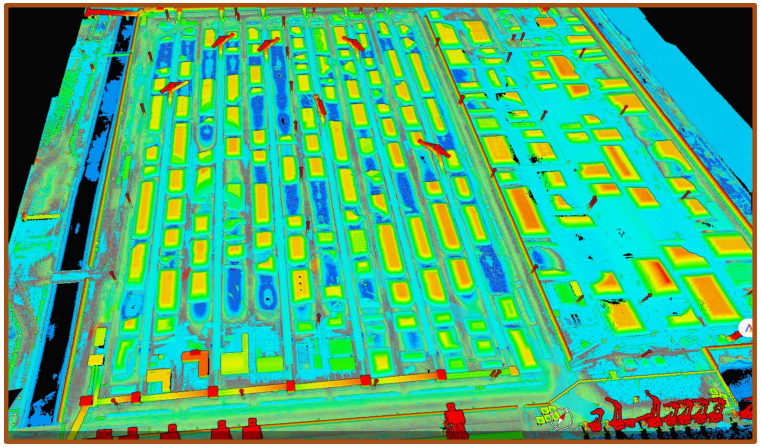


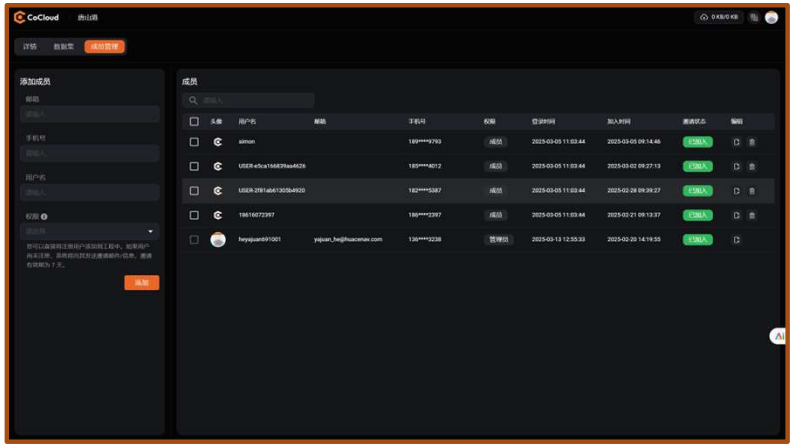
# CHCNAV COCLOUD

ACCOUNT MANAGE, SLICE & MEASURE, VIEW & DOWNLOAD, SHARE & PUBLISH









# APPLICATIONS & INDUSTRIES

GENERAL OVERVIEW

Infrastructure

Building Construction

Asset Collection

Energy

Disaster Recovery

Virtual Industrial Training

Accident Simulation

Urban Planning

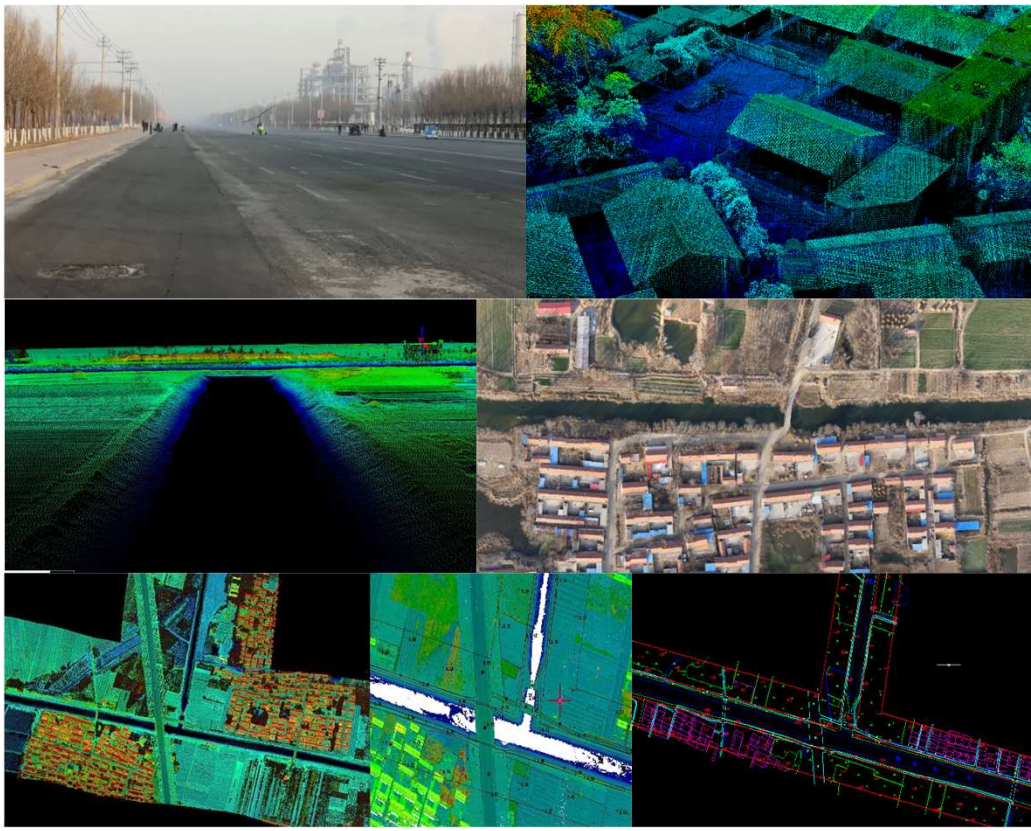
Forestry

Safety & Security

# CADASTRAL & MAPPING

GENERAL OVERVIEW

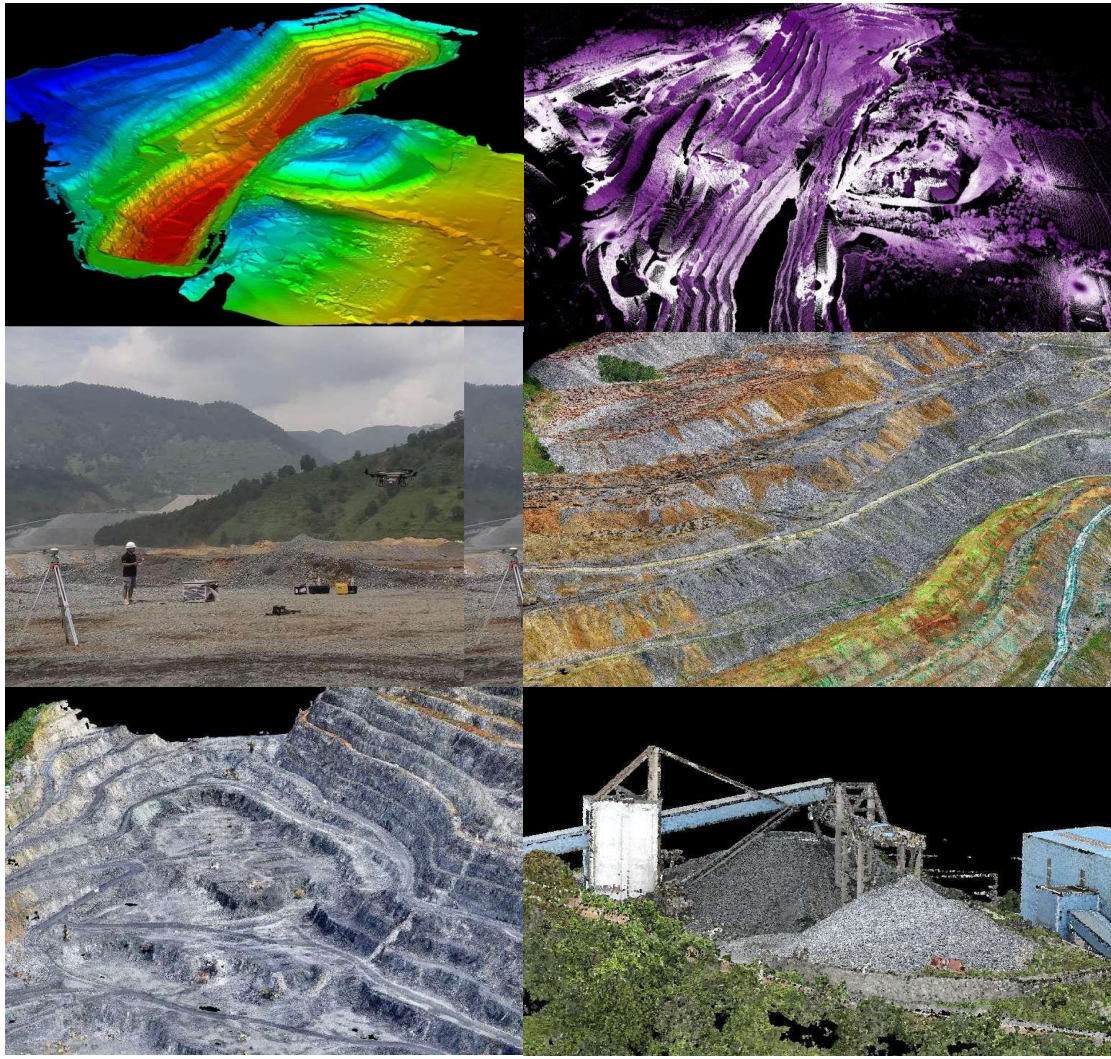
- Topo plans
- Capture features & attributes
- Capture natural surface, DTM
- BIM management
- Forensics & large event management
- Border control & crop identification
- Damage assessment (Infrastructure & Building)



# MINING

## GENERAL OVERVIEW

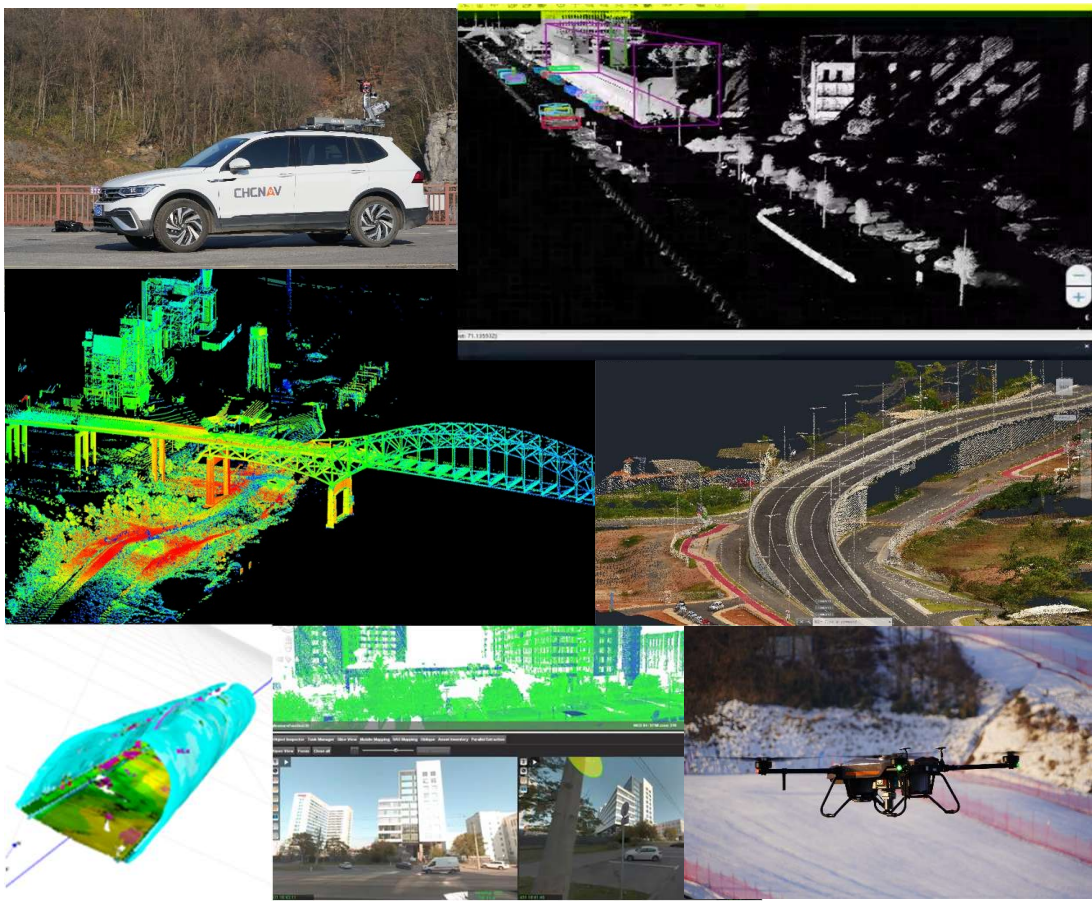
- Capture natural mine surface
- Capture features & attributes
- Calculate production volumes
- Monitoring of mine slopes



# INFRASTRUCTURE

## GENERAL OVERVIEW

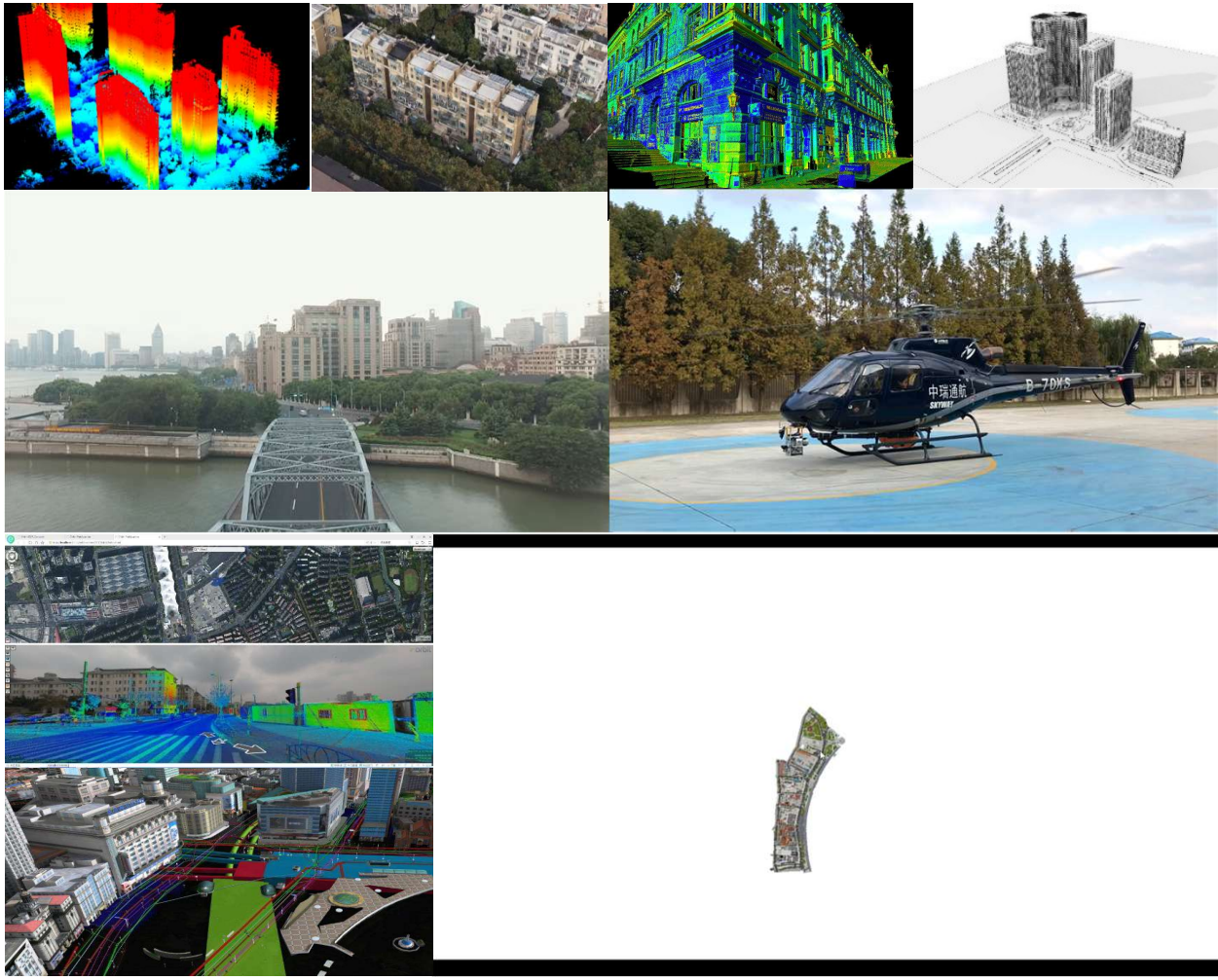
- Roads & Highways corridor mapping
- Roads asset management
- Capture natural surface, mapping, volume calculations, DTM
- Roads design & visualize
- Rail Signaling & control
- Rail network management



# DIGITAL CITYES

GENERAL OVERVIEW

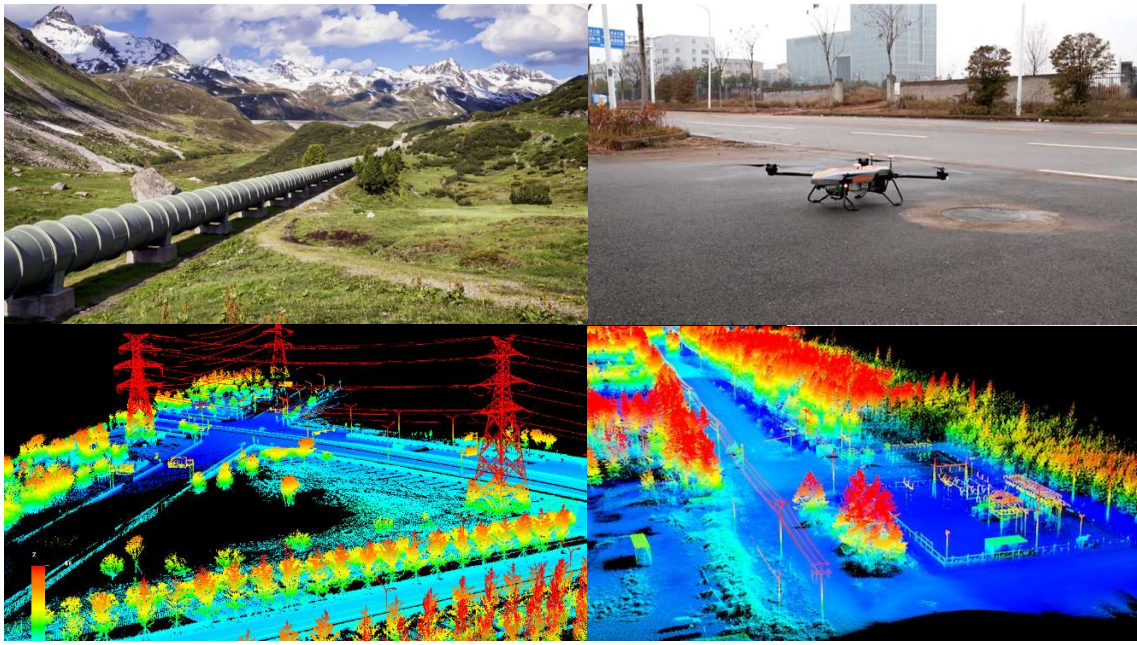
- 3D city models
- Tree cadaster
- Solar potential
- Street view Mapping for Navigation
- Virtual surveying
- Asset management
- Facade / Heritage modeling
- Noise modelling
- Traffic pattern analysis
- Capture features & attributes
- Capture natural surface, DTM
- BIM management



# ASSET COLLECTION

GENERAL OVERVIEW

- Powerline mapping
- Localized mapping/inspection
- Capture pipe networks
- Oil & Gas GIS and asset data capture, inspections



CHCNAV

# 04

# JOIN THE CHC NAVIGATION JOURNEY

# STAY IN TOUCH WITH US

CHC NAVIGATION | www.chcnav.com

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HUNGARY, EUROPEAN HEADQUARTER | UNITED KINGDOM

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UNITED STATES