

DARK WING AERIALS



DRONES IN CONSTRUCTION



COMPANY BACKGROUND

Darkwing Aerials was founded in 2012, becoming one of the first fully licensed UAV companies in South Africa.

Darkwing quickly became a leader in the film industry, boasting an impressive client list. Darkwing broadened its scope to the Industrial sector in 2018, working in renewables, construction, maritime, telecommunications, security, mining, engineering and insurance.



INDUSTRY OVERVIEW

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Engineering requires precision to be successful and drones can provide that edge.

Using our advanced drones and sensors, Darkwing can produce:

- Geo-Referenced Orthomosaics
- DEM (Digital Elevation Models)
- LiDAR Dense Point Clouds
- 3D Photogrammetry Models
- DTM's (Digital Terrain Models)
- CAD drawings for planning and development

Darkwing Aerials can leverage this wide range of services to provide pin point accurate data for engineering projects.

Drones also reduce overall project costs and improve safety by removing humans from potentially dangerous areas.





AERIAL NDT TESTING

The Darkwing team together with **international robotics** companies, developed ground breaking technology to perform **Aerial NDT**.

This purpose built drone has **interchangeable inspection booms for UTM & DFT surveys**.

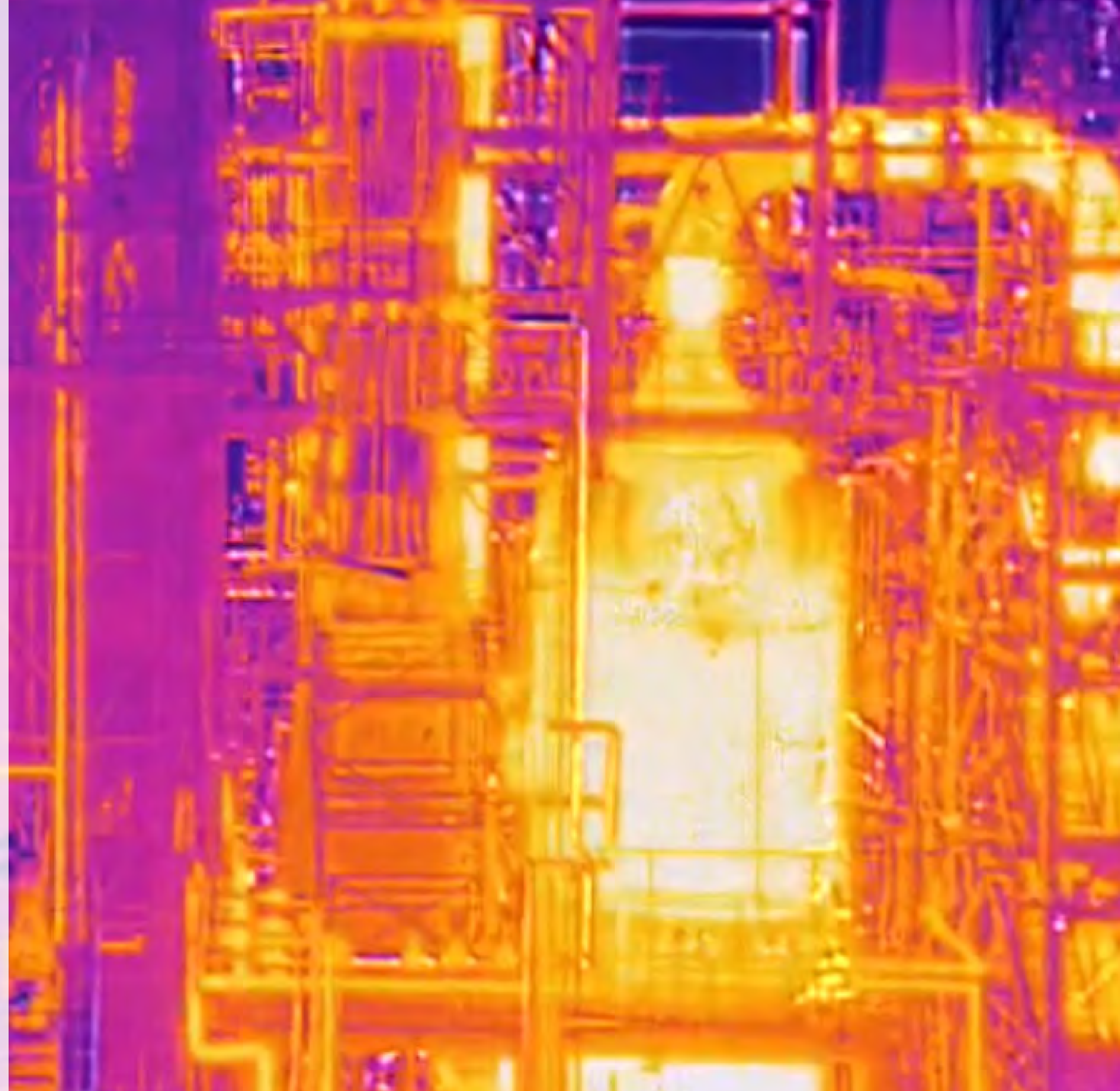
Mounting these sensors on our drones allow for **NDT testing** to be conducted on any **tall metal structure**.

THERMAL IMAGERY

Our XT2 pairs the FLIR Tau 2 thermal sensor and 4K visual camera with DJI's leading stabilisation and **machine intelligence technology**.

Using our XT2 FLIR camera the drone can easily detect **heat signatures** from a variety of **altitudes** and **distances**.

The thermal **image data** is available in **real time** to the drone pilot and allows for **quick assessment** and response.

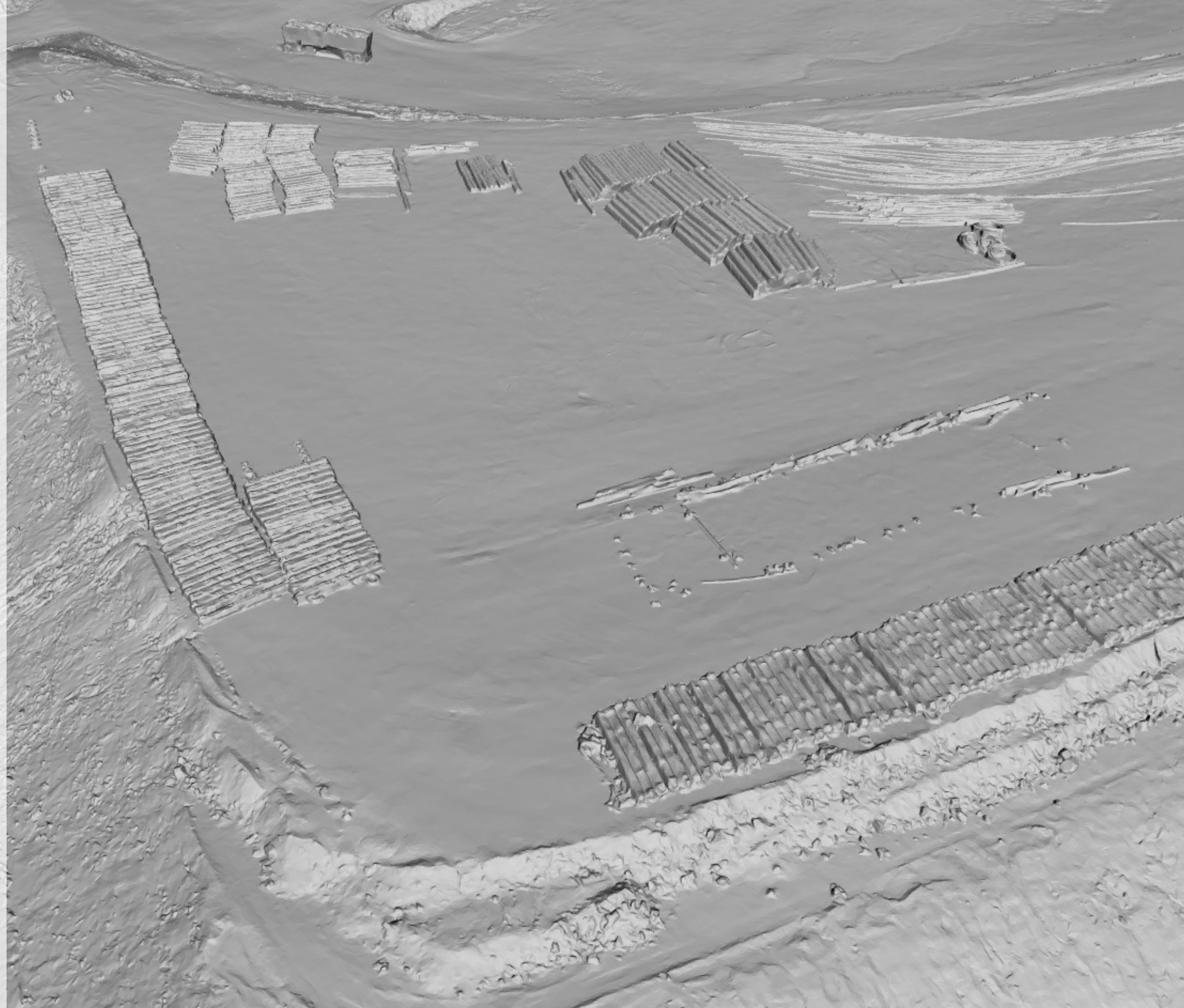


2D/3D TERRAIN MAPPING

The 45 megapixel P1 camera mounted on our drone is used to capture **HD aerial images**.

The images are processed to recreate a **3D terrain model** of the scanned area.

2D orthomosaic aerial maps are also generated, providing an **up to date** and **scaled aerial view**.



AERIAL VISUAL INSPECTION

Adverse weather conditions can cause **surface damage** to structures over time.

These areas are can be difficult to access via the traditional routes of **rope-access** or erection of working structures such as **scaffolding**.

Darkwing's **drones** are **small** and **agile** enough to reach any area on a structure with ease.

With an **HD stabilised camera**, we can quickly capture images and cover every sector of the structure.

Using drones, **paint degradation** and **structural integrity** can quickly be established and proper **maintenance** arranged.



360 VIRTUAL REALITY

Darkwing records and reconstructs **any interior or exterior space** and hosts it online.

Using the Matterport 360 scanner photo spheres and LiDAR measurements are taken of a space.

Each room and area of the property is scanned to ensure that **every detail is captured.**

The data collected is processed online and **reconstructed** to create a **3D virtual space.**

The property can then be **explored online** as a virtual tour.



A black and white photograph of a custom-built drone, the Opus X8 SW, performing aerial washing. The drone is a quadcopter with a central body and four arms. It is equipped with a large, black, cylindrical spray nozzle mounted on the front arm, which is extended forward. A blue hose is connected to the bottom of the drone, and a red wire is visible. A GoPro camera is mounted on the underside of the drone. The background shows a blurred view of a building and trees.

AERIAL WASHING

Our surface preparation spray **cleaning** and **washing system**, the **Opus X8 SW** (Soft Wash), is built for cleaning **elevated surfaces** and limited **surface preparation** prior to coating.

The Opus X8 SW is a "Corrosion Innovation of the Year" award winner by the National Association of Corrosion Engineers (NACE) and Materials Performance Magazine for our creation.



AERIAL AND TERRESTRIAL LiDAR

By generating a **3D point cloud** of your site, we can **reduce** the time, **cost and complexity** of inspections and surveying while providing a detailed 3D model of the area.

We digitise the world around us to create powerful analytical 3D models to extract engineering value. We strive to **improve efficiency, reduce costs**, and provide **comprehensive information** for accurate and informed decisions.

Combining cutting edge drone platforms and **scanning technology** together with **3D digitisation**, Darkwing can produce **pin-point accuracy** in digital twin models.

PREVIOUS WORK: Paper Mill Smoke Stack Inspection - October 2020

Darkwing was contracted by a large paper mill facility in Kwa-Zulu Natal to conduct a **confined space inspection**. There was a large smokestack where debris had accumulated on the inside surfaces during operation of the paper mill. The extent of the debris build-up had to be established to formulate a cleanup procedure.

To protect the propellers from contacting with the stack's walls we added a basket cage around the whole drone. We also mounted a 360 camera to the top of the drone to capture a **full panoramic view** of the smokestack's interior. There were also several **LED lights** mounted around the drone to provide illumination inside the dark interior of the stack. With these modifications our pilot was able to manoeuvre the drone up and down the smokestack. Despite the difficult conditions our pilots thought on their feet and found creative solutions.




An aerial photograph of a large, cylindrical grain silo. The silo's surface is light-colored and shows some signs of wear and discoloration. A horizontal band of darker material, possibly a joint or a different material, runs across the middle of the silo. The top of the silo is visible, showing a flat, circular surface.

PREVIOUS PROJECT: Grain Silo Surface Degradation Inspection - March 2020

Exposure to natural elements like sunshine, rain and wind has a degrading effect on large structures. The large grain silos at a food processing plant in Cape Town had shown possible signs of structural fatigue. Our client wanted to ensure that all the damaged areas on the grain silos were identified.

Darkwing Aerials performed a **full RGB and thermal inspection** of the 20 grain silos with our drone. Using the Zenmuse X5 RGB camera and the Zenmuse XT2 FLIR camera **full coverage** of the grain silos' **exterior** was achieved.

The **thermal images** captured by the XT2 detected sub-surface fault lines and cracks in the façade of the grain silos. We also used our smaller drone to capture **aerial images** of the entire food processing facility. These images were used to **reconstruct the facility in 3D and create a digital twin.**

A thermal image of a grain silo, showing the same structure as the RGB image but in grayscale. The thermal image highlights the surface temperature variations, with darker areas indicating cooler temperatures and lighter areas indicating warmer temperatures. The structure of the silo is clearly visible, including the horizontal band and the top surface.

PREVIOUS WORK: Astron Oil Tank Drone Inspection - September 2021

Darkwing Aerials mobilised to the Astron refinery for the inspection of the internal surfaces of a massive oil tank. The nature and location of the inspection presented our drone team with several challenges. The storage tank is completely covered by a metal roof. There is no natural light available inside the tank and all lighting is via spotlights. The metal roof also blocks all GPS signal and reduces the drone to manual flight control.

Despite the limited light conditions inside the tank, we were able to **capture clear and high-definition images**. This was thanks to the camera mounted on our drone. We used our P1 camera which has a 45-megapixel sensor. It is **excellent for use in low light conditions** and gives the pilot more room to breath and focus on flying the drone.

We did two full rotations of the tank's interior in both directions. All the flying inside the tank was done in **less than thirty minutes**. Despite the difficult conditions it was the right call to use a drone for this inspection. The speed of the drone ensured that the inspection team only had to spend **minimal time** inside the confined space. The image data provided by the P1 also gave **unparalleled coverage** of the tank's interior surface.



INDUSTRIAL:

Marius Geyser

+27 81 839 0308

marius@darkwingaerials.com

FILM AND MEDIA:

Dean Engela

+27 83 678 2326

dean@darkwingaerials.com

GENERAL INQUIRIES:

Ceil Reyneke

+27 83 635 2312

info@darkwingaerials.com

www.darkwingaerials.com

