

IntroductionA Corporate Overview



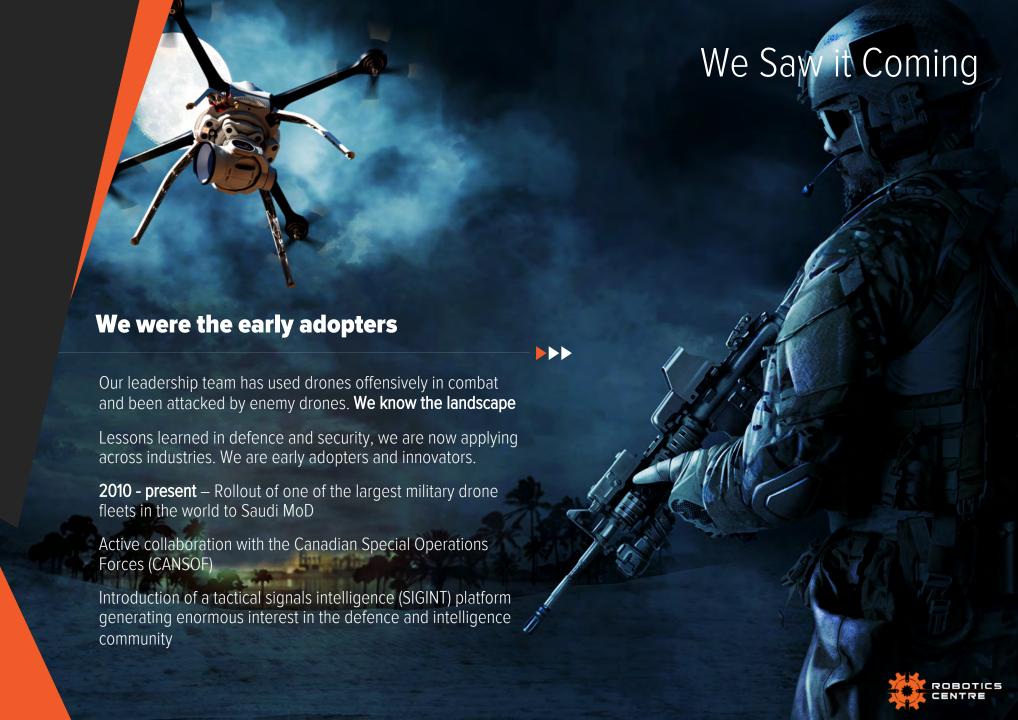






185

Collective years of military early adoption





Massive Industrial Clients



Industry will follow the military lead

Industry has a long history of using indoor manufactorobots

Industry is just beginning to experiment with outdoor robots focused on inspection, cleaning, maintenance, security

2017 – We sold Aramco their first two robots

2018 – Multiple new systems delivered to Aramco

2018 – First underground stope inspection for Barrick and Newmont

2018 – Active Industrial inspection analytics development for ADNOC

2019 — Counter Unmanned Aerial System install at major airports in Asia

WE ARE UNIQUELY PLACED TO HELP INDUSTRY IMPLEMENT UNMANNED SYSTEMS PROGRAMS







How We Started



Co-Founder and President



Incorporated in Canada in 2009 as ZARIBA Security
In 2017, began operating as Robotics Centre

Comprised of a talented team of individuals from various backgrounds and expertise including retired members of the Canadian military special forces, seasoned business professionals, and long-time academics (PhDs).

Sales and operation offices in Saudi Arabia and Japan









Khaled El-Sayed
Co-Founder and Vice President



Eric Karmouch Chief Technology Officer



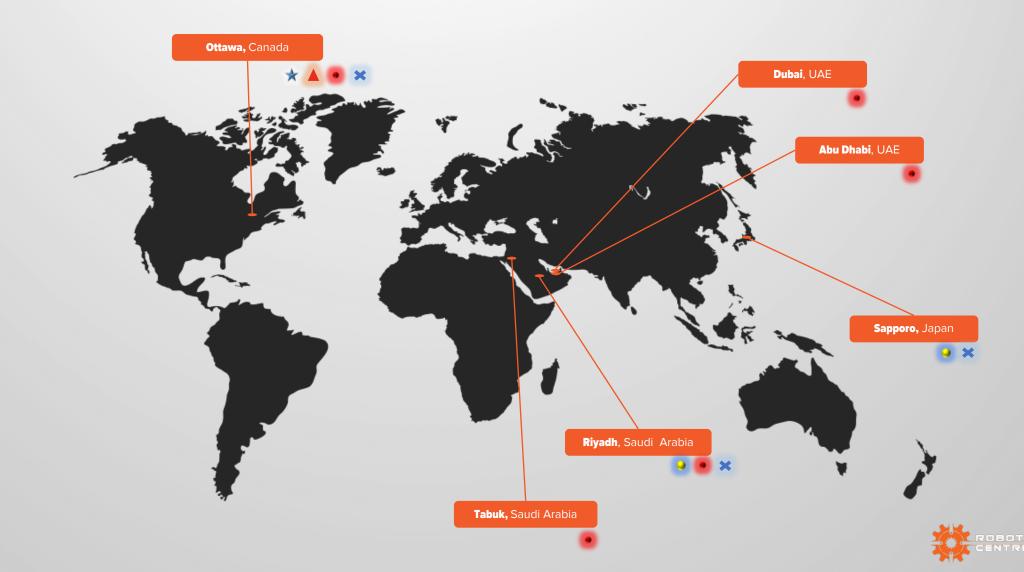
Francis Bleeker Chief Operations Officer



James Brown
Director of Business Development



A Global Reach



- ★ Global Headquarters
- Training and Support
- Sales & Operations Offices
- R&D Centres of Excellence
- Manufacturing & Logistics





Technical Vision

All about data...



Business Intelligence through

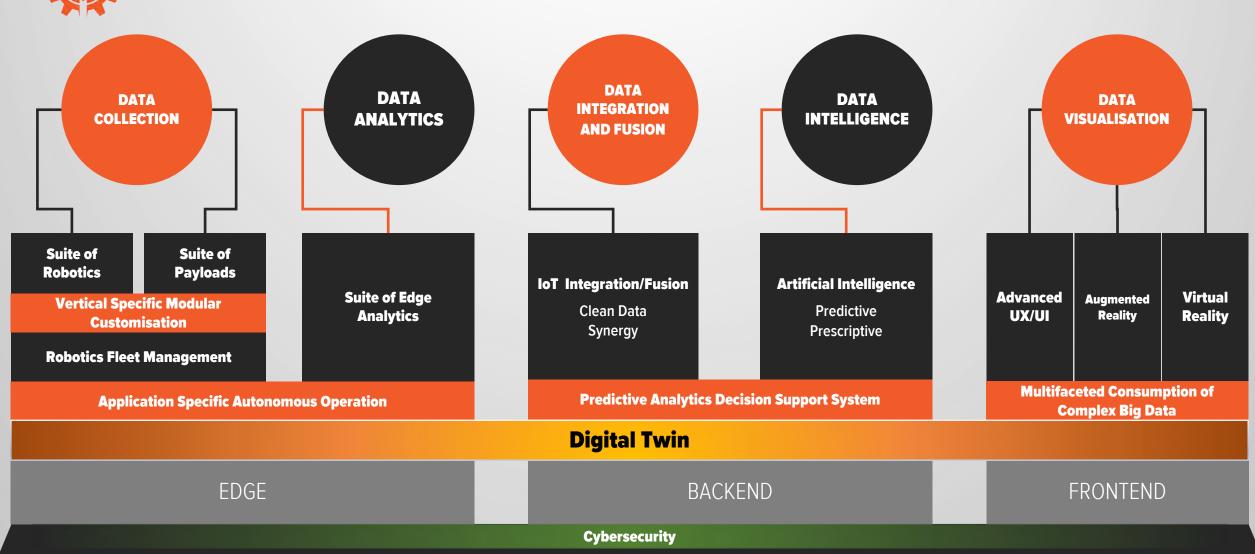
Advanced Data Analytics and Al



Increasing Complexity and Value



End to End Innovation and Best of Breed







Defence and Security Market Vertical



SAUDI ARABIA 4th Largest Global Defence Spending – Robotics Centre staff embedded in the MOD UAV directorate



Robotics Centre has delivered, and trained the Saudi Ministry of Defence (Army, Navy, Air Force and Special Forces) on one of the largest drone fleets in the world.

Applications in defence and security are numerous and focus on providing personnel the ability to limit their exposure to lifethreatening scenarios, increase their transport capabilities in unreachable areas, and act as extensions to their senses.



PROJECT X2 hardware & software integration project to modify a drone so that it is capable of a state-of-the-art tactical signals intelligence solution.

The Future

Continued expansion into new defence and security markets and continued access to Tier 1 Special Operations Forces.









FLIR SkyRanger R70

Latest in INNOVATION

AIRCRAFT

Adaptive. Ruggedised. Innovative. One platform, many missions.

Carbon Fibre + Magnesium IP-Rated Airframe >>>

Compact design is deployable in minutes by a single operator

4x Redundant Batteries

Maintain safe flight, even under single battery failure <99Wh batteries enable transport on commercial aircraft

Multi-Aircraft Control

plan.

Allows for the operation of multiple

aircraft from a single GCS, with each aircraft

executing a unique, semi-autonomous flight

2x Redundant Navigation Systems

Two distinct flight control computers and multiple sensor redundancy

Modular Propulsion System ▶▶▶

Optimise R70 for different missions by simply switching arms and props

4 Downward Facing Computer Vision Cameras

Provide flight control input for future autonomous navigation capabilities

Laser Altimeter

Maintains consistent altitude over uneven terrain

MIMO antennas for maximum throughput, and multi-stage failover

Next-Generation Comms Link

technology

Front-Facing EO/IR Camera

Provides ISR when carrying non-optical payloads and situational awareness for safe flight in urban and BVLOS operations







FLIR SkyRanger R70

Adaptive. Ruggedised. Innovative. One platform, many missions.



HD Zoom 30

Fully-integrated, high performance electro-optical camera payload designed for demanding applications that require clear and precise images

The StormCaster − L ▶▶▶

Ultra low-light imaging payload with exceptional line of sight stabilisation and range of motion in a rugged, low SWaP-C package





EO/IR Mk-II

imaging payload delivers enhanced thermal (IR) imagery in a range of colour palettes — white-hot, black-hot, rainbow and ironbow

Osprey >>>

simple, flexible and reliable way to attach and carry almost any object weighing up to 2 kg (4.4 lbs)



PAYLOADS Latest in INNOVATION



The StormCaster – T ▶▶▶

Longwave infrared, continuous zoom ISR payload with exceptional line of sight stabilization, range of motion and geolocation accuracy in a rugged, low SWaP-C package

Tether Kit ▶▶▶

Modular, highly transportable system enabling persistent mission support







Robotics Centre Integrations

PAYLOADS
Latest in INNOVATION

Working hand in hand with UAV manufacturers and best-in-breed technology firms in data collection, communications, and intelligence to deliver only the most innovative and cutting-edge in low SWaP UAV deployable payloads



βX **>>>**

Complete standalone UAV low SWaP deployable LTE payload. Single payload can cover vast area equivalent to coverage provided by several terrestrial cell towers. Optional Encrypted Secure Voice, Video, MCPTT, Conferencing & Unified Messaging



αX **>>>**

Low SWaP Drone/UAV mounted system for cell interrogation. Leading edge proprietary Software Defined Radio (SDR) utilising 2G, 3G & 4G macro-cell protocol stacks. Performs Surveillance, Counter Surveillance, Geolocation and Tracking, and Intelligence Gathering and Survey



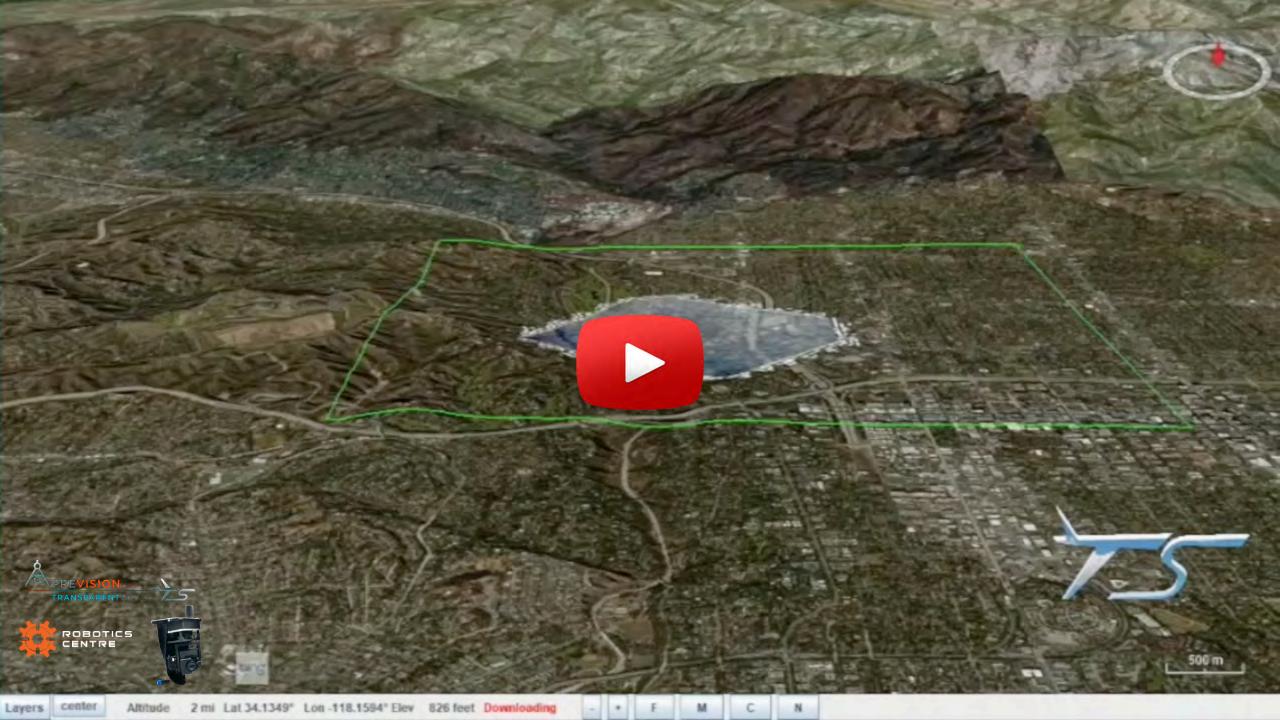


Military-Class Wide Area Motion Imaging (WAMI) in a simple low SWaP package designed for unmanned aircraft. Real-time situational awareness of city-wide events at street-level resolution





For Military and Government Only













Easy Aerial

Smart Security. Fully autonomous tetherable drone-in-a-box monitoring surveillance systems.

Perimeter Security Latest in INNOVATION



The Osprey

The Osprey hexacopter is a uniquely designed drone with motor redundancy and increased reliability. The hex configuration makes this frame ideal for carrying larger payloads up to 3.0kg (6.6lb). Tetherable with Easy Guard for unlimited flight.

The Falcon

The Falcon drone is the ultimate US military quadcopter. Made from military-grade, weather resistant materials, it is durable, tactical and capable of carrying a wide variety of payloads up to 2kg (4.4lb) in weight. Tetherable with Easy Guard for unlimited flight.





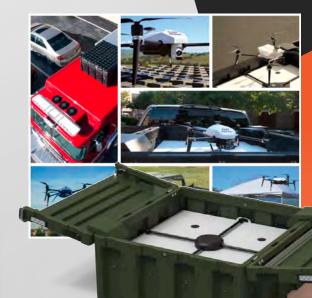
Easy Remote Monitoring Software

ERMS is a proprietary software that enables command and control of a single or multiple remotely operated drones, while transmitting highdefinition optical and thermal video in real-time. Can be securely accessed anywhere and at any time, enabling users to manage missions with one click.



Easy Guard

The Easy Aerial ground station is an independent, automatic, aircraft hangar for take-off, landing and charging. It features an automated roof opening and closing system and is made from military grade plastic, rendering it mobile, rugged and weather resilient. Tethered version available including a tether capable of advanced data-over-power (DOP) technology.

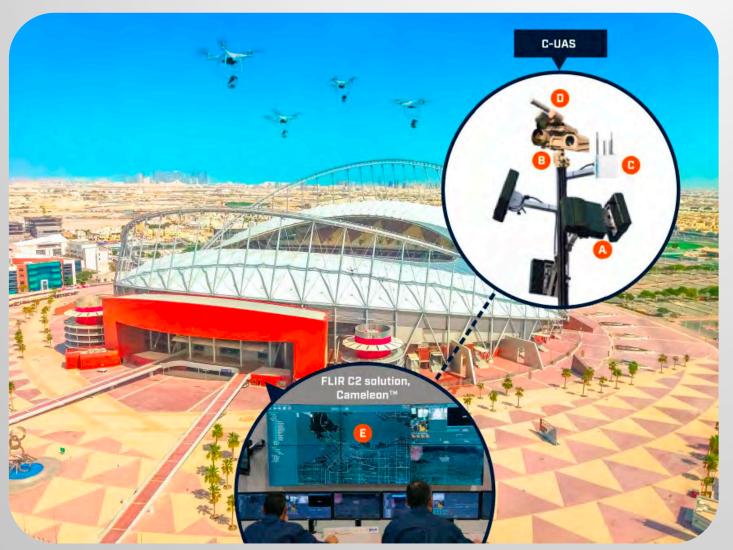




FLIR C-UAS

COUNTER-DRONE Latest in INNOVATION

Counter Unmanned Aerial System. Combination of integrated sensors provides most robust detection capability.



A. FLIR R8SS3D Radar >>>

- Provides 360-degree coverage of the entire area
- · Multiple target detection

B. FLIR HD Multi-sensor

 Long-range daylight and thermal imager to provide visual detection of the drone

C. RF Detection

• Identification of standard drone frequencies when drones are in the area

D. RF Jamming >>>

Jams the drone's circuits and renders drones inactive

E. FLIR C2 solution, Cameleon™ ▶▶▶

- Provides full sensor integration for all C-UAS solutions
- Integrates existing perimeter surveillance solutions into an integrated solution with C-UAS





FLIR C-UAS

COUNTER-DRONE

Latest in INNOVATION

Counter Unmanned Aerial System. Combination of integrated sensors provides most robust detection capability.

A1



A2



В



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- Provides 360-degree coverage of the entire area
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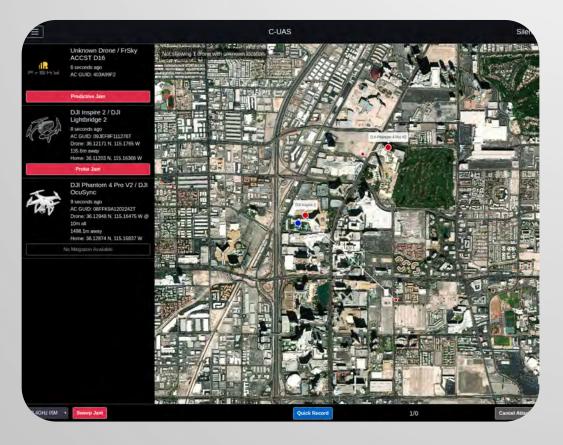




SKYSAFE

World-class drone defence and airspace control solutions.

Applying advanced radio engineering and deep threat analysis to the latest in commercial technology, SkySafe provides military, public safety, and commercial customers with comprehensive airspace awareness and control.







COUNTER-DRONE Latest in INNOVATION



Mitigation

- Control Protocol Attack
- Selective Link Interruption
- Broadband Jamming



Monitoring & Detection

- Passive RF detection
- Targets are identified by type, including serial number
- Metadata from the link is used to give operator location







DroneShield Solutions

DroneShield offers a complete system of products and services to aid your security team in the defence against threats made possible by drone technology.



DroneGun Tactical

Provides a safe countermeasure against a wide range of drone models. It allows for a controlled management of drone payload such as explosives, with no damage to common drone models or surrounding environment due to the drones generally responding via a vertical controlled landing on the spot, or returning back to the starting point (assisting to track the operator).







DroneGun MkIII

Compact, lightweight drone countermeasure designed for one hand operation. The product provides a safe countermeasure against a wide range of drone models. It allows for a controlled management of drone payload such as explosives, with no damage to common drone models or surrounding environment due to the drones generally responding via a vertical controlled landing on the spot, or returning back to the starting point (assisting to track the operator), with an immediate cease of video back to the drone pilot.







COUNTER-DRONE

Latest in INNOVATION







Automated data collection by mobile robots and bespoke data solutions that result in savings, new opportunities and enhance human safety





PROJECT DEEPVIEW hardware & software integration project to modify a drone so that it is capable of autonomous exploration in GPS-denied areas like mines and tunnels.





3D Mapping/Imaging and Inspections in GPS Denied Areas

The use of unmanned vehicles (airborne, ground-based, and underwater) is a key aspect of such automation. Robotics play a large role in data collection towards the digital transformation of the mining industry focusing on safety, environmental impact, process improvement, remote operations, exploration and production techniques, asset management, and efficiency.

The Future

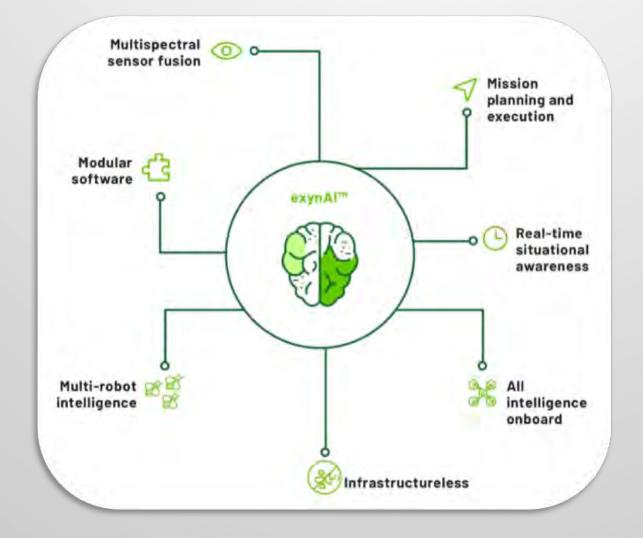
GPS-denied automated flight in dark, dusty, enclosed, and unforgiving environments, utilising cutting edge advancements in Lidar based technologies, SLAM [simultaneous localisation and mapping] algorithms, edge analytics, and sensory technologies.





True Autonomy: not cruise control.

True autonomous operation implies a robot's ability to be context-aware and plan and execute missions in real time with only high level instruction.



Autonomous GPS-Denied Flight

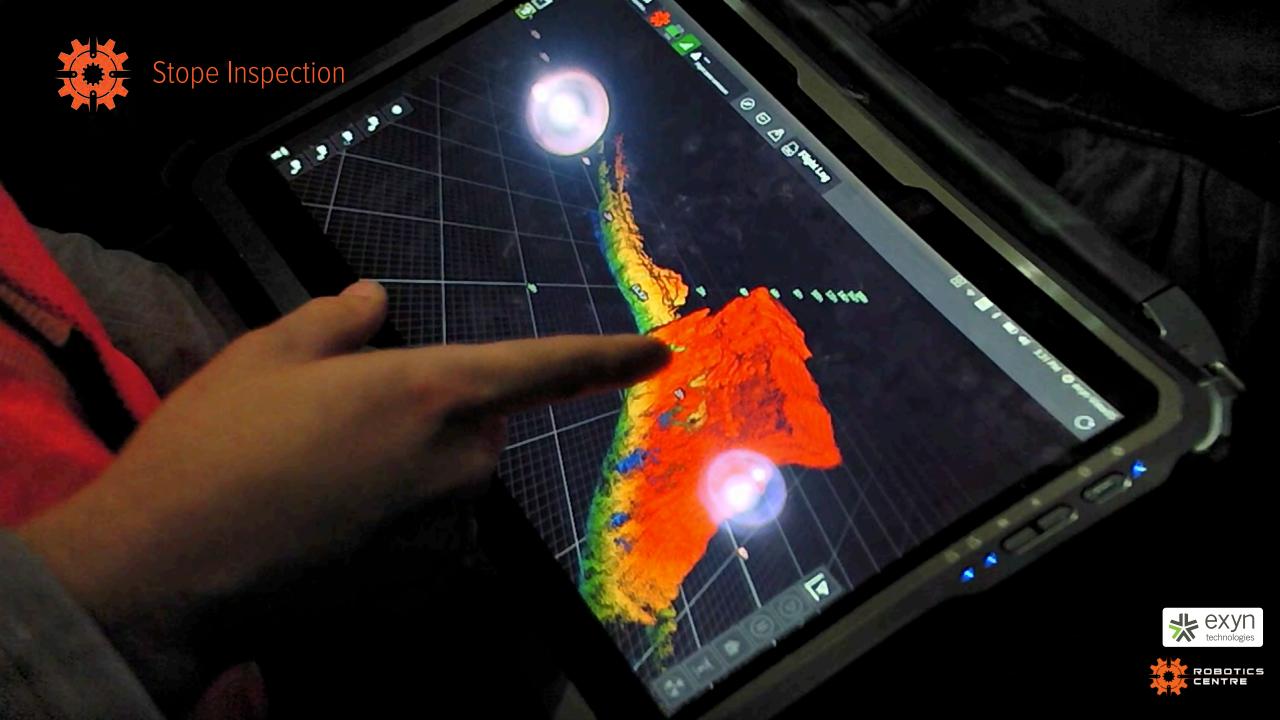


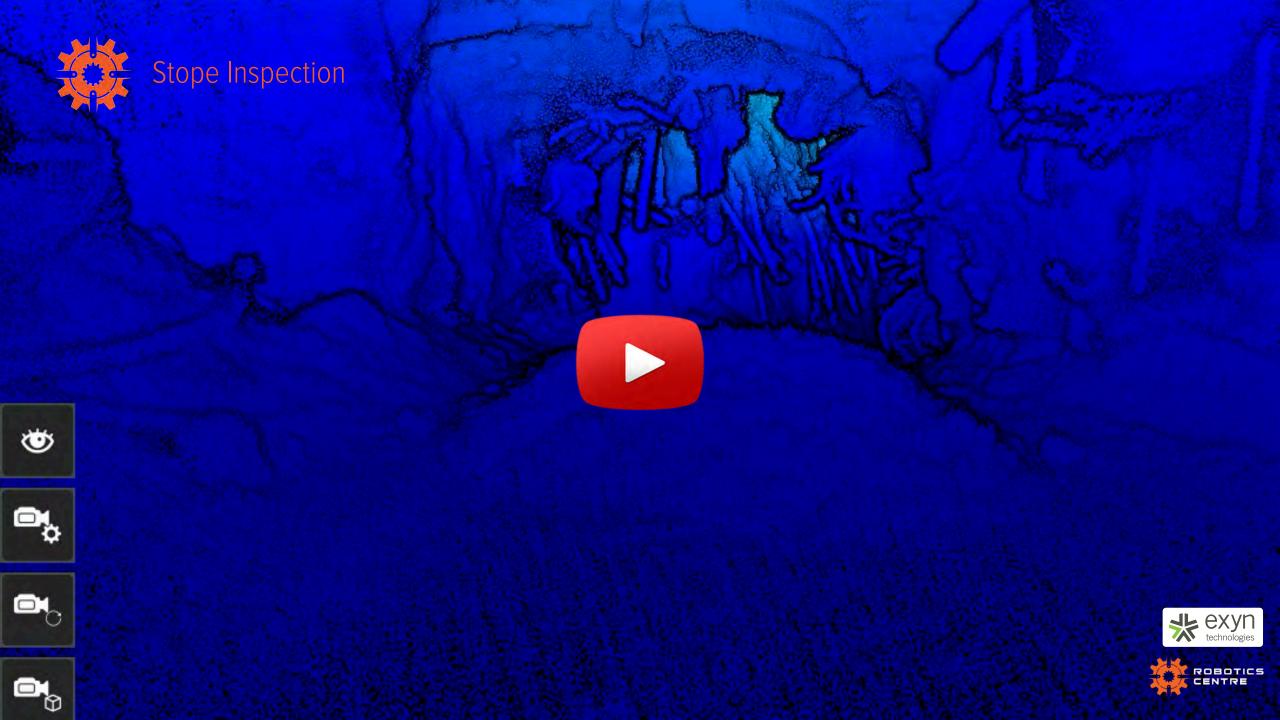














Stope Inspection - Full Point Cloud Comparison

Autonomous GPS-Denied Flight

CMS survey method (Optech)

- 25,000 points
- Survey process hours



Exyn autonomous aerial robot method

- 25,000,000 points
- Survey process approx. 30min









A3R - Advanced Autonomous Aerial Robot

GPS-Denied Flight

Autonomous

The cutting edge in autonomous data collection in underground GPS denied areas combined best in breed hardware. Bringing true autonomous data collection to never before explored environments. Keeping miners safe and production on track.

Value of the A3R

Safety

 Significant reduction in risk and personnel exposure to hazardous conditions.

New Frontier in 3D Mapping

 Mapping information in previously unexplored or difficult to reach areas.

Optimized Workflow

 Performs traditional and novel data collection in minutes as opposed to hours.

Resources

 Double person operation frees up valuable personnel and machinery to tackle other high priority tasks.

Accuracy

Provides real-time accuracy unachievable in other mobile solutions.

Detail

1,000x more points than CMS point cloud.









A3R - Advanced Autonomous Aerial Robot

Autonomous GPS-Denied Flight

| | Competition | A3R |
|--|-------------|----------|
| Underground data capture | ✓ | √ |
| Full 360 capture | ✓ | √ |
| Survey area difficult to reach/not accessible to humans | ✓ | √ |
| Full autonomy | × | √ |
| Complete autonomous mission without prior map/information | × | √ |
| Exploration mode to map areas without a pre-defined path | × | √ |
| Beyond line of sight and communications | × | √ |
| Real-time on-board planning and mission execution | × | √ |
| Usability to capture other data sets (e.g. imagery, gas, etc.) | × | V |







Oil and Gas Market Vertical



Automated data collection by mobile robots and tailored data solutions produce significant savings in operating and maintenance costs for clients



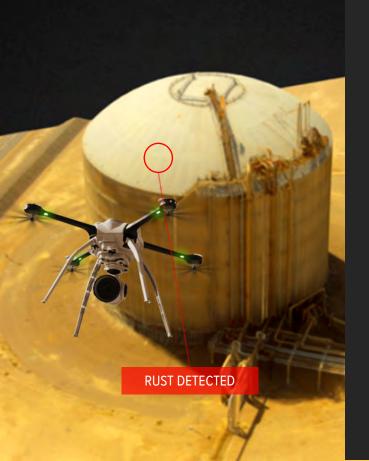
The oil and gas industry requires constant monitoring and surveillance of production, environmental compliance, safety, and other important aspects of the industry. Such monitoring is complex, costly, high risk for workers, and leads to lengthy production downtimes. Emerging technologies in unmanned vehicles (airborne, groundbased, and underwater) are providing the necessary potential towards the digital transformation of the oil and gas industry, to improve operations by reducing downtime and risk, and increasing safety, speed, and efficiency.



PROJECT RUSTEYE a computer vision edge analytic project for the use of Al on drones to identify and complete rust inspections in a completely autonomous fashion.

The Future

Combining robotics, artificial intelligence, IoT, analytics, and other hardware and software tools, allowing oil and gas companies to move towards new levels of business intelligence, limit human interaction, decrease costs, and improve safety and operational efficiency.







RUST DETECTION

PROOF OF CONCEPT



This object detection neural network was trained on images from a single 5-minute drone video flying around a single silo.

Even with a data set as small as 607 images from this video, it is verifiably possible to begin training a machine to detect spots of rust.



 \odot

For training and demonstration purposes, the same rust spot image-to-image is given a unique rust spot number. In the future, **Object Tracking** will consolidate rust spots across images for a smaller list of actual rust spots.



The machine detected with high certainty that 34% of the images had at least one rust spot.

Many of the uncertain spots are actually rust, and will be taken care of by Object Tracking as they are the same spot identified by the machine in other images.

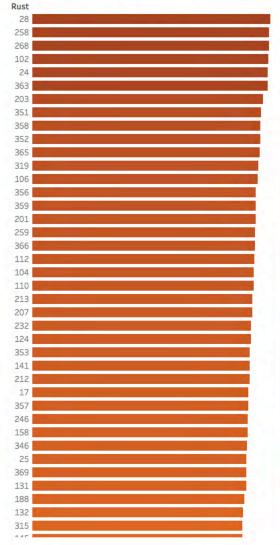


Images with No Rust

0001 0002 0003 0004 0005 0006 0007 0008 0009 0010 0011 0012



Detected Rust Spots & Certainty Levels





RUST **DETECTION**

PROOF OF CONCEPT

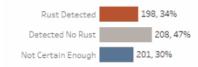


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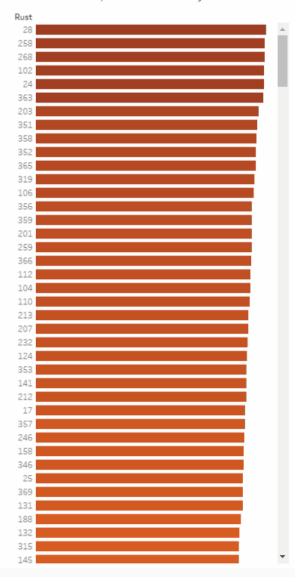


Images with No Rust





Detected Rust Spots & Certainty Levels





C-ASTRAL

Enduring-precision. Blended Wing Body design with large payload capacity, highest aerodynamic efficiency and long endurance for better productivity.

Unmanned Systems

Bramor C4EYE

The field proven BRAMOR C4EYE UAS line is suitable for operations where real-time or near real time video observation and surveillance capability is of utmost importance. With an endurance of up to 4 hours (200km), a standard data and payload link of up to 40km LOS, or the optional MANET digital communications capabilities.



The revolutionary BRAMOR sAR has been designed to accurately locate mobile phones in the challenging airborne SAR environment. The system is designed to identify and accurately geolocate mobile phones on the ground. The NSX module is a unique integration of the SAR system dedicated to a fast and accurate location of mobile phones.



Bramor mSX

A revolutionary multispectral, visible light and thermal remote sensing instrument is here. The industry leading Bramor mSX BVLOS long endurance UAS is is equipped with the advanced Micasense ALTUM sensor (MS-AL), capable of acquiring data for precision agriculture and multi mission remote sensing for 4 hours (200km) per flight.



The BRAMOR ppX (GNSS PPK - Post Processing Kinematic) UAS is ideally suited for surveying and remote sensing applications that need a fast high precision set of results, down to subcentimetre GSD level also in the absence of a grid of ground control points.





C-ASTRAL

Enduring-precision. Blended Wing Body design with large payload capacity, highest aerodynamic efficiency and long endurance for better productivity.

AIR Unmanned Systems



Atlas C4EYE

The ATLAS C4EYE is the fixed-wing UAV/drone of choice for first responders and special operations forces in the under 3 kg category. Developed by C-ASTRAL X-WORKS after a decade of field experience in small UAS exploitation, this Bungee cord lunched, easy to operate, water-resistant system can carry an EYE-X HD stabilised multi-sensor gimbal while observing the target stealthily and silently for up to 1.5 hours.



ATLAS ppX

The ATLAS ppX is currently the most compact member of the C-ASTRAL UAS family weighing only 2.3 kg. Developed through a decade of exploitation experience by C-ASTRAL X-WORKS, this hand launched system has a tactical heritage and can carry multiple modular sensors for precise PPK supported photogrammetry, multispectral and thermal remote sensing.





Herculift HL4

The Aerdron Herculift HL4 provides innovation in heavy lift operations with up to 12kg of payload capacity.

The Aerdron HL4 composite structure is fully optimised to achieve the highest loading / structural weight ratio possible. With a Plug & Play Payload Attachment System, Multiple payloads can mounted using a universal mounting plate.

- Take-off weight with batteries: 13.0 kg
- Payload Area: 300mm x 320 mm
- Aerospace Grade Prepreg Carbon Composite
- CNC Aluminium Components
- Stainless Steel hardware
- Removable battery trays
- x2 Storage Access Areas: Avionics/User Storage
- Transportation Hard Case











GRIFF Aviation's UAS' offer a completely new standard in fully customisable system and payload options.

The models in the GRIFF fleet share a number of core innovations and benefit-enhancing features that truly distinguish these UAS from the competition.

- Ultra Strong, Ultra Light Construction
- Dependable Performance Whatever The Weather
- Flexible, Modular Design
- SAL™ Switch And Lock System
- Carbon-Fibre Propellers
- Quality And Reliability
- Inflight Updates





Pipe Crawler

The Deep Trekker DT340 is the world's only truly portable, battery-operated pipe crawler system.

Not only does the DT340 pipe crawler include internal batteries, it also comes with a lightweight handheld control console, a strong but thin tether, a pivoting tether connection, wheel and track options, and plugand-play integrations — all designed to make your pipe inspections easier.

Lightweight handheld control console

Strong but thin tether

Pivoting tether connection

Depth rated to 50 m (164 ft), requires

no topside power

Perfect for water pipe and sewer pipe inspections



Unmanned Systems

Utility Crawler

The Deep Trekker DT640 Utility Crawler is the most versatile inspection vehicle of its kind.

Work underwater up to 50m (164ft), all with live video streaming to the surface. The Utility Crawler is your go-to tool for a multitude of remote inspections, with application-specific add-ons for pressure washing, vacuuming, thickness testing, and more both above and below the water.

- Compact for transportation and extremely portable
- Up to 8 hours of work in a single 1.5 hour charge
- Work underwater up to 50m (164ft), all with live video streaming to the surface
- Skidless steering and zero turning radius
- Earth magnets allow the DT640Mag to climb in almost any direction on ferrous materials









Deep Trekker ROV

Powerful vector thrusters for inspections that require lateral movement in deeper challenging environments.

Deep Trekker ROV is based on the principle of bringing a portable, affordable, and easy to use solution to anyone that wants to look underwater.

- Lightweight, low-drag tether
- Patented pitching system
- Fully integrated viewing & control
- 360 degree viewing
- Portable solution
- Built to last





Unmanned Systems

CHINOOK

Explore the depths down to 1,000ft/300m with the standard vehicle or 2,000ft/600m with the deep water version.

A true workhorse, the Seamor CHINOOK offers a stable platform yet remains compact. With its small profile, the CHINOOK can operate in tight places and is easily stowed when not in use. Multiple handles and frame cross members allow two people to handle this ROV with ease.

- Intuitive controller
- High-resolution colour, zoom camera
- Integrated controller with LCD monitor & Digital Video Recorder (DVR)
- Up to six (6) powerful thrusters
- Auto depth, auto heading functions
- Leak detection warning system
- Tether-launchable







Barracuda

Designed for speed and power, the Shark Marine Barracuda is very capable in high current applications.

Constructed using high-tech plastics, anodized aluminium and syntactic foam, it is small and manoeuvrable. It is also large enough to support the easy addition of mission specific accessories (e.g. sonar and video systems). All accessories fit inside the frame to avoid entanglement issues. The built in Total Navigation System, and Dive Log software, give the it full geodetic positioning and autonomous capabilities.

- Dimension: 87.7 cm x 53 cm x 31 cm (34.5" x 20.875" x 12.21")
- Weight: 39 kg (86 lbs)
- Power In: 220-240 VAC @ 50-60 Hz, Draw scalable in software 2000-7200 Watts
- Thrust: 2x Horizontal, 2x Transversal, Forward Thrust 36.3 kg (80 lb)
- Depth Rating: 300 m (1000 ft) (deeper options available)
- Illumination: 2x Shark Marine Aurora LED lights: 3700 lumens (additional lighting optional)
- Options: SD/HD Cameras, Digital Still Cameras, Laser Scaling System, Recovery Reels, Electric Manipulators, Launch and Recover Systems, USBL Positioning, Multi-Beam Imaging Sonar, Scanning Sonar, Radiation Detectors













MAKO DDS

The MAKO Diver Delivery System (DDS) marks a new evolution in diver transportation; innovative, high quality, dependable, and cost effective.

The MAKO DDS combines a propulsion device with the Shark Marine "Navigator", Diver Held Navigation and Sonar Imaging System. The combination provides a system that is capable of automated flight paths, from a simple "Goto Target" to complex survey routes, while providing the diver with full navigation and forward looking sonar to view and locate targets up to 300m (984ft) away.

- Operating in manual, autonomous, semiautonomous modes
- Route following (waypoint, target, and survey routes)
- Station keeping auto depth / altitude
- Goto target (with user defined standoff distance)
- Divers: 1-2 onboard, up to 4 towed behind
- Dept rating of 50m (164.0ft)
- (LxWxH) 1.86×1.25x.72m (6x4x2.4ft) at 87kg (192.0lbs)





ROBOTICS

225 Marché Way, Suite 205 Ottawa ON K1S 5J3

Canada

Office: +1.613.755.2280

Email: sales@robotics-centre.com