



# ATEC-3D

UNMANNED AERIAL SOLUTIONS

## BUILDING A UAV BUSINESS IN MINING (KEEPING IT REAL)





# ATEC-3D

## Mike Spratley

- 10 years mining and production
- 17 Years consulting to mining and industries
- 5 years as GM of Bastillion Resources
- 18months of Independent consulting and Associations with JPMC and other mining consultancies, including SMS mining
- Director of ATEC-3D (UK), and founder and MD ATEC-3D SA
- Chairman of FTC



# ATEC-3D

## Introduction to ATEC-3D (SA)

- Aerial Survey and Information gathering
- Conceived in 2010, 2011 research and development with friends and family, 2012 setup and funding, operational 2013. (5<sup>th</sup> year)
- Operations in England, Wales Scotland, Mozambique, SA prior to new legislation, Mozambique, Tanzania, Gabon, Ivory Coast, Zimbabwe in Nov 2016, France.
- Provide: flight operations, consulting, Installation support, training and market education including lobbying.

# Developing a Commercial UAV Business

1. Original Strategy – What and How
2. What Works – to pay the bills
3. Where will we go.....

# OUR ORIGINAL MISSION STATEMENT

**ATEC-3D LTD will deliver the highest level of service to clients with the use of Unmanned Aerial Vehicles.**

It aimed to provide a **highly mobile and rapid deployment to collect and deliver surface data** for almost any purpose including but not limited to **high definition photography, precision aerial surveys including detailed volumetric surveys, 3D digital modelling, and site monitoring and environmental services.**

*Such services providing near real time accurate data reduces operating risk and cost, especially associated with volume contract measurement and payments*

All of our UAV operators are authorised by the UK Civil Aviation Authority (CAA) to conduct aerial work safely and responsibly. ATEC-3D is based in the UK, operates internationally and can assist clients deliver better project management outcomes through safe, cost effective site data acquisition at short notice.



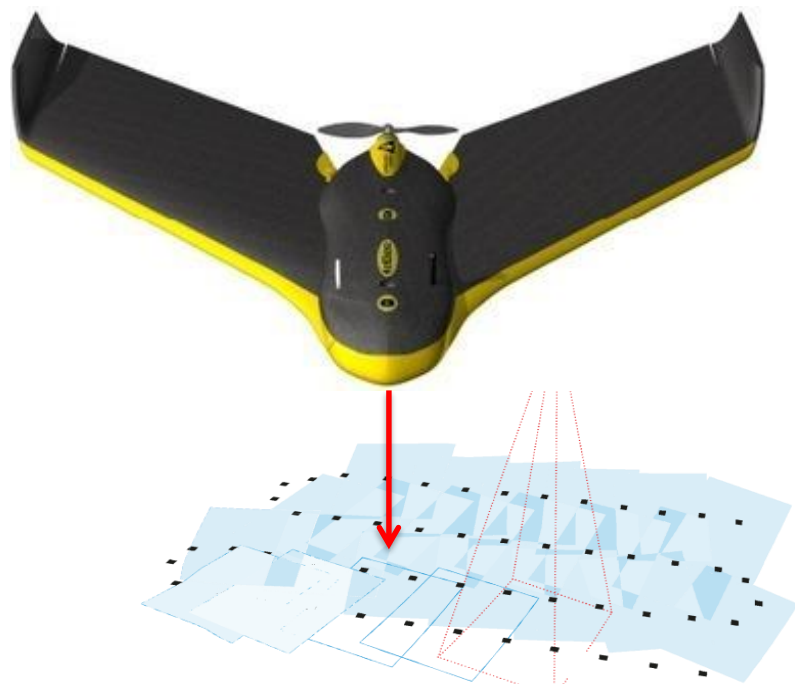
# BUSINESS TARGET OPERATIONS - SIZE

Some operations need bigger systems for comprehensive surveys...

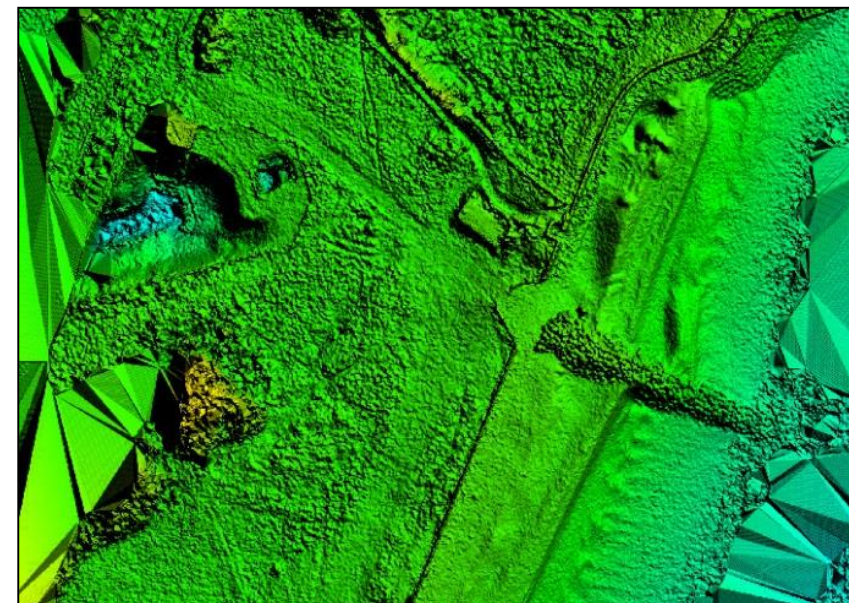


- But continuous measurements over smaller areas will keep the mine database current.
- Speed of mobilisation can provide detailed cover of an area in a hurry
- Changes in any dynamic operation, pits, dumps, vegetation cover, water courses and levels, can be monitored and measured.
- Rotary wing UAV's can examine places personnel cannot or should not go.
- ATEC-3D can formulate a supply and training package to expand in-house survey capability and assist with independent QAQC of program.

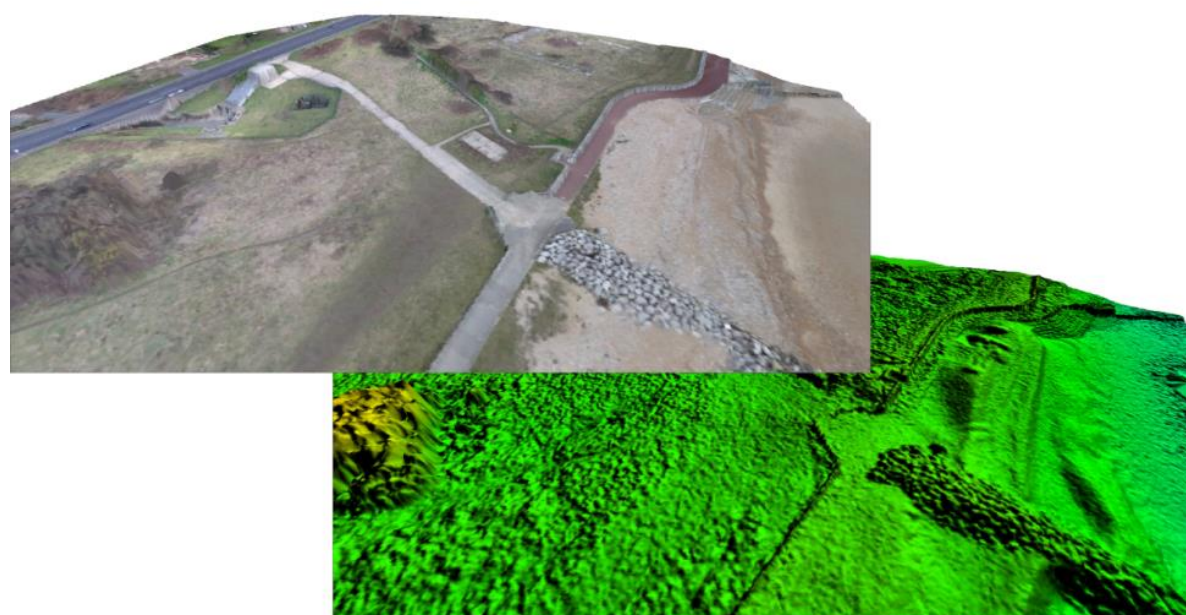
# HOW - FIXED WING SYSTEM



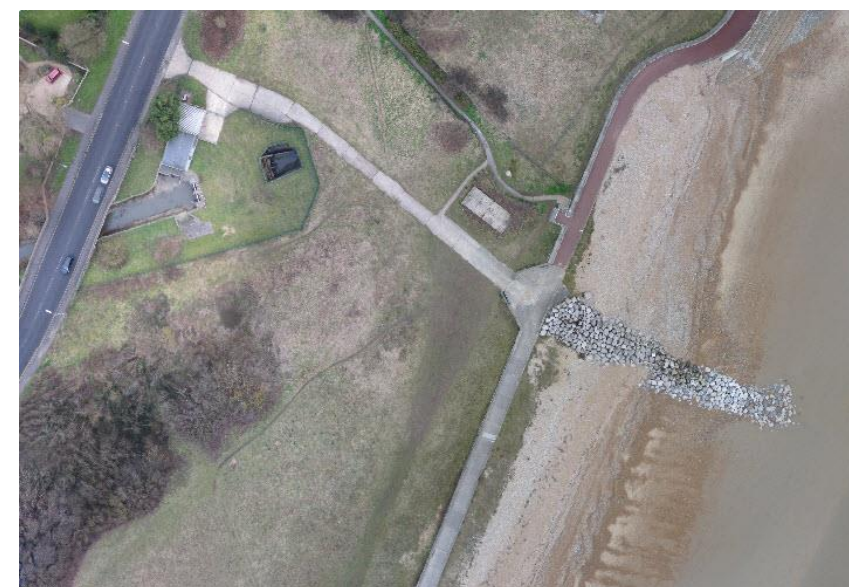
Photographic overlay of 75% minimum



Point cloud created for each image containing +300K points



Post flight processing to combine imagery



+/- 1Km<sup>2</sup> compilation in 1 flight

# HOW - ATEC-3D SYSTEMS



## FIXED WING - EBEE

- Aerial surveying - mapping
- Large area coverage
- Accurate ground data collection
- Digital Modelling
- Measurements
- Visual inspections
- Planning



## MULTI ROTOR - VARIOUS

- Aerial structural surveying
- High resolution images
- First person view
- Aerial Photography
- Aerial Videography
- Instant results



# HOW – ROTARY, A DIFFERENT PERSPECTIVE

## PHANTOM .....



## EVO S900 – GH4



## INSPIRE 1 V2



These systems can be used for a variety of operations:  
Aerial Surveying, 3D photography modelling, high level visual inspections etc.

# TARGET OPERATIONS

Mine Dumps, Open Pit Slopes and Tailings Dams all have different challenges in gathering detailed surface data for monitoring.



# Targeting - Highest Quality

- Systems are aimed at clients needing extremely accurate and fast results. The point cloud density and accuracy is comparable to LiDAR data.
- Aerial Survey requires Ground Control Points (GCPs)
- Using an optimized hardware setup, it takes as little as 2 hours to generate the Orthophotograph and Digital Surface Model (DSM) for a flight area of between 0.5-1km<sup>2</sup>



# Developing a Commercial UAV Business

**2** What pays the bills.....

# FIXED - WHAT PAYS THE BILLS

Cost effective dense survey data coupled with photography delivers:

- Accurate volumes for any period
  - Reduces negotiation and reconciliation costs
  - Saves over and under payments
  - Reduces disagreement
  - Reduces reporting costs
- Photographic examinations and records:
  - Accurate record of progress
  - Systematic area coverage for possible changes in conditions
  - Stops spurious damage claims
  - Reduces land use costs
  - Reduces periodic reporting costs to regulators



Cost Benefit, ATEC-3D Services

# ROTARY WHAT PAYS THE BILLS

Video photography delivers (not precision):

- Real experience or emersion experience into a site
  - Shows distant management situation
  - Complexity
  - Environment
  - Record
  - Simplicity
  - Movies (The Fort)
  - Property Marketing
- Photographic examinations and records:
  - Speed
  - Marketing ability
  - Communication
  - Angle



Cost Benefit, ATEC-3D Services

## Base Map Creation

ATEC-3D completed a large 10km<sup>2</sup> survey in Canada to gather ground information:

- Base Map Created
- Hydrology identified digitised
- Tailing sites located for further study
- New outcrop located
- Environmental study completed



10km<sup>2</sup> site covered

Flight data processed

Drill Sites Mapped

Trenches mapped  
and digitised

Aerial photographs taken

Total time 15 days



## Stockpile Reconciliation

A TEC-3D were tasked to survey a coal mine to calculate the volumes of its stockpiles for a reconciliation. Two flights were completed over the operating quarry at a height of 123m.



2 flights of 30 minutes

Digitisation of stockpiles

21 Volumes calculated

Accuracy of 1.8% +/- 0.5%

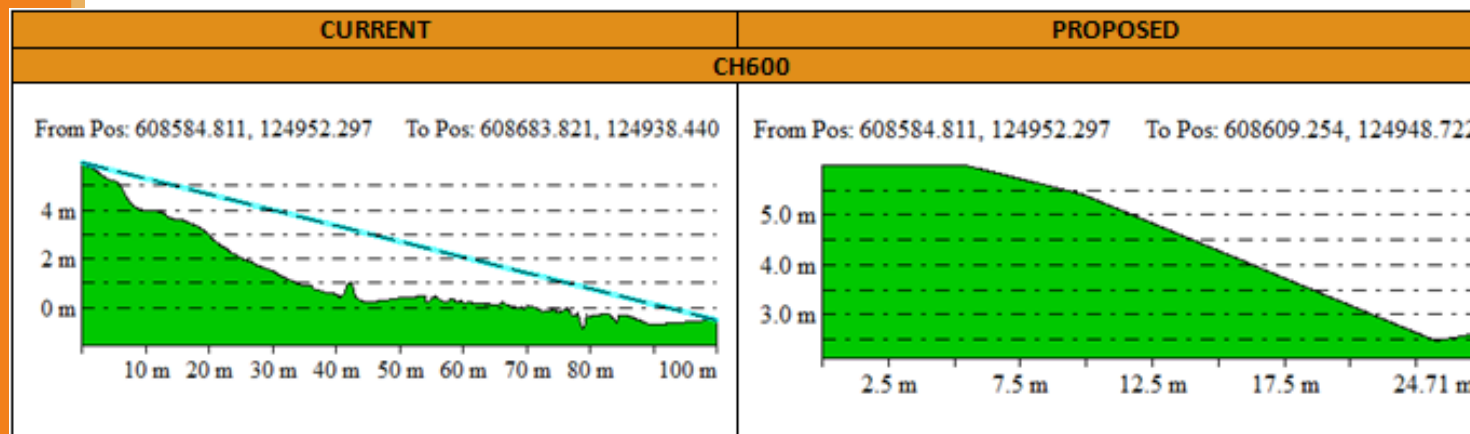
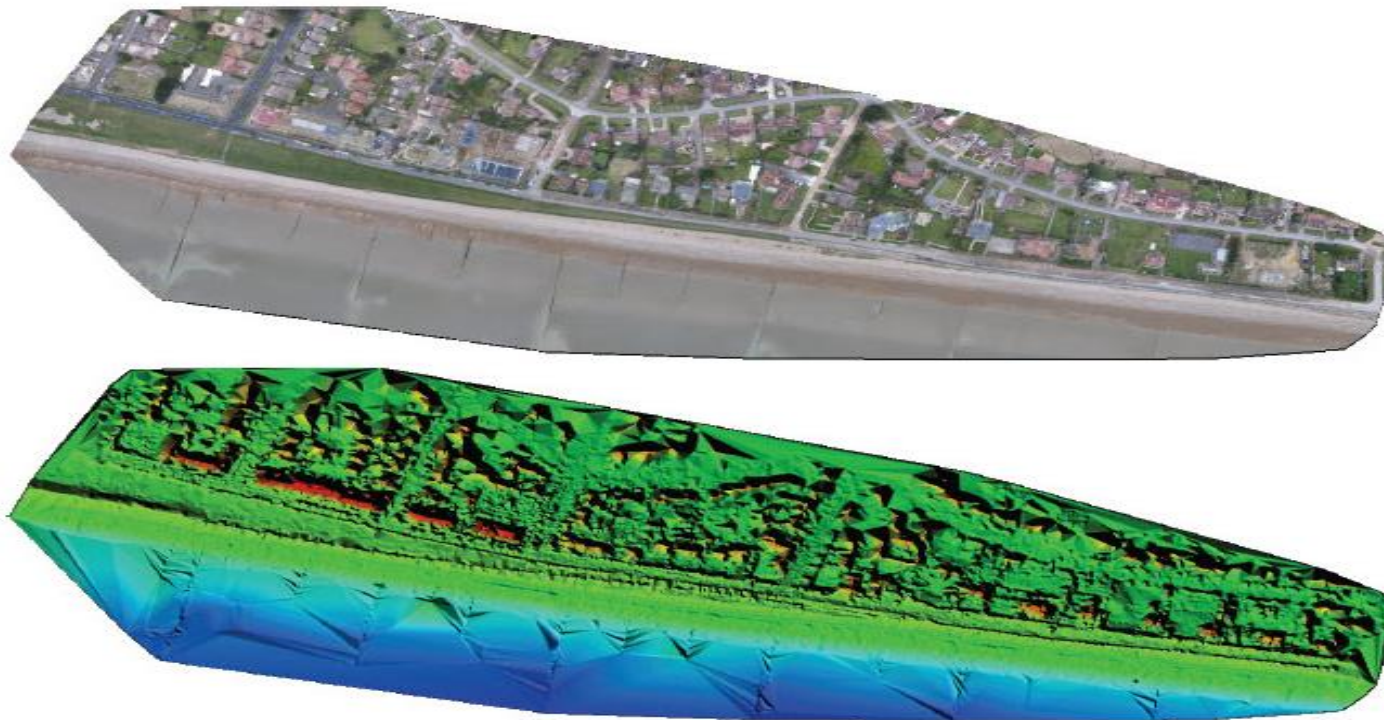
Total time 2 days





## Beach Design and Volume Estimation

ATEC-3D were tasked to survey a large stretch of beach to determine the fill volume of shingle required restore the beach to the desired profile.



Ground Control Laid

4 flights of 35 minutes

3.5 Km<sup>2</sup> covered

12 hours full processing

Volumes calculated for design options

QA/QC

σ XY 20mm Z <25mm

Total time 5 days



Environment  
Agency

Cost Saving of over  
50% from a  
conventional survey

# Topographic Survey



Ground Control  
Incorporated

1 flight of 35 minutes

0.5 Km<sup>2</sup> covered

90m altitude flight

3D PDF and DXF output

QA/QC  
 $\sigma$  XY 20mm Z <25mm

Total time 2 days

<http://www.atec-3d.com/video-gallery/quarry-video/>

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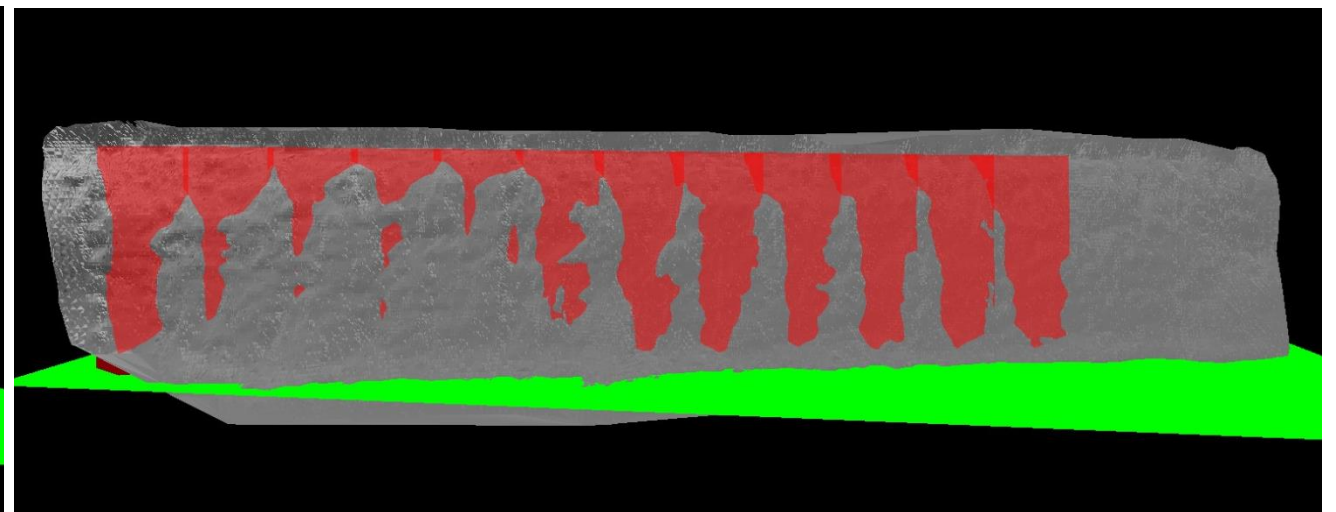
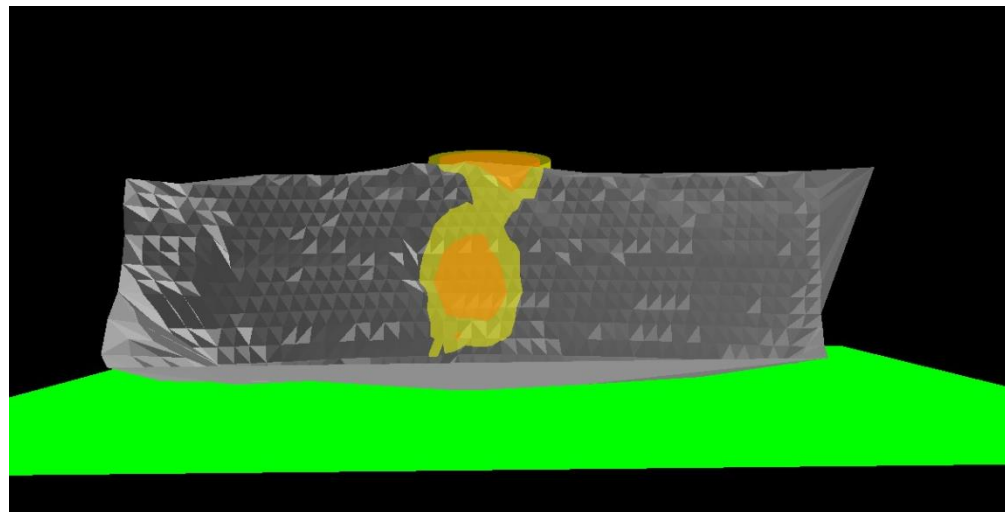
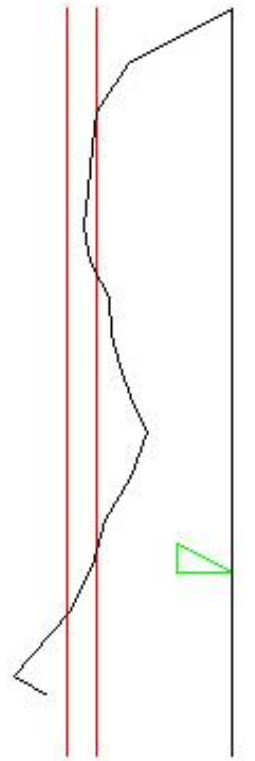
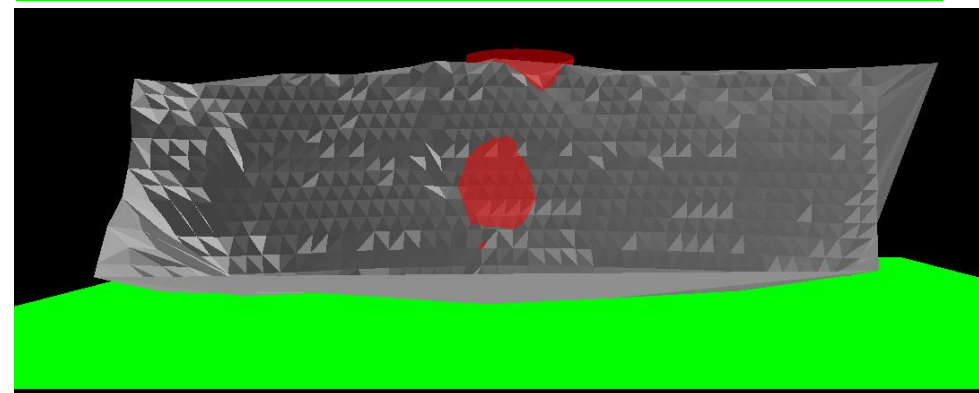
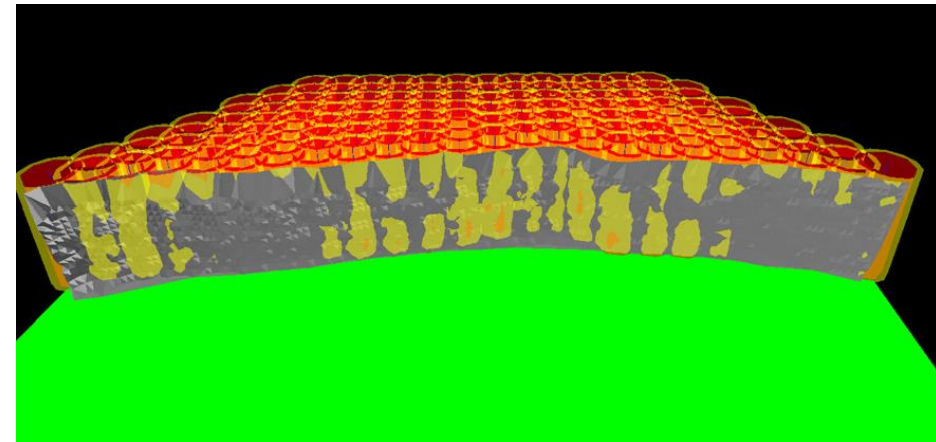
Total time 2 days

## New - Blast Management Software – Rockmate

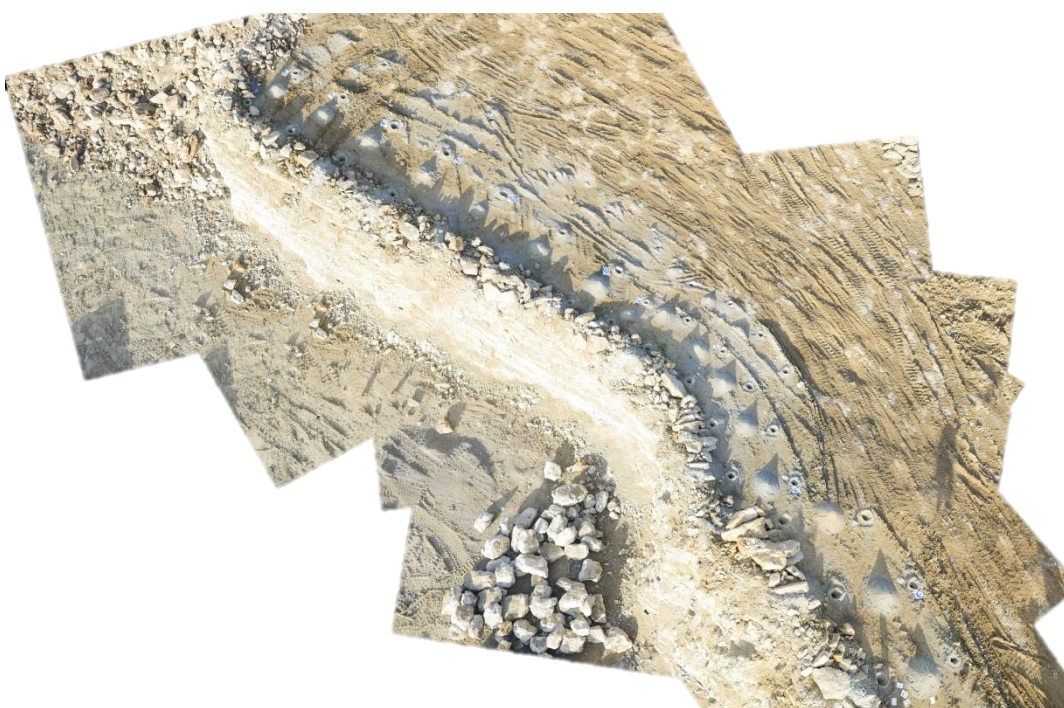
A TEC-3D and Rockmate are developing a blast optimisation survey for quarries and open pit mines to reduce survey time and reduce costs through optimal hole positioning and reduction in explosive usage.

A TEC-3D flew the face of an active quarry creating a 3D orthomosaic that was inputted in to the Rockmate software which

The site was then mapped with the fixed wing to give a time space data set for further analysis.



# AERIAL PHOTOGRAPHY



# 3D AERIAL SURVEYING



- Using the Phantom v2 with a flat lens ATEC-3D acquired imagery from the surfaces of St Peters church which was located in the middle of a town.
- Scaffold was not an option in this case as the client wanted a visual record of the building for subsequent monitoring and repair estimation
- The building all faces were flown in just over an hour, the images were then processed giving 3D model of the building with data supplied from scanning.

This technology has a direct relevance to Mining...

# AERIAL SURVEYING

Mining has many difficult, dangerous, inaccessible areas, the ATEC-3D systems can survey and monitor them safely and periodically, and derive report data that would be otherwise unobtainable or at great cost.



# The Current Strategy - Services

- Data collection for one off or:
  - Base maps and images for mapping
  - Preparation for site establishment, scoping level designs
  - Review of terrain for roads, rail lakes etc.
  - Inspections / cataloguing of structures
- Creating Information for control and management on a daily, weekly or monthly monitoring or project management of:
  - Mining activities, volume extracted, dump size
  - Pit shape, mining according to plan
  - Earth moving, moved, fill, rehabilitation progress
  - Environmental baseline and change
  - Damage assessment, slope failure, spill, storm
  - Dam assessment wet spots, vegetation survey (leaks)
  - Residential creep, population change assessment
  - Planning for sitting of structures
  - Beach movement, volume and mass estimation



# TRAINING ATEC-3D

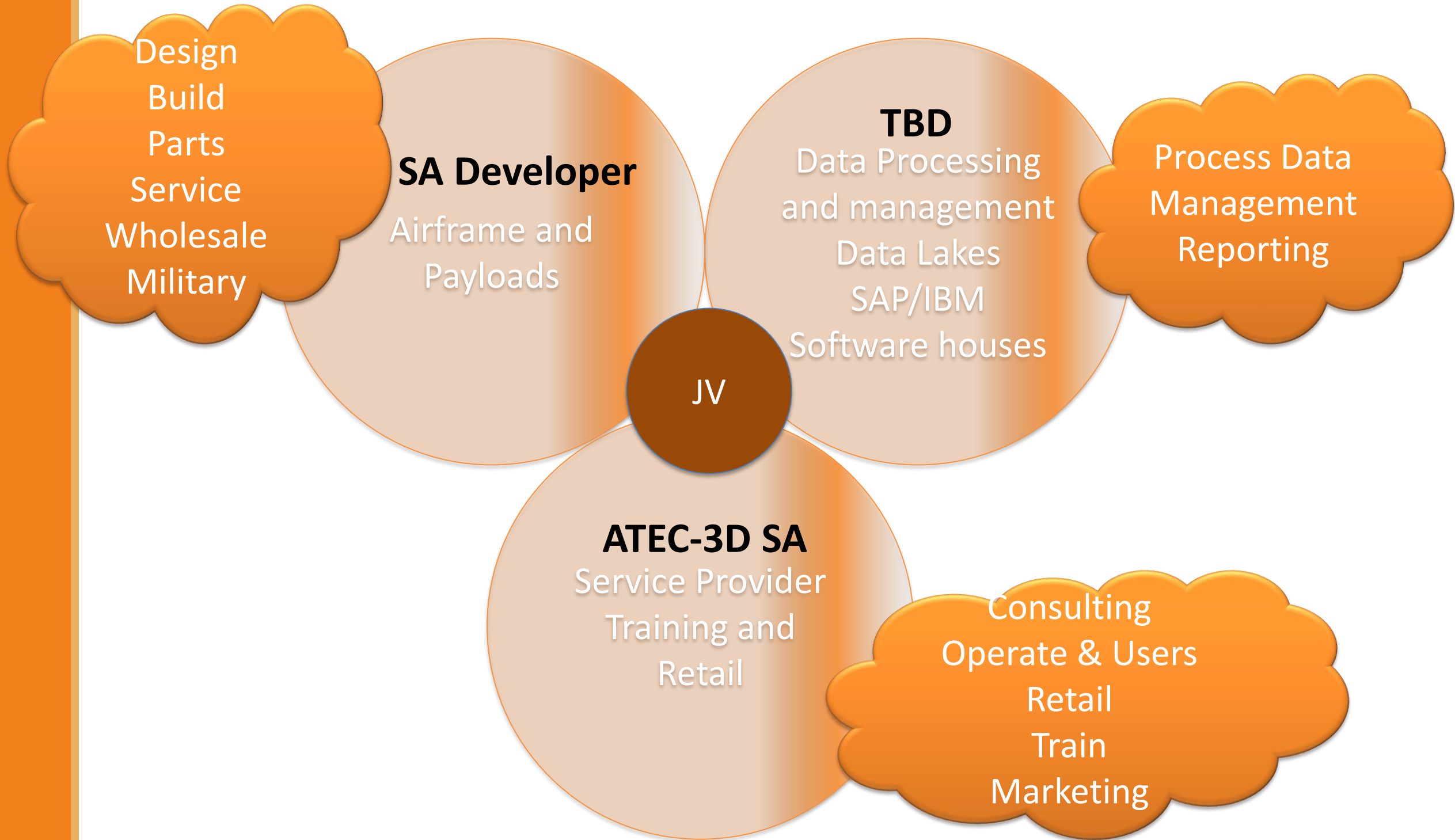
## Gaining National Qualified Entity Status.....

- 🌀 ATEC-3D are now in the final stages of applying to the Civil Aviation Authority for NQE status. This means we will be assessing and teaching all the critical elements of UAV operations . As a result we will be able to recommend pilots to the CAA for granting of their permission for Aerial Work.

# Developing a Commercial UAV Business

**3** Where will we go.....

# ATEC-3D BUSINESS REQUIRES



# UAV's: A BRIEF HISTORY



## History

- 1916 Ruston Aerial Target
- 1917 Flying bomb (gyroscope)
- 1927 Bi and Mono plane flying torpedo's
- 1930'3 Radio Controlled aircraft
- V1 Flying Bomb 1941 - 44
- UAV 's – Unmanned war Planes – Joseph Kennedy 1944 RIP
- 1980's Basic Training Target Drones
- Cruise....
- Reconnaissance UAV's
- Raptor..
- Micro Air Vehicles MAV's
- Back to the Dirigible

## Who..

- Pakistan
- India
- USA
- South Africa
- Japan
- China
- Korea



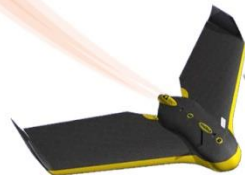
DARPA's *Vulture*, an ultra-long endurance aircraft



BQM-74C CHUKAR III (NORTHROP GRUMMAN)  
A BQM-74 Chukar III, turbojet-powered aerial target.

# ATEC-3D SA

- **INTO THE FUTURE**  
**COMMERCIAL AIRFRAME**  
**SELECTION**  
**PAYLOAD INTEGRATION**



# FIXED WING AIRFRAMES AND PAYLOADS

Specification	Super Light	Light	Medium	Heavy
<b>Mass</b>	0 - 3kg	3 – 7Kg	7 to 20kg	+20kg
<b>Range</b>	500m 30min – 2hr	1km – 10km 2hr – 4 hr	10 - 25km 4 – 5hr	100km 5 - 10hr
<b>Payload</b>	Photo Survey Video NIR RGB	+ Lidar + Mag Geophysical packages	+ Geophysical packages Multiple payloads	+ Duration Multiple payloads
<b>Client/Mission</b>	Current (small)Market Military QS	Mining Exploration	Game Parks Environmental Infrastructure	Large scale Projects

# PROPOSED - UNMANNED AERIAL VEHICLE

## Lightweight (Sub 3kg)

- Wingspan approx 1m
- Take-off weight approx 1kg
- 10km range. Up to 45km/h wind speed.
- Throw launch, no requirement for ramp or bungee.
- Polystyrene / EPP Foam construction
- Powered by Lithium – Polymer battery
- In-Car battery charger.



- Ruggedized tablet for planning and in-flight control. Control App.
- Custom box to carry the UAV, tablet and all necessary equipment.
- Operate in light rain
- Camera triggered automatically.
- links direct to existing GPS base stations, removing need for ground control points
- Camera, NIR, Video, Thermal. Interchangeable payloads
- Battery powered with 2hr flight time



## Medium (3-20kg)

### All specs of Lightweight UAV +

- 25km range.
- Up to 60km/h wind speed.
- EPP Foam or lightweight rubber construction
- Powered by Battery or Gas / Petrol
- Auto take off & landing
- Battery or Gas / petrol powered with 2-5 hour flight time
- Hybrid UAV or Stall landing so minimal operating area needed (see links).
- Live feed to ground station
- Custom box to carry the UAV, tablet and all necessary equipment and able to check in on commercial aircraft
- Emergency parachute in-case of emergency landing or link loss due to weight
- 100% Waterproof. Can operate in rain
- Ability to carry 3+ payloads at a time to remove need for re-flying
- Sense & Avoid capabilities



[Hybrid UAV](#)

[Stall Landing](#)

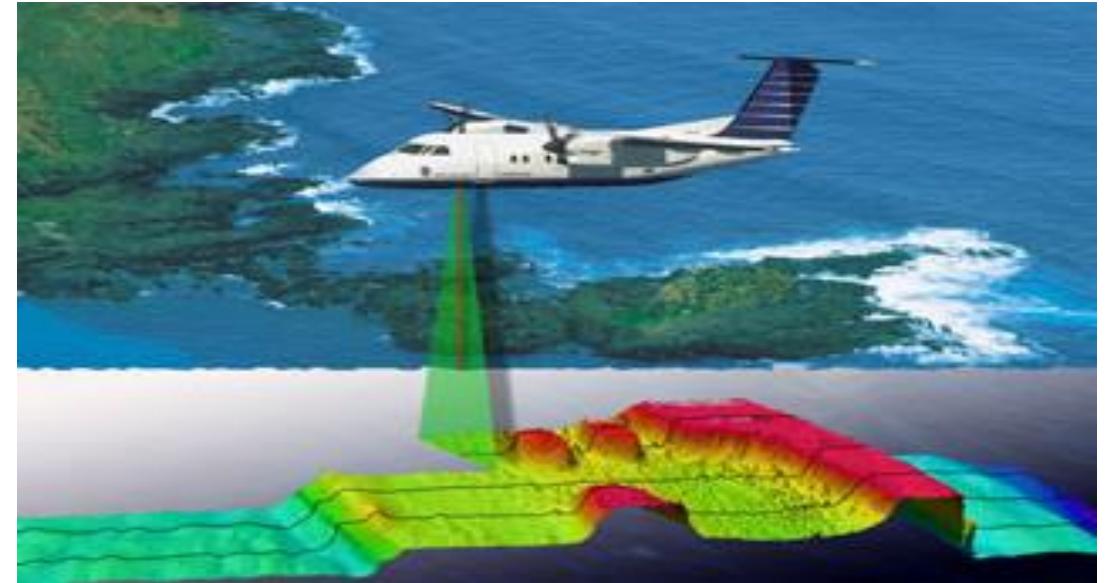




## Heavy (20kg+)

### All specs of Medium UAV +

- 100km range.
- Rubber or other hardwearing construction
- 5-10 hour flight time
- Lidar Sensor



## Software

- Digitization tools / vector object editing
- Volume object creation (volume measurement)
- Point cloud editing
- Fly-through animation

Recommended we approach Pix-4D  
To create our own branded post processing software to  
complement our the range of UAVs.

This has been done with several other  
UAV manufacturers.

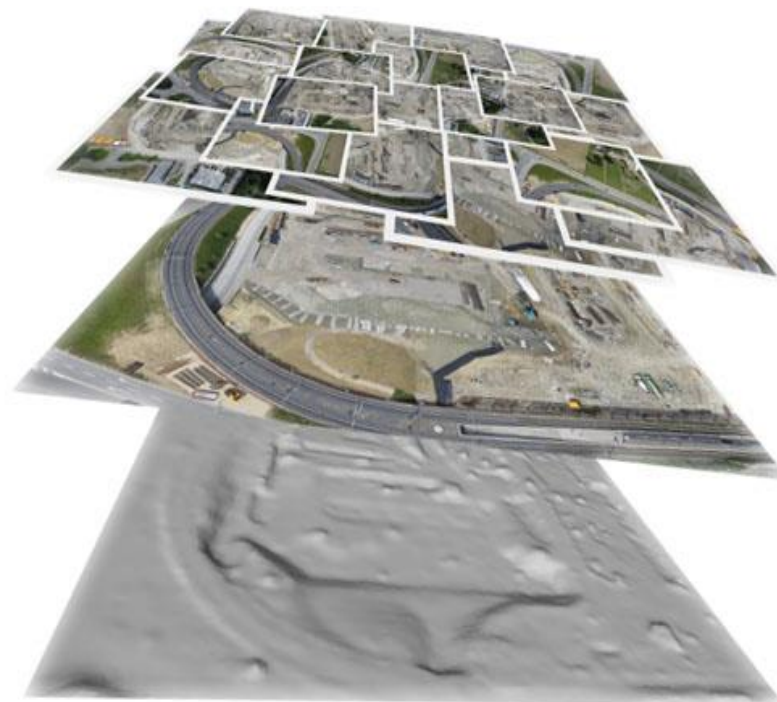
PIX4D



# International Rescue – Thunderbirds are Go!

There are a number of benefits to the ATEC-3D approach:

- A large area can be covered rapidly
- Avoidance of human contact with hazardous or dangerous areas
- Reconnaissance surveys of open pit or unprotected openings
- Machinery location and movement
- A value added dataset (orthorectified photography) is produced
- Beach volume calculation
- High pit wall and dump toe inspections



# Video Index – See the ATEC-3D Channel on YouTube

- [ATEC-3D Surveying](#)
- [King Edward Mine, Cornwall](#)
- [Botallack and Levant Mine, Cornwall](#)
- [Head to Space, 2015 Schools Competition](#)
- [Dungeness Point Cloud Survey](#)
- [Blaise Quarry Survey](#)
- [MTS Cleansing Services](#)
- [Rapeseed Fields in Hawkinge, Kent](#)
- [Geevor Tin Mine, Cornwall](#)
- [High Level Survey Work](#)
- [Westernhanger Castle, Kent](#)
- [Flooding in Yalding, Kent](#)
- [Saltwood Boxing Day Run 2014](#)
- [Kent Christmas Cracker Run, 2014](#)



eastkent  
property services





# ATEC-3D

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