



Confined Spaces UAV Inspections in Singapore

Czech Trade Conference

23 Nov 2021

Agenda




1. About VISCOY
2. Our Market Space
3. Unmanned Aircraft Systems in Singapore
 - Regulatory & Infrastructure
 - The UAS Eco-System in Singapore
4. VISCOY's UAS Focus
 - Confined Spaces UAV Inspection
 - Examples of confined spaces UAV applications in Singapore
 - Training Facility for Confined Spaces UAV



About VISCOY



 **VISCOY** is a specialist provider of Remote Visual Inspection (RVI) Equipment and Solutions since 2014.

With a comprehensive portfolio of RVI equipment and years of experience working with our customers.

We are in the unique position to help identify and supply the best equipment to overcome your visual inspection challenges.

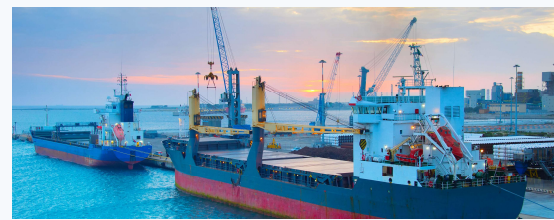
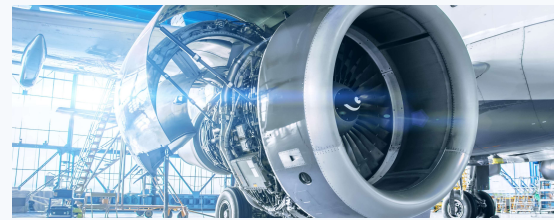


Professional Advice



Equipment Suitability,
Bespoke Solutions,
Deployment Method,
On-Site Trial

Covering Wide Range of Industrial Applications



Training Support

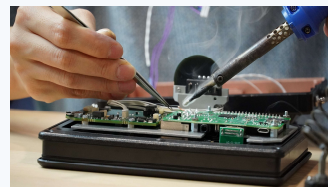


Classroom and hands on equipment operations

Technology Partners



After Sales Support



Repair and Maintenance

Inspection Equipment & Solutions



Portable RVI Systems



Industrial Endoscopes / FOSAR

- Engines & Gearboxes
- Heat Exchangers
- Boiler Tubes
- Precision Engineered Parts
- Turbines
- Airframe
- Special Environment (ATEX / Hi Temp)
- Police / Tactical / Search & Rescue



Ground-Based RVI Systems



Push Cameras / Crawlers

- Petrochemical Product Piping / Pipelines
- Seawater Pipelines
- Boiler Tubes
- Water Piping / Pipelines
- Sewage Lines
- Storage Tanks
- Special Environment (ATEX)
- Search & Rescue



Aerial RVI Systems



ELIOS 2 Indoor Drones

- Storage Tanks
- Ballast Tanks (Marine)
- Chimney
- Furnace
- Mines
- HVAC ducting
- Lift Shafts
- Digital Twinning
- Police / Tactical / Search & Rescue



Remote Corrosion Monitoring

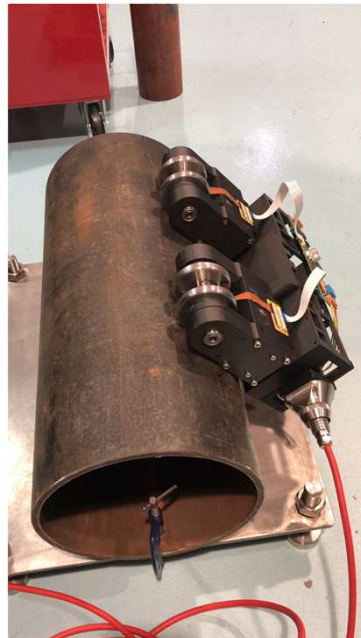
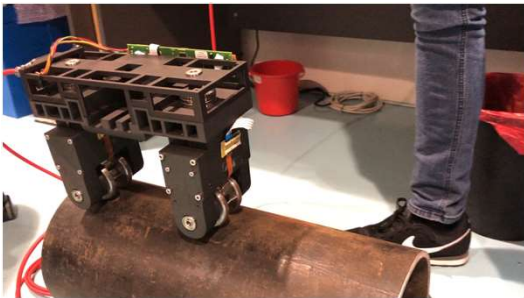


SmartPIMS / MicroPIMS

- Overhead Lines
- Natural gas lines
- Vessel Monitoring
- Underground lines
- Corrosion Management
- Corrosion Rate Analysis



Collaboration with local Training Institutions



- Apart from the supply of inspection equipment and training, VISCOY offers customised inspection solutions.
- These are projects commissioned by our customers to address specific inspection challenges
- We collaborate with local universities in some of these projects.
- We host interns from local universities that work on these developmental projects



Our Market Space



Oil & Gas / Petrochemical

- Singapore is Asia's main Energy and Petrochemicals hub
- Singapore is one of the top three oil refining centres in the world
- More than 95 leading petroleum, petrochemicals and specialty chemical companies
- Jurong Island (3,000 hectares) is the centre-piece of Singapore's petrochemical industry (among the world's top 10 petrochemical hub)



Aerospace

- Singapore accounts for 25% of Asia's MRO market
- More than 100 international companies carrying out MRO activities
- Aerospace industry CAGR of more than 10% annually since 1990
- New 300-hectare Seletar Aerospace Park

Marine & Offshore

- Singapore is the world's busiest port in terms of shipping tonnage
- 20% of the world's specialized vessels are repaired in Singapore
- Singapore has 70% of the world market for jack-up rigs
- Over 65% of global floating production storage and offloading (FPSO) conversion market



Urban Infrastructure

- Singapore is an urban city state with heavy investments in urban infrastructure
- Infrastructure spending set to exceed USD 10 billion annually
- Major investments in transport network (Changi T5), water infrastructure (DTSS), etc

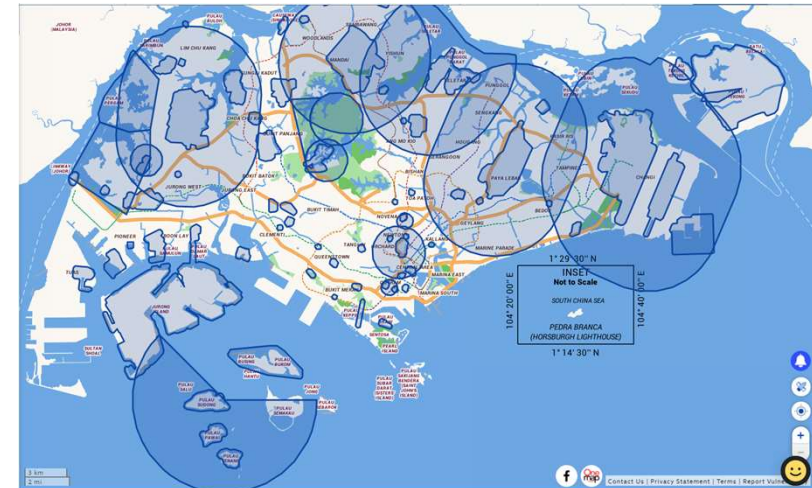
Source: Singapore Economic Development Board (SEDB), Maritime & Port Authority of Singapore (MPA), Public Utilities Board (PUB), GlobalData

UAS in Singapore - Regulatory & Infrastructure



REGULATORY

- Dense build-up city. Lack of open space.
 - ✓ Need for careful regulations, while encouraging UAS development
- **Civil Aviation Authority of Singapore (CAAS)** is the regulator for UAS activities
 - ✓ Air Navigation (101 – Unmanned Aircraft Operations) Regulations 2019
- **Association of Aerospace Industries Singapore (AAIS)** - UAS Community
 - ✓ Industry Association to represent UAS industry; Bridge between UAS Industry and Regulator



AAIS Indoor Drone Testbed



MPA
Maritime
Drone
Estate

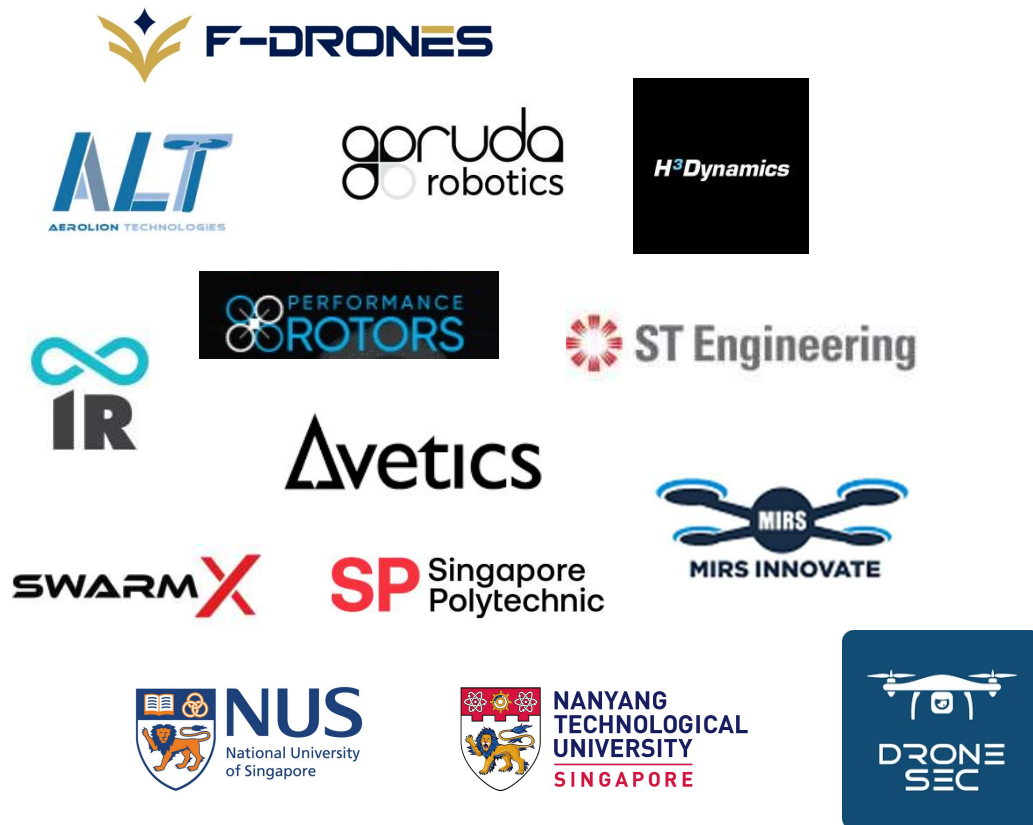


VISCOY
Confined
Spaces UAV
Training/Testing
Facility

INFRASTRUCTURE

- **One-North Drone Estate** in 2018
 - ✓ Designated by CAAS as the estate for test bedding of drone applications in urban setting
- **AAIS Indoor Drone Testbed** in 2019
 - ✓ For companies to conduct development trials and customer demos
- **MPA Maritime Drone Estate** in 2021
 - ✓ Testbed for Drone Technologies addressing Maritime Applications
- **VISCOY Confined Spaces UAV Facility** in 2021
 - ✓ Facility for Confined Spaces UAV training and testing

UAS Eco-System in Singapore



- Growing eco-system of UAV related companies and organisations
- Activities span the entire value chain:
 - ✓ Research & Development
 - ✓ Services
 - ✓ Training & Education
 - ✓ Security
- Urban UAV Applications
 - ✓ Drone Delivery & Transportation
 - ✓ Infrastructure Inspection & Maintenance
 - ✓ Mapping & Survey
 - ✓ Public Safety & Surveillance
 - ✓ Inventory/Warehouse Management

Our Focus – Confined Spaces UAV Inspection



- VISCOY works with technology owners to bring their technology to market in the region
- Partnered with FLYABILITY SA from Switzerland to market their ELIOS 2 confined spaces drone in Singapore, Malaysia and Brunei
- Leveraging on our network in the Remote Visual Inspection space to identify relevant inspection applications for the ELIOS 2
- VISCOY's team of CAAS qualified UA pilots conducts:
 - ✓ Proof-of-Concept Flights
 - ✓ Design of asset inspection regimes (using UAS and ground-based robotics)
 - ✓ Confined Spaces UA Pilot Training



VISCOY & Flyability - Confined Spaces UAV

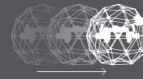


DESIGNED FOR CONFINED SPACES

We believe that robots should be sent in hazardous places and dangerous situations instead of humans. Reinventing collision-resilience, Elios 2 allows you to capture every corner and inch of the most complex and confined assets, from a safe location.



INDOOR CAPABILITIES



COLLISION RESILIENCE

With a spherical cage protecting propellers from impacts, Elios 2 remains always stable through lightning-fast corrections on the propellers' speed and direction of rotation. The entire payload is mounted on a retractable structure that protects it from damages in case of frontal shocks.



ACCESSIBILITY

With an overall dimension just below 40 cm (15.7 in) Elios 2 fits into standard manholes and can enter any space where an inspection is needed. It can safely and easily be flown into assets without any human access needed; at no point do workers need to enter the space during the inspection.

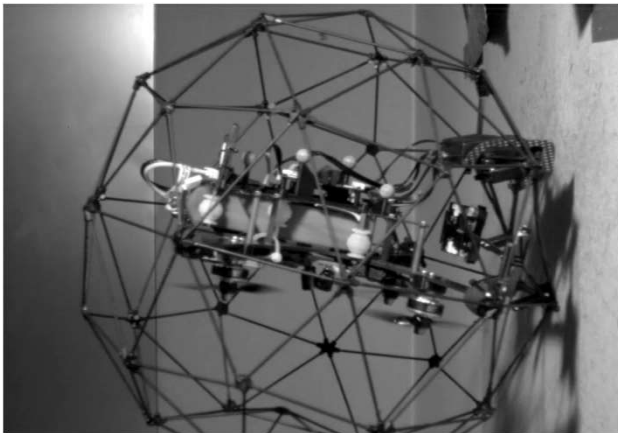


ROBUST TRANSMISSION

Perform remote inspections beyond line of sight, through walls and past obstacles with Elios 2. Its wireless transmission system overcomes the needs of indoor configurations and is compatible with the Range Extender for the most complex setups.



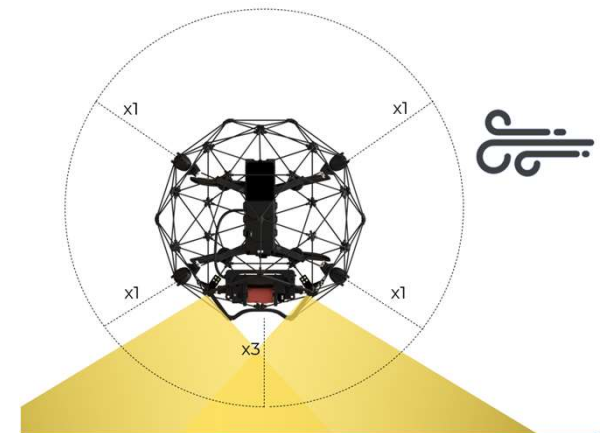
Impact Resilience



Collision Resilience



GPS-Free Stabilisation



Confined Spaces UAV Applications - Storm water culvert



The screenshot displays a software interface for UAV data analysis, titled "349-DRY RU...". The interface is split into two main sections:

- Left Panel (3D View):** Shows a 3D point cloud of a storm water culvert. The point cloud is rendered in white and grey, with green wireframe boxes highlighting specific areas. A red line indicates a trajectory. The view is controlled by a mouse, with a coordinate system showing X: -0.0 m, Y: 0.0 m, Z: -0.0 m, D: 0.0 m, and H: 353°. A "Map tree" panel on the right lists "dry run day 2", "trajectory_1", and "pointcloud_1".
- Right Panel (Video Feed):** Shows a live video feed of the storm water culvert site. Two people are visible, one standing and one sitting at a table. The ground is covered with a blue and white patterned tarp. The video feed includes a "Alt." indicator showing -0.0 m and a speed indicator showing 255.0 m/s.

The bottom of the interface features a timeline with markers for POI-1, POI-2, POI-3, POI-4, POI-7, I-8, and POI-10. The timeline shows a duration of 0:00.000 / 8:11.524. The file path is "F:/Flyability Inspector Data/349-800_drain_tr-dry_run_day_-02/349_RGB.MOV" and the log file is "F:/Flyability Inspector Data/349-800_drain_tr-dry_run_day_-02/349-800_drain_tr-dry_run_day_-02.LOG". The drone ID is "AdK0UA3NDQ5".

Confined Spaces UAV Applications – Underground Drainage



Confined Spaces UAV Applications – Concealed Ceiling Inspection



Confined Spaces UAV Applications – Underground Pipeline



Confined Spaces UAV Training Facility



- VISCOY operates the first Confined Spaces UAV Training and Testing Facility in Singapore
- Offers training for *First Person View (FPV)* drone flying
- Meeting Room for theory and pre-post-flight briefings
- Modular obstacles for confined spaces flight training
- Facility is also available to UAS developers & companies for flight testing



Training Obstacles in the Facility



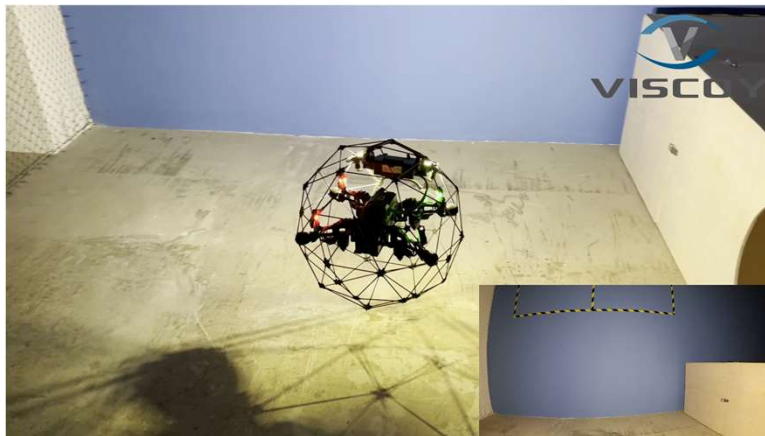
Basic FPV Flight Training



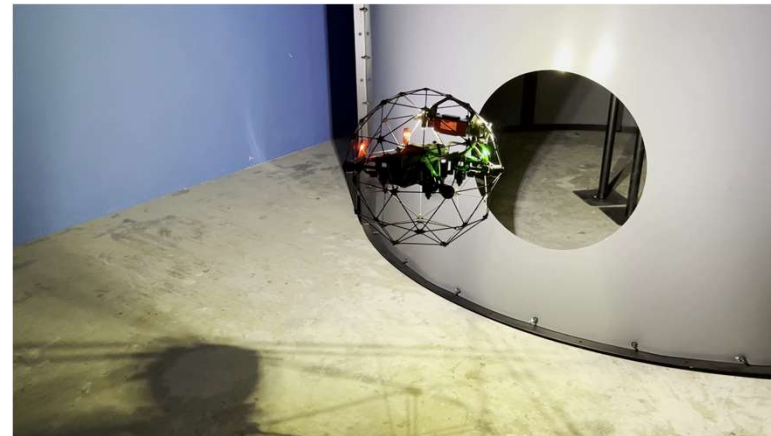
3D Maze



2D Maze



Simulated Tank



Thank You!

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