SKYBORNE®
TECHNOLOGIES

Topics Today

Michael Creagh – CEO Skyborne Technologies and Director Athena Artificial Intelligence

Discussing technologies under development now that will be up for acquisition in 3-7 years.

Representing four companies today:

SKYBORNE® TECHNOLOGIES

Air Robotics

Cyborg Dynamics

BIA5 PTY LTD

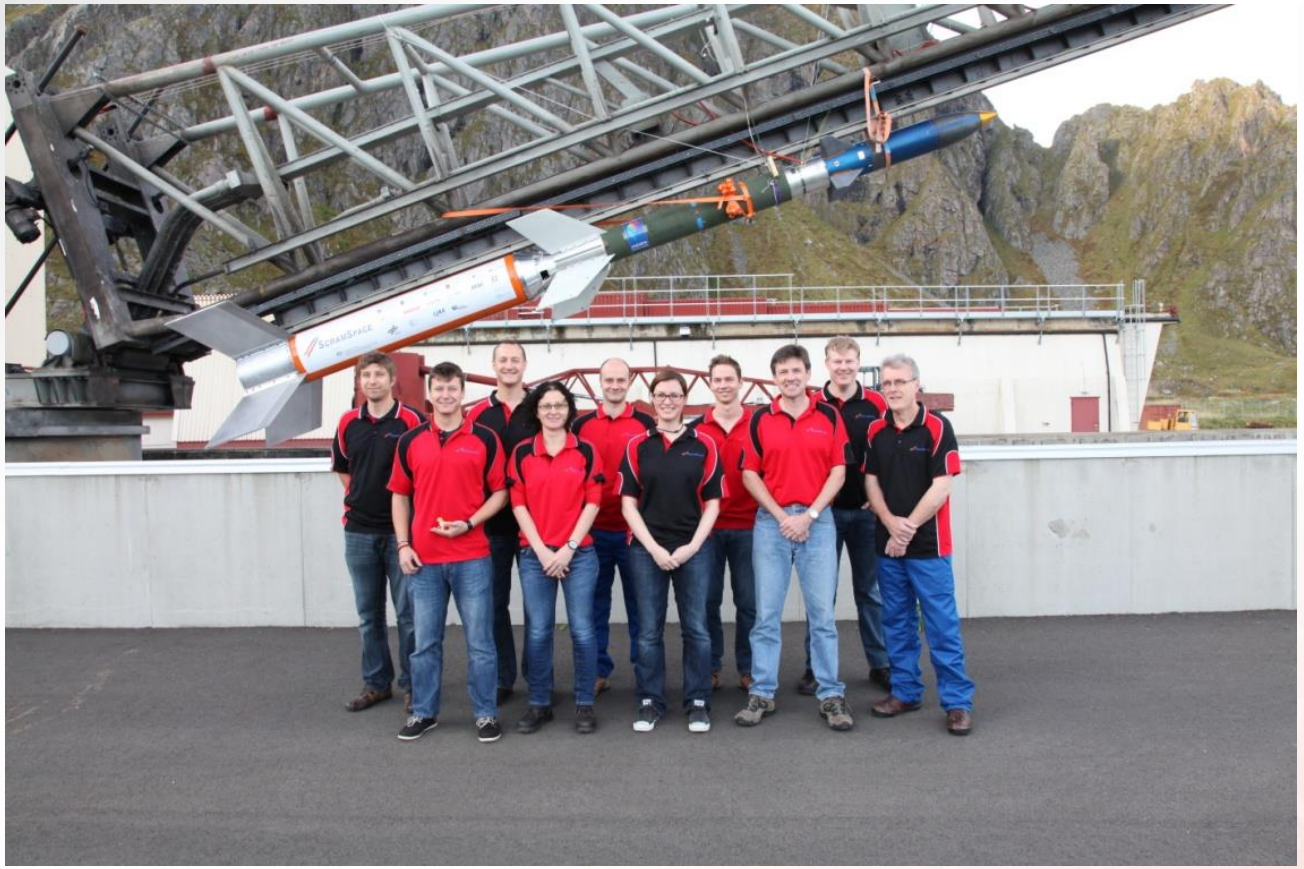
Ground Robotics

Common Software

ATHENA AI

Athena Artificial Intelligence

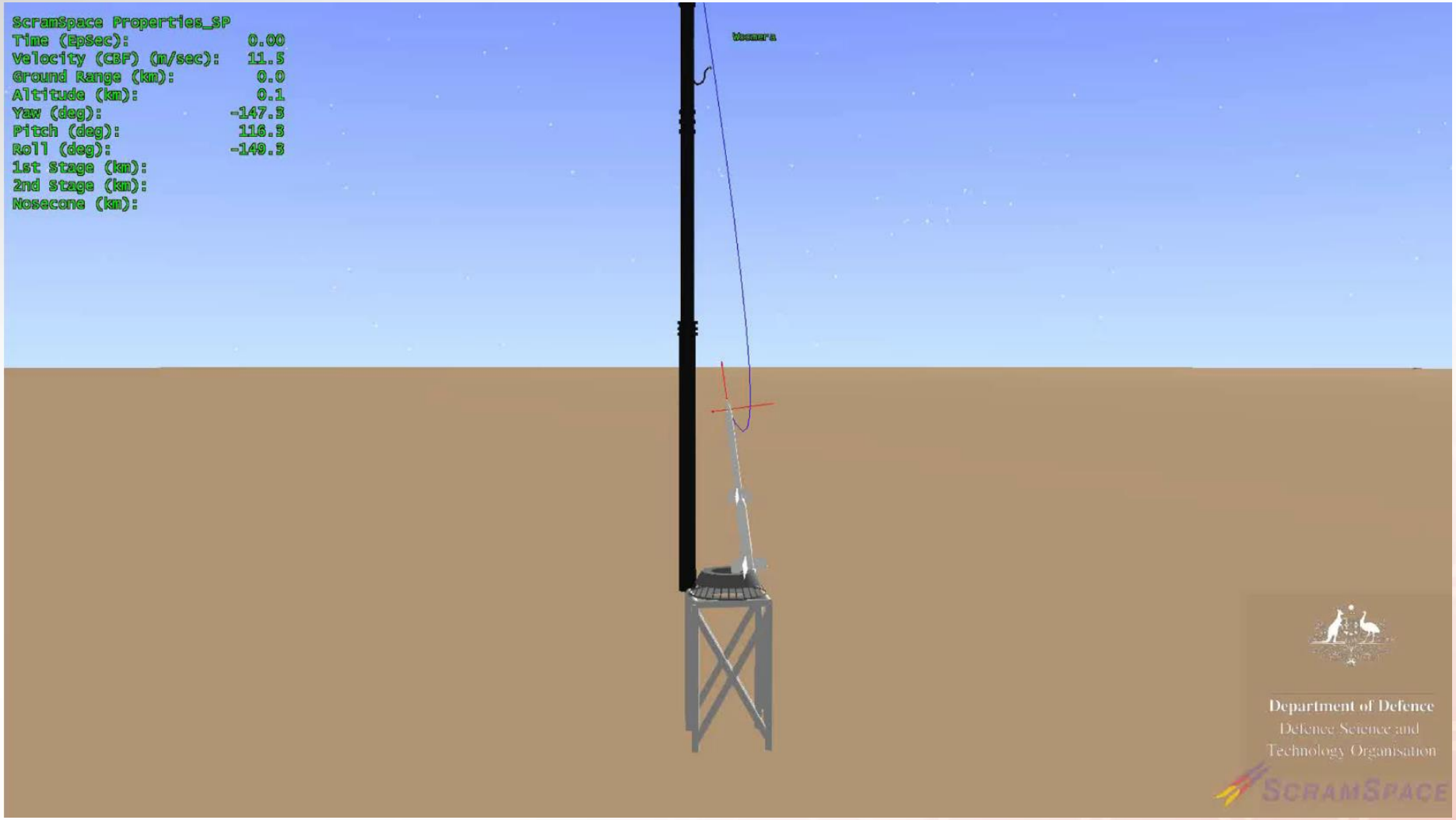
Personal Background



PhD in Missile Guidance (2006 – 2009)

Guidance, Navigation and Control Engineer for the SCRAMSPACE 1 Hypersonic Flight Experiment (2009 - 2013)

Personal Background



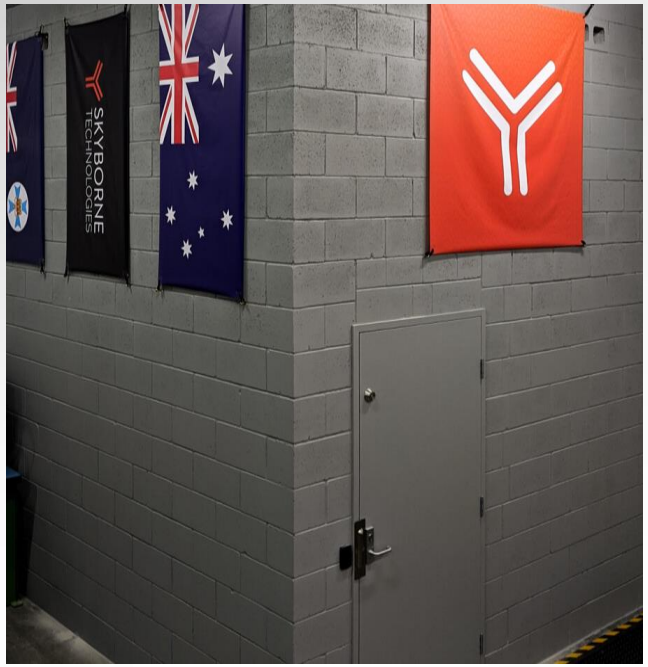
About Skyborne

Skyborne Technologies develops smart aerial robotics to give our Defence & Security customers cutting-edge capability.

We deliver mission critical technology solutions to protect service members and civilians.

- Developed the flagship Tri-Tilt Cerberus UAV platform
- Company was founded in 2014
- Company size: 17 (20) staff - *Made up of 82% R&D engineers and 18% business professionals*
- 400sqm R&D facility in Brisbane, Australia

Research & Development Capability



Weapons Armoury

- Armourer's licence to store, modify or repair weapons
- Purpose built weapon storage vault for all categories of weapons
- Queensland Weapon Act Ministerial Exemption

Mechanical Workshop

- 4-axis CNC Milling Machine
- UAV hardware-in-loop (HIL) testing area
- Motor & Propeller Test Stand
- Other general workshop machinery to support R&D prototyping, including manual machining capability and 3D rapid prototyping

Electronics Lab

- Custom PCB assembly & testing
- Custom harness fabrication
- Mechanical & Electrical assembly area
- Anti-static (ESD) protected lab

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CERBERUS® GLH

MAN-PACKABLE 40MM MULTI-SHOT UAV

The Cerberus GLH is the next generation tactical-level aerial fire support UAS. Designed to be the first man-packable multiple-shot UAV on the market.

CERBERUS GLH

HAVOC LAUNCHER

- Bespoke weapon system for UXV application
- Solenoid operated firing pin
- Servo actuated chamber selection, allowing for in flight round selection (i.e. lethal or non-lethal)
- Rapid rate of fire (120 Rounds per minute)

MAN-PACKABLE

Weighing in at 10kg, the Cerberus GLH can be deployed from a backpack to flight within a matter of minutes and operated by a single operator.

PRECISION STRIKE

Delivering increased precision firepower resulting in minimising collateral damage. The Cerberus GLH has the ability to locate and identify a target, strike it accurately, and determine whether desired effects have been achieved (Battle Damage Assessment) or restrike as needed.

AI ENABLED

Next Gen GPU based flight computer enabling onboard AI at the edge. Athena AI is a military AI decision support tool being developed with Skyborne to provide operators a reduced senor to effector cycle.

CERBERUS GLH

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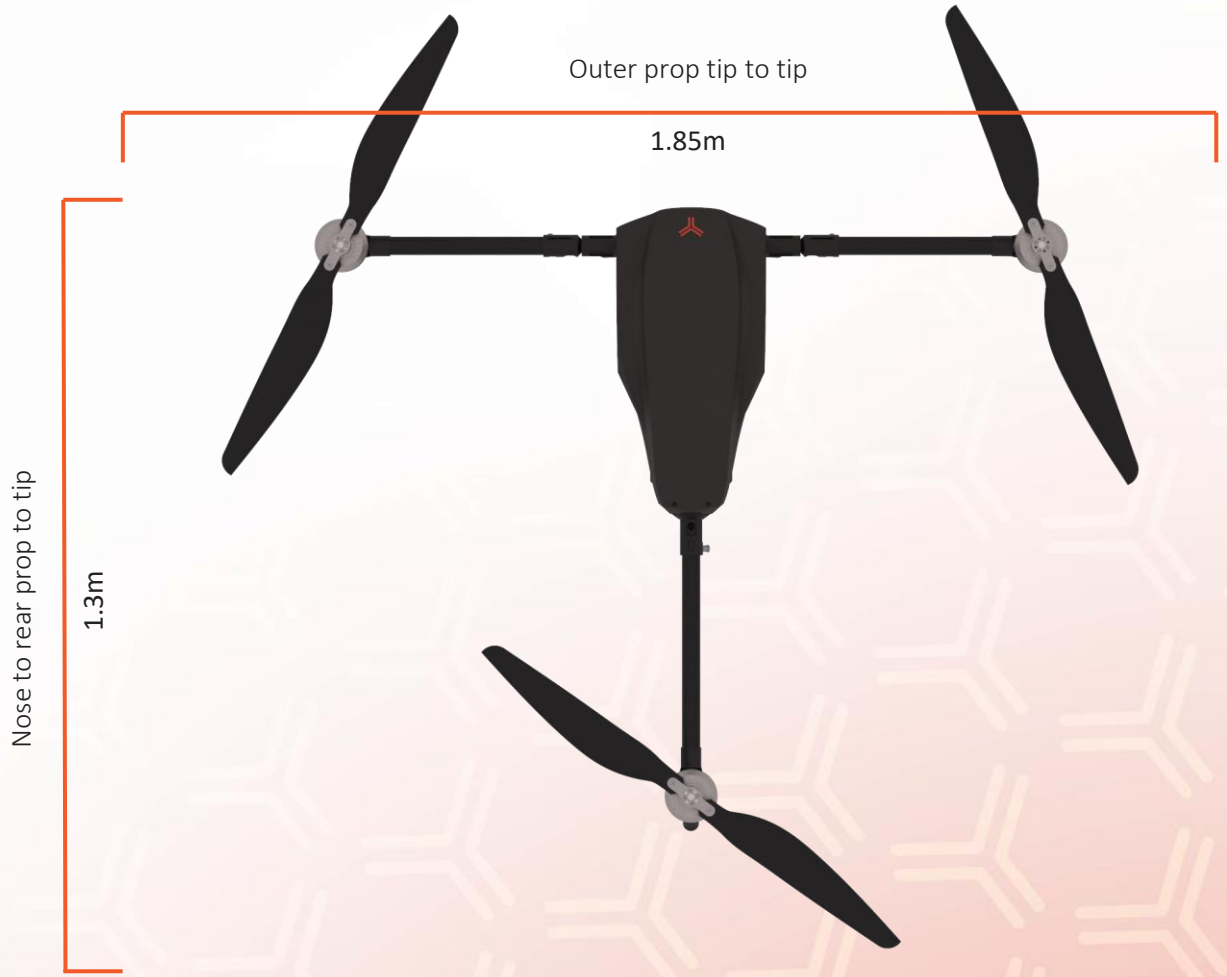
Nominal Take-off Mass	10 kg (22 lb)
Endurance	20 - 30 mins
Range	3 - 5 km (Line of Sight)
Launch/Recovery Method	VTOL
Optics	Fixed EO/IR/Low light
Weapons Targeting	Integrated Laser Rangefinder
Effective Firing Range	180m (Line of sight)
Construction	Carbon fibre, aluminium
Speed	60-70 km/h
Propulsion	Electric



CERBERUS® UAV PLATFORM DESIGN

Skyborne's technology development leverages from the flagship Cerberus Tri-Tilt UAV platform.

The Cerberus UAV design has multiple advantages:

1. TILT MODE

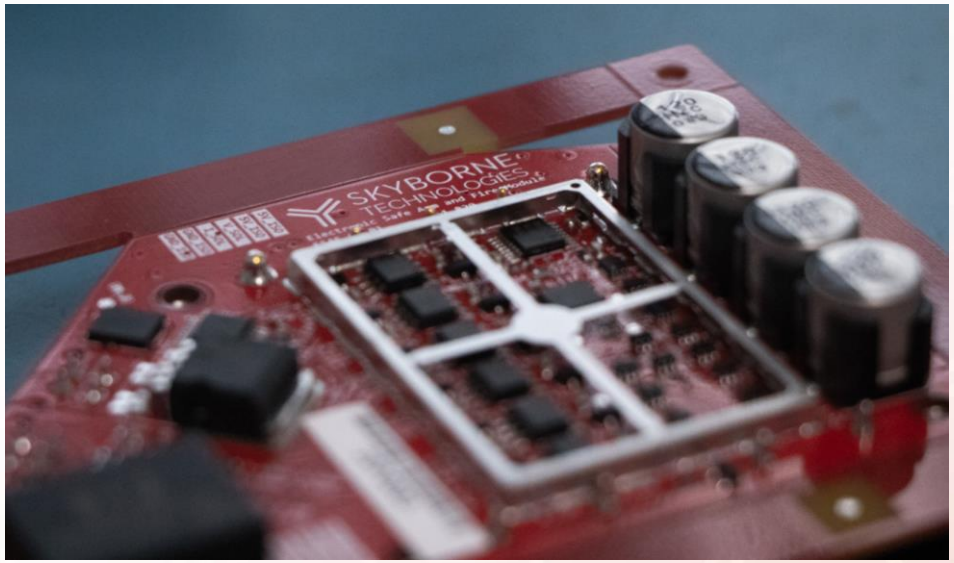
The entire airframe can tilt up and down, allowing long payloads to be pointed eliminating the need for a separate large unwieldy gimbal.

2. RECOIL ROBUSTNESS

Allows recoiled weapon payload to be placed close to the Centre of Gravity, resulting in a significant recoil resistance over low-slung gimbals.

3. SUPERIOR HOVER EFFICIENCY

Allows for greater hover efficiency than a standard quad/multi copter UAV. The Cerberus has two main lift fans and one rear control fan.



4. PROPRIETRY FLIGHT COMPUTER & CONTROLLER

Bespoke flight computer (hardware) and controller (software) developed in house enabling full control of the UAV and its security. No open-source flight controllers used.

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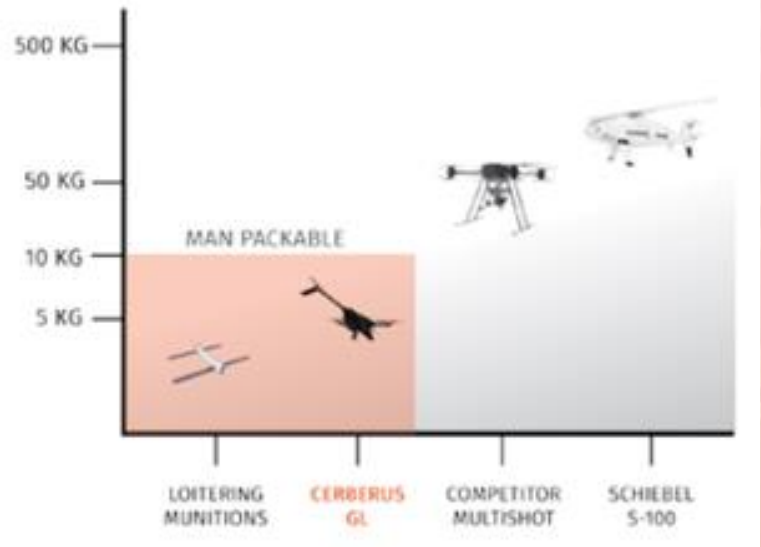
Cerberus GLH has a number of advantages over loitering munitions:

1. **Cost** – few order of magnitude lower cost per shot
2. **ISR** – Cerberus is a multishot armament that can perform ISR/BDA and re-engage with a target if required
3. **Speed of Effector** – Standard 40mm HE grenade has a higher muzzle velocity (76 m/s) compared to a loitering munition (40 m/s)
4. **Operational Flexibility** – Cerberus provides a variety of armament options 40mm rounds (HE, smoke, IR,flash, CS tear gas), 12GA shotgun, compact machine guns (ie. FN P90), net-guns, smart micro-munitions)
5. **Urban Environment Operations** – Loitering munitions have a limited turn radius when engaged with a target in an urban environment. Cerberus has the ability to operate in complex urban environments.

Armed UAS Class Comparison	Loitering Munitions	Cerberus GLH	Competitor Multishot
Mass	0.5 – 3 kg (1.1 – 6.6 lbs)	**10 kg (22 lbs)**	30 – 130 kg (66.1 – 286.6 lbs)
Multishot Capability	No	**Yes**	Yes
Man-packable	Yes	**Yes**	No
Endurance	5 – 20 mins	**30 mins**	20 – 30 mins
Weapon Speed on Target	Fixed Wing – 40 m/s Multicopter – 15 m/s	**76 m/s**	76 m/s
Battle Damage Assessment	No	**Yes**	Yes



Integrated Ground Control System (GCS)

Compact unit to complement man-packable advantage

Custom UI for ISR and firing operations

ARMAMENT CONTROL

FIRE

AIM

SAFETY

FLIGHT CONTROL

POSITIONING

UK MoD – Cerberus CHAOS

Urban Operations UAS with a 10-shot 12-gauge

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GANNET GLIDE DRONE

SILENT STRIKE SYSTEM

The Gannet Glide Drone (GGD) is an air-launched effect for extended-range precision delivery system, capable of deployment at the dismounted combat level.

Air-launched from a manned or unmanned aerial platforms such as the Cerberus UAS, the GGD can hit dismounted and soft-skinned vehicle targets.

GANNET GLIDE DRONE

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SWARM MESH CAPABILITY

Deliver synchronous strike at the dismounted combat team level

GNSS / INS GUIDANCE

High-grade MEMS INS provides minimal drift in GPS-denied environments

STEALTH OPERATIONS

Acoustically silent and optionally RF silent mode

TERMINAL EFFECTS MODULARITY

Top-down shaped charge attack for armoured targets, horizontal linear charge for exposed targets

EXTENDED RANGE PRECISION STRIKE

10:1 glide ratio allows excellent standoff distance to target

UAS LAUNCH EXAMPLE

Air-launched effects from UAV or manned aircraft

GANNET GLIDE DRONE

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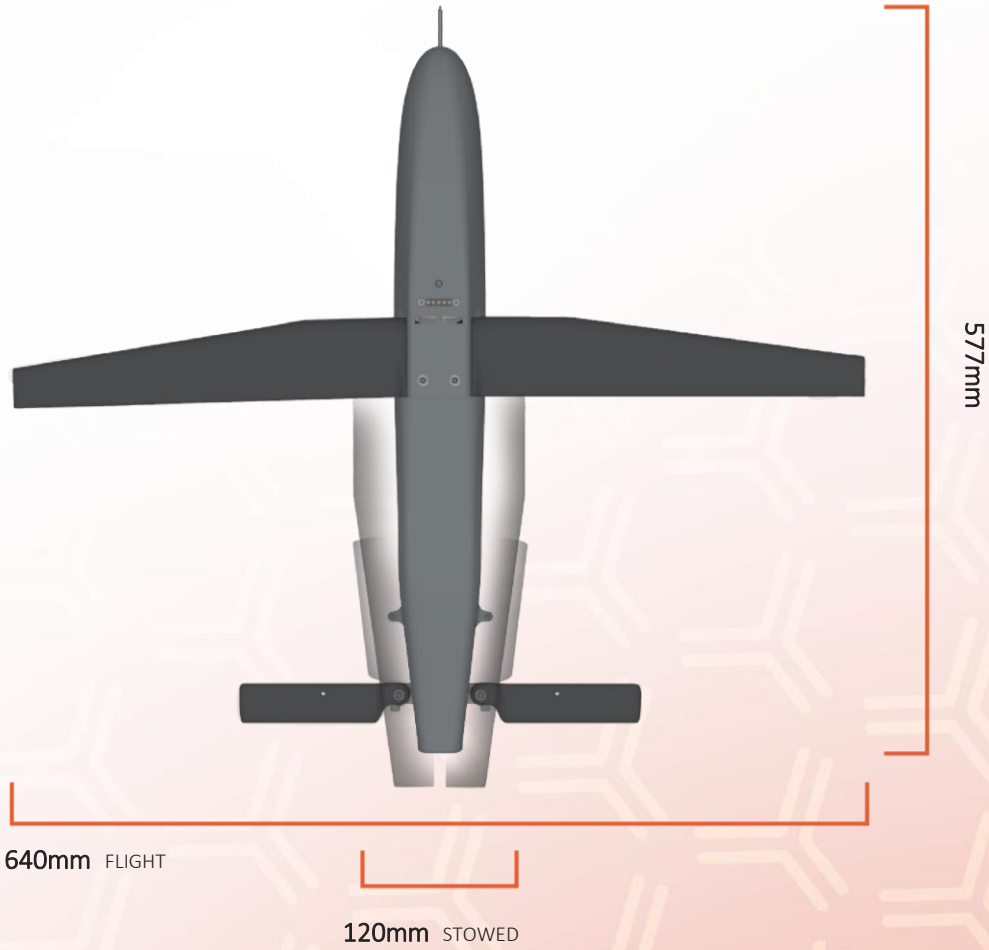
Mass	1.6 kg (0.6kg payload)
Payloads	HEDP, EW, Comms, RF
Glide Velocity	90-110 km/h
Terminal Velocity	150 km/h +
Precision (CEP)	1.5 m
Launch method	Air Launch from UAS or manned aircraft
Development Status	Under Development – TRL 4



Future Concepts – Cerberus Hunter Killer

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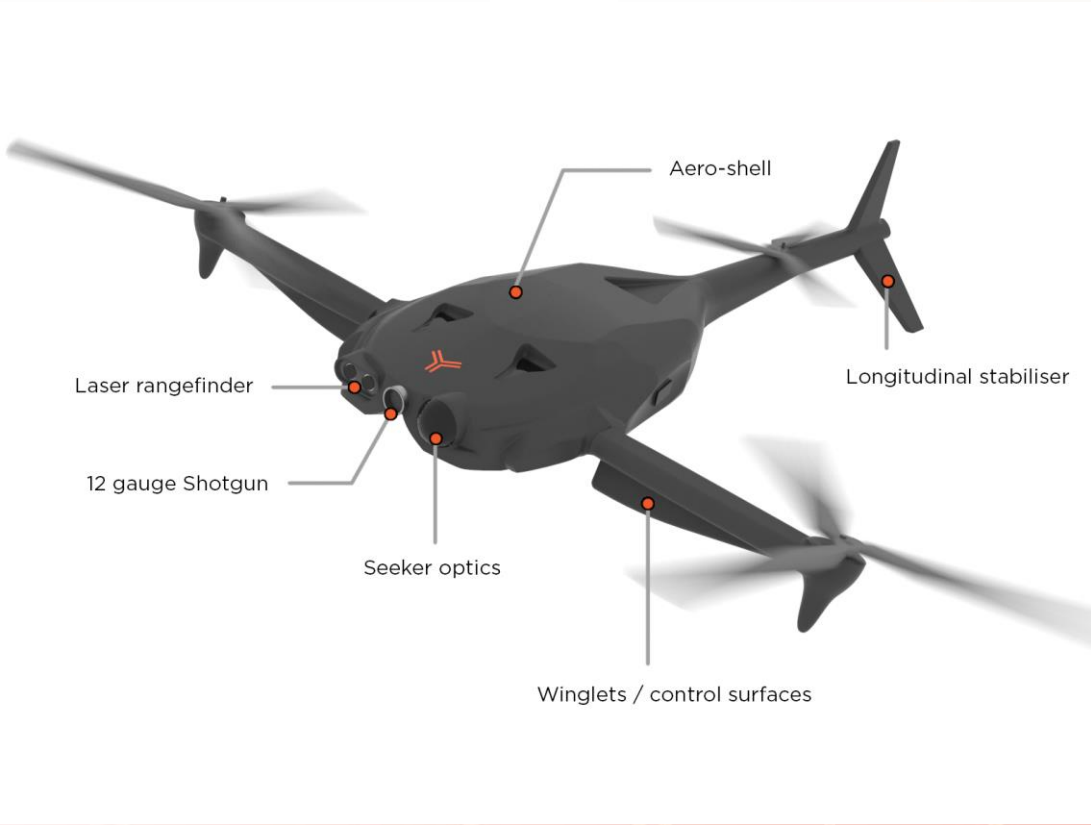
Counter-UAS Air to Air Interceptor

- Hunter killer hard kill counter-UAS solution to supplement soft kill strategies
- **Development Status:** Concept Design - Full-time PhD Student. Pending project funding.

Proposed Specifications	
Mass:	3-4 kg
Armament Type:	1-4 shot 12 gauge (optional specialty rounds)
Comms Range:	2+ km
Detection Range:	1 km (approx.)
Engagement Range:	10 m buckshot round
Max Velocity:	200 km/h (faster than a multi-copter. Goal is to be able to catch a fixed-wing loitering munitions)
Endurance:	15-25 mins (pending operational speed and mode)
Take-off & Recovery:	VTOL



Future Concepts – Cerberus Heavy Support

- Larger Cerberus variant allowing for heavier weapon payloads, for example:
  - Light machine gun
  - RPGs (M72 LAWs)
  - Multiple swarming Gannet Glide Bombs (GGB)
  - Re-supply missions
  - Logistics platform to reduce burden on manned rotorcraft
- Platoon and Company level fire support vehicle (25-50 kg Maximum Take-off Weight)

Warfighter UGV

CYBORG DYNAMICS ENGINEERING

BIA5

WARFIGHTER

UGV

ASSAULT

LOGISTICS

CASEVAC

COMBINED ISR

GO WHERE THE SOLDIERS GO

ENGINEERED AND BUILT IN AUSTRALIA

MISSION PLANNING DATA

Weight	440kg
Payload Capacity	400-500kg at 30deg incline
Speed	20-30km/h max
Endurance	6 hours battery with APU for 48 hours additional
Comms range	1-2km with 900Mhz, 2.4 and 5.8Ghz, further on local 4G LTE. Meshed option with military bands
Max climb angle	45deg
Payloads	CASEVAC, Logistics, ISR, RWS, Anti tank, Counter UAS, Comms relay, ballistic plates
Transport	Vehicle tow option 2 x in MRH90 12 x in CH47 (4 per pallet)
Onboard systems	Driver camera, target recognition, edge computing, waypoint nav, collison aovidance

Spike LR2 Launcher (under development)

Multipurpose, electro-optical guided missile system

- 5.5km range
- Mid-flight abort capability
- Fire & forget
- Fire & observe
- Fire to coordinates
- Breach up to 200mm reinforced concrete, internal detonation

Multirole ISR (under development)

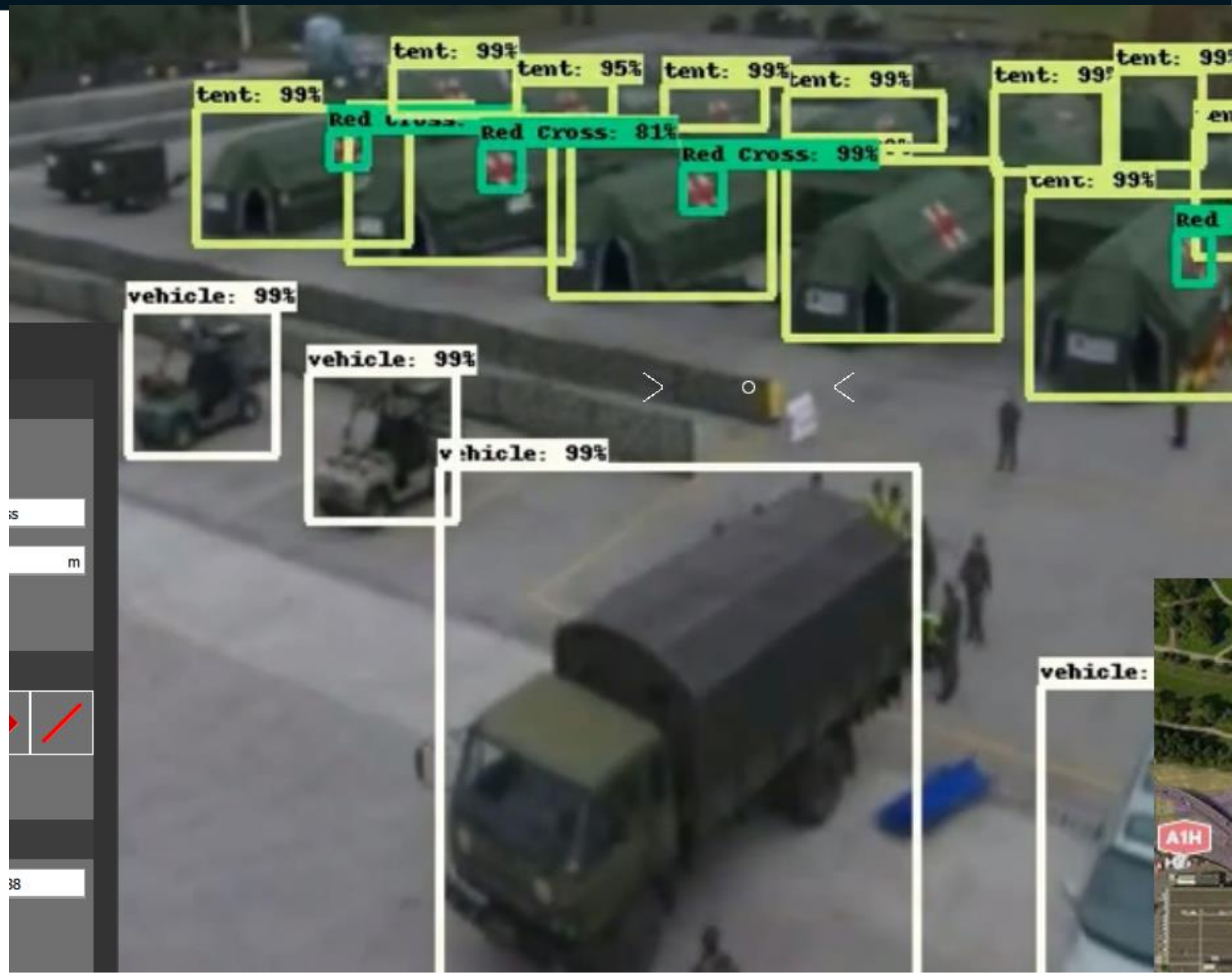
- Servo-actuated mast for EO / IR gimbal
- Platform for UAS takeoff / landing / recharging
- Options for additional mast sensors such as acoustic and radar, laser range finder
- Integration with ground-based target recognition
- Geo-localisation

Controller Hardware – COTS Device

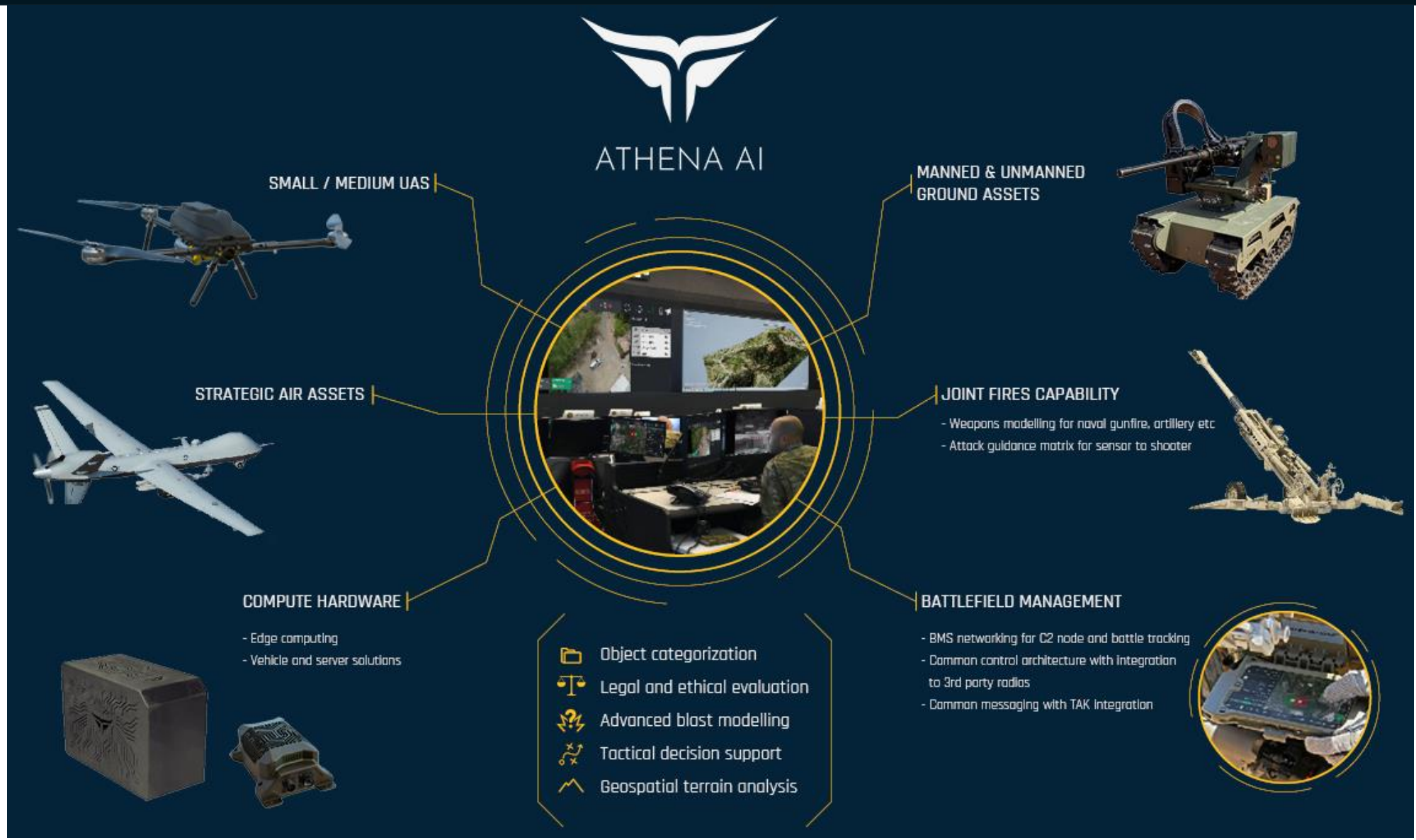
- 4G or MESH MANET Radio comms
- Android/Windows/IOS
- PS4/Xbox controller
- Virtual joysticks
- Cheap and easily replaced
- Simple to ruggedize
- Integration with soldier-mounted hardware
- Weapon station control

Athena Artificial Intelligence

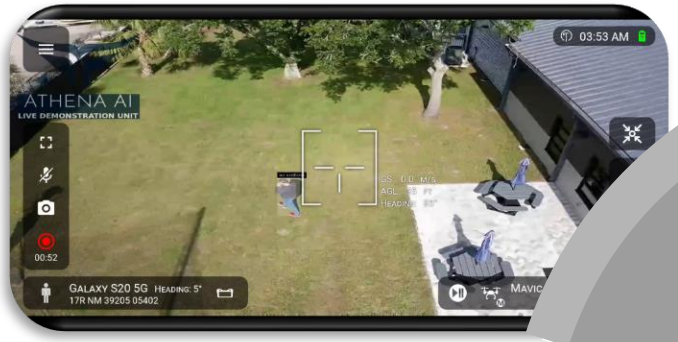
www.athenadefence.ai

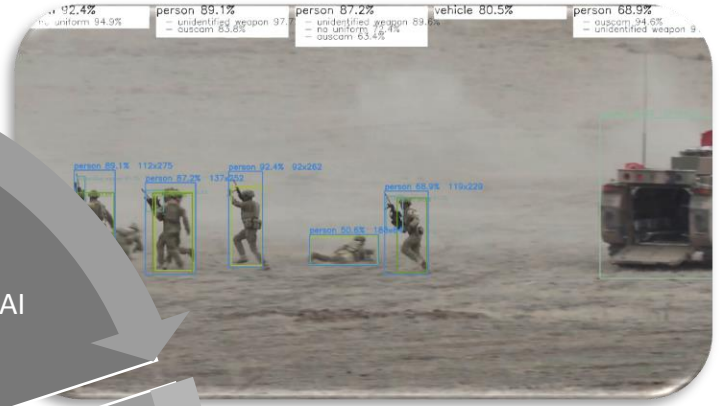


Defence Market Technology



The Product – Vision AI





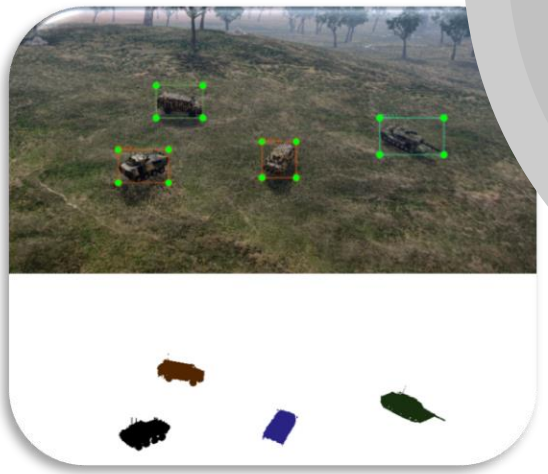
APIs to UI applications

Vision based AI

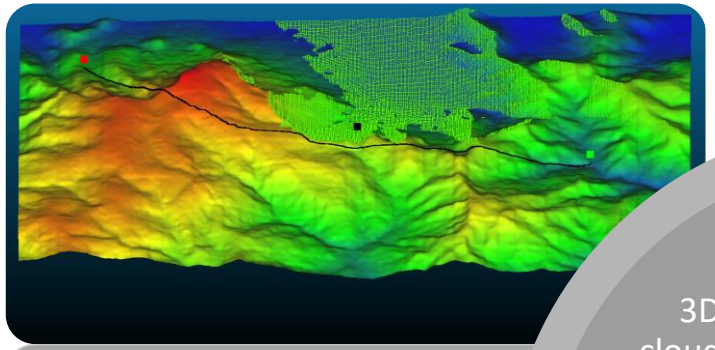
Machine Learning Decision Support including LOAC

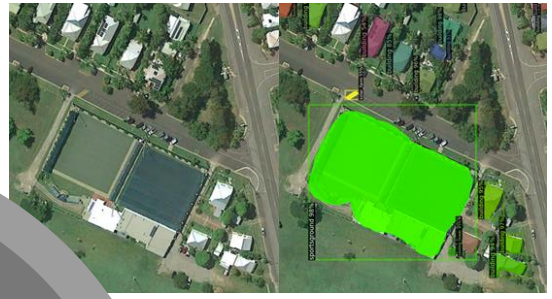
AI optimized UI

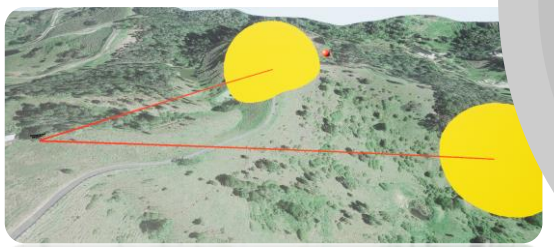
Synthetic AI Training and Assurance Framework

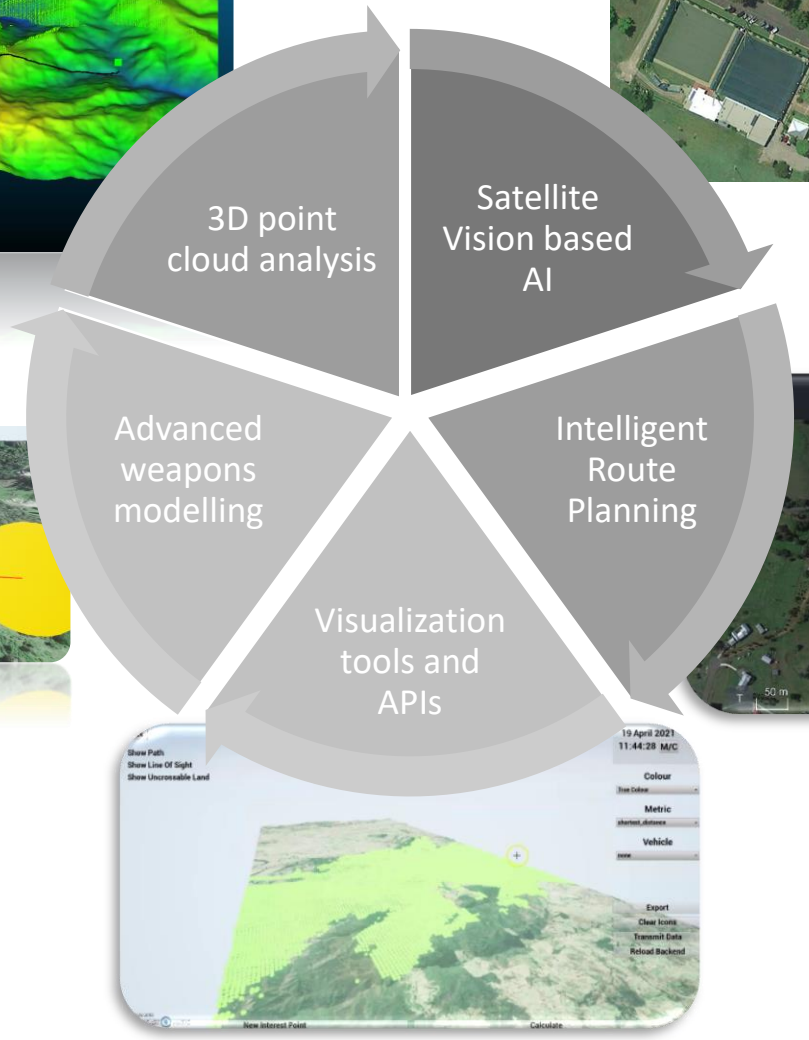


The Product – Geospatial AI





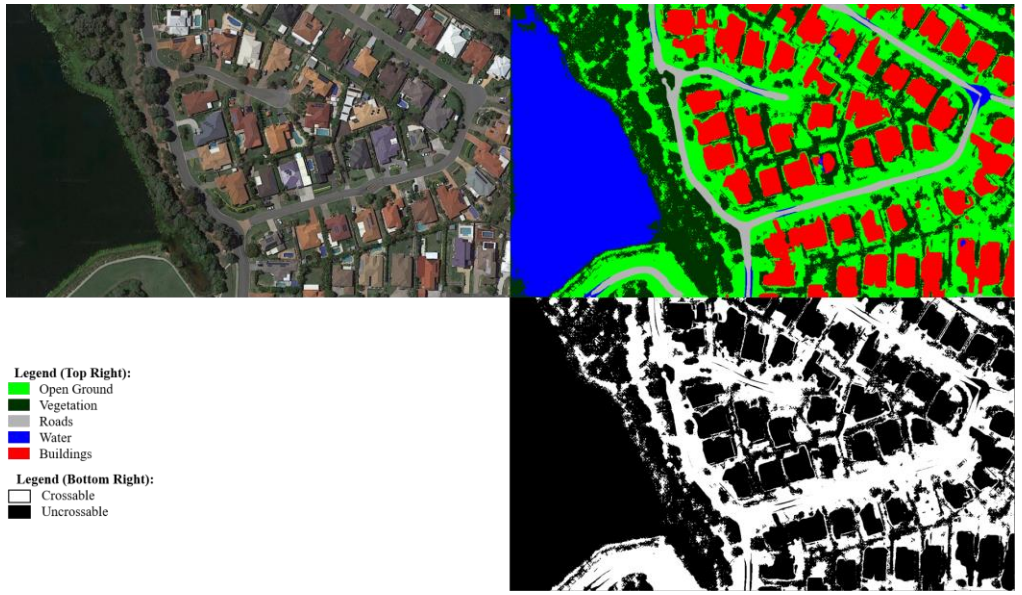


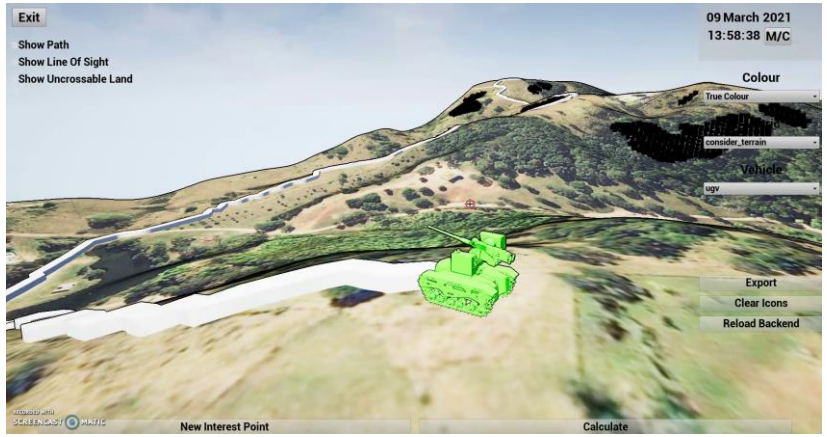


Geospatial Computer Vision Analysis

Analysis of key features in urban and rural environments

- Works with satellite and military style maps
- Output detections, object locations, key terrain, civilian infrastructure
- Produce military style map as a result of geo analysis of terrain
- Produce overlays for military decision making
- Plan routes with given entry conditions
- Same assurance of AI as targeting





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QUESTIONS?

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