

5-GENIUS

5G Enhanced Navigation

Integrity for UAV Systems

ESA – NAVISP Element 2



Agenda

- Why 5-GENIUS?
- Project Overview
- Current Status
- Market Potential

Why 5-GENIUS?

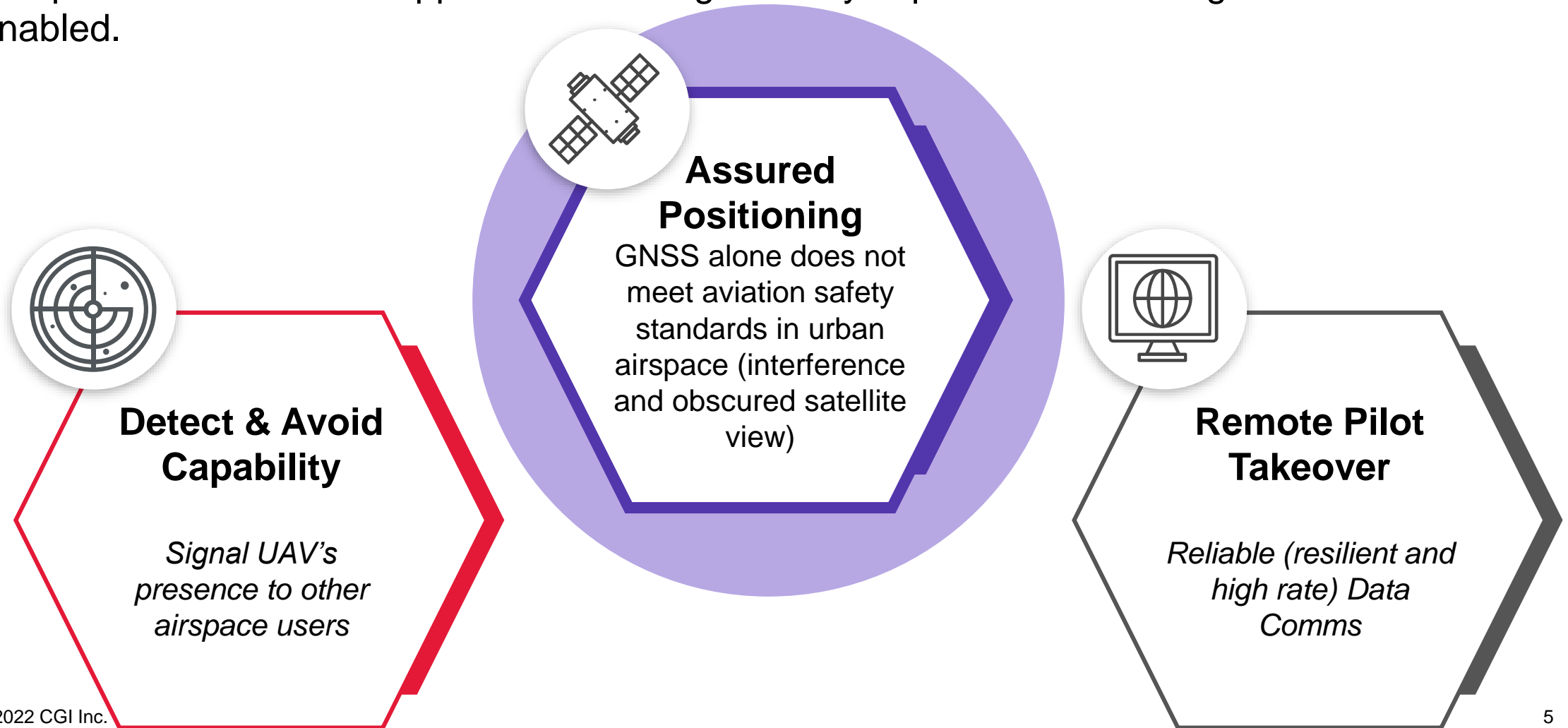


Benefit of BVLoS Operations

- ADS in the UK, along with leading business analysts, estimate the advanced air mobility market to grow into a **multi-Billion Dollar business** throughout the 2020s
- This requires overcoming key challenges of **urban airspace operations**
- A key element of this is the **operations beyond the visual line of sight (BVLoS)**
- To sustainably leverage this market potential, **aviation levels of operational safety** need to be achieved

BVLoS Enablers

The possibilities for UAV applications will significantly expand once safe flight BVLoS is enabled.



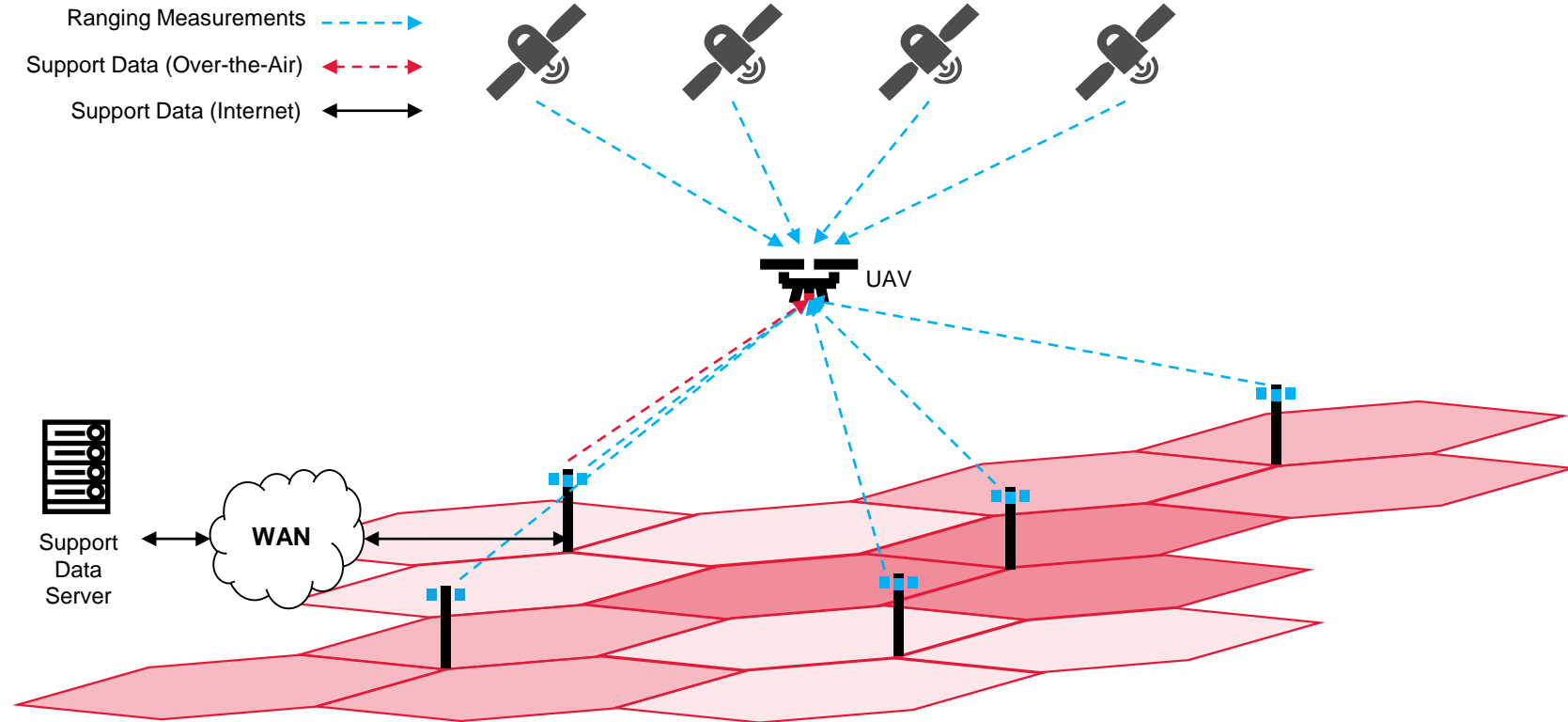
Project Overview



Project Overview



- Development of a Proof Of Concept 5G/GNSS Hybrid Positioning Algorithm
- Concludes with Real World Demonstration including drone flight
- Goal is to demonstrate alternative and complementary positioning method for additional safety assurance
- Thus facilitating UAV BVLOS use cases and possibilities of UAV applications
- Future UTM Opportunities



Project Organisation

NAVISP Element 2

European Space Agency



UKSA Support



Supporting delivery milestones

Providing technical feedback and stakeholder steer

Prime

CGI



Management and execution of all project work to be performed and delivered, coordinating consortium

Definition of use cases and requirements

Define and compile Drone Payload

Design, development and validation of PoC algorithm

Subcontractors

NATS



University of Sussex



u-blox



T-Stop Aerials



NATS

- Supporting Definition phase and Market Potential Review
- Airspace Permissions

T-Stop Aerials

- Providing and Flying Drones for demonstration

University of Sussex

- Consultancy throughout project lifecycle, focused on 5G New Radio design, algorithm design and implementation

u-blox

- Review of viability for chip manufacture
- Supply RTK equipment for demonstration

Current Status



Use Case Analysis for BVLoS

Multiple Use Cases studied

- Operational Risk quantified for each case
- Navigation functional requirements and performance requirements (accuracy, integrity, availability, update rate, etc.) deduced from existing aviation safety standards
- Operational Risk assessed based on worst case scenario

Performance requirements based on UK CAA standards
(Specific versus Certified category of operations)



Street mapping a city with optical and acoustic sensors



Transporting parcels from a distribution centre to a customer



Long-distance aerial surveys of a construction project



Persistent surveillance at the scene of an incident, operated from a control centre



Inter-hospital transport of medical supplies and materials



Long-range heavy goods transport

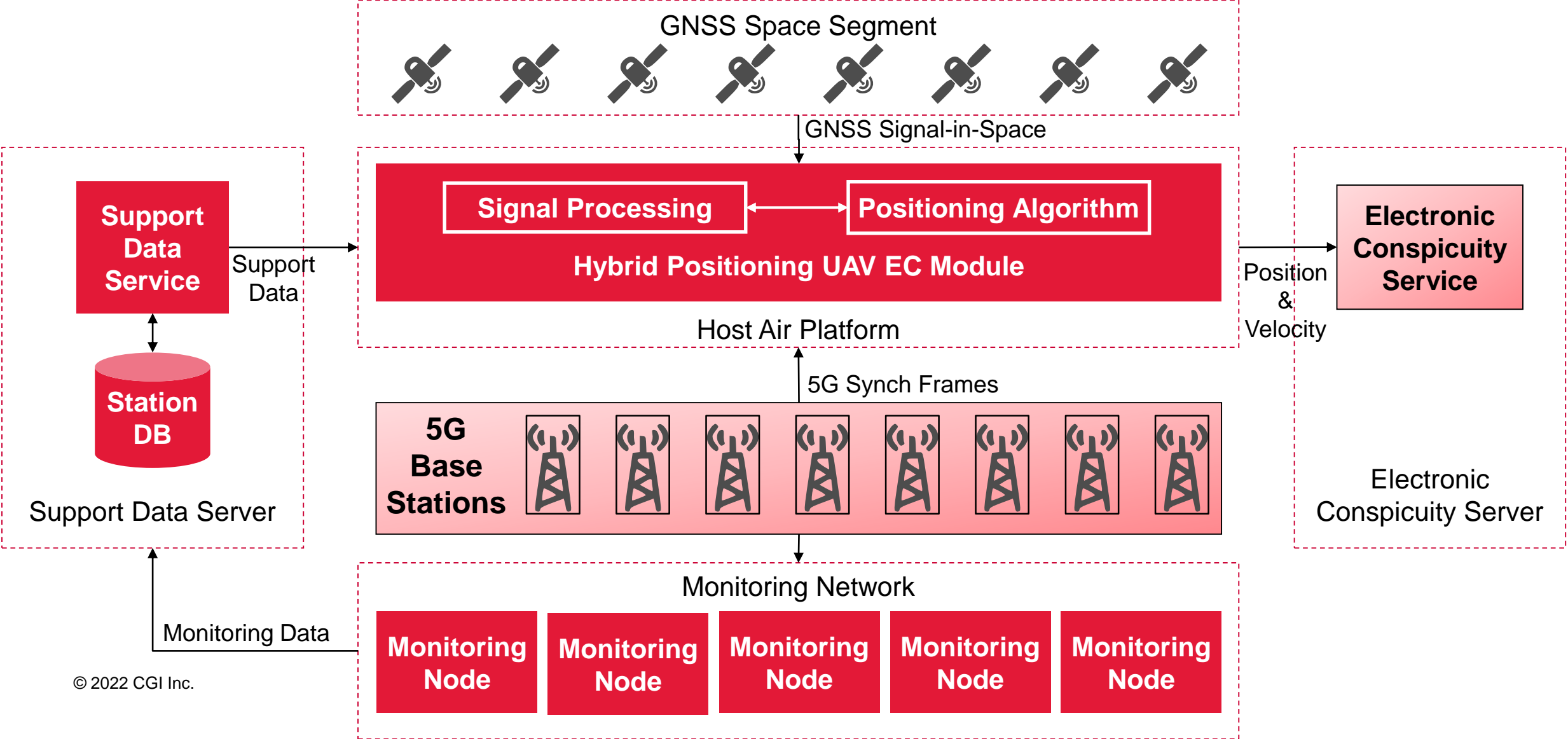


Air Taxi

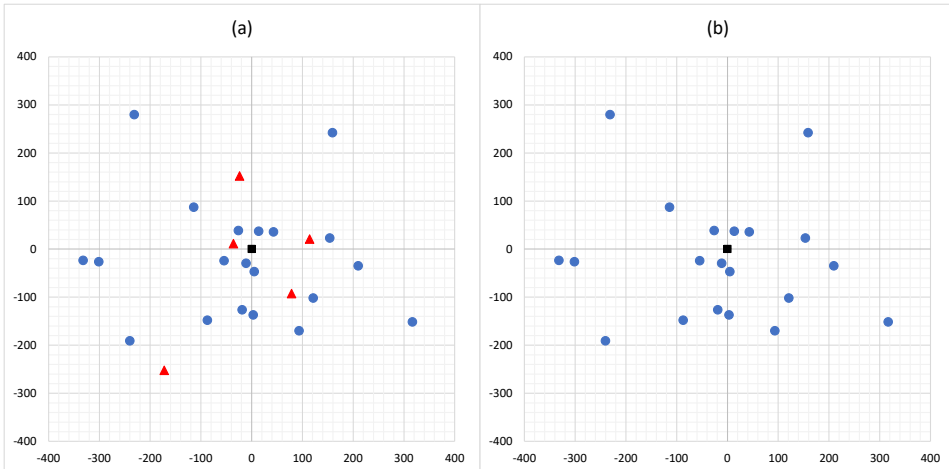


Agricultural spraying

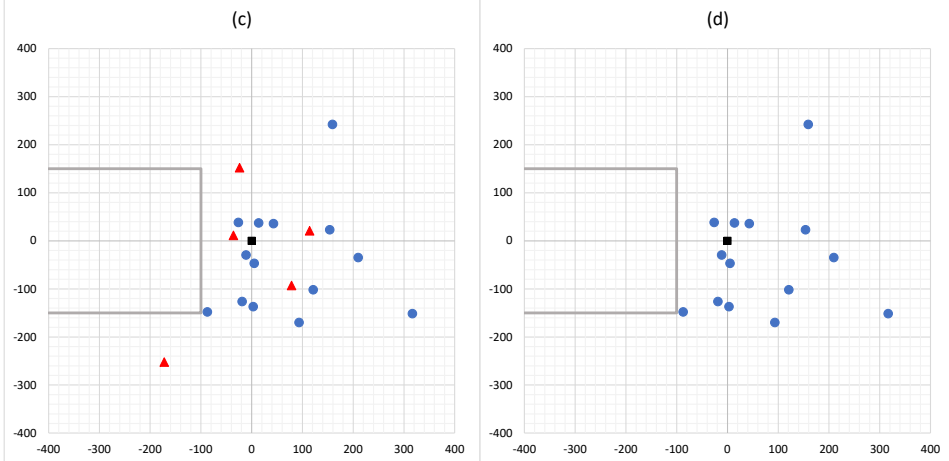
System Architecture definition



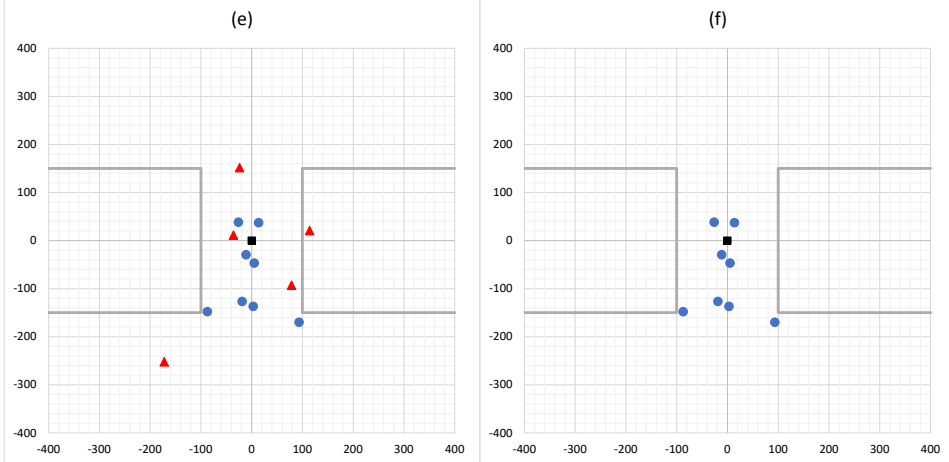
Open Sky



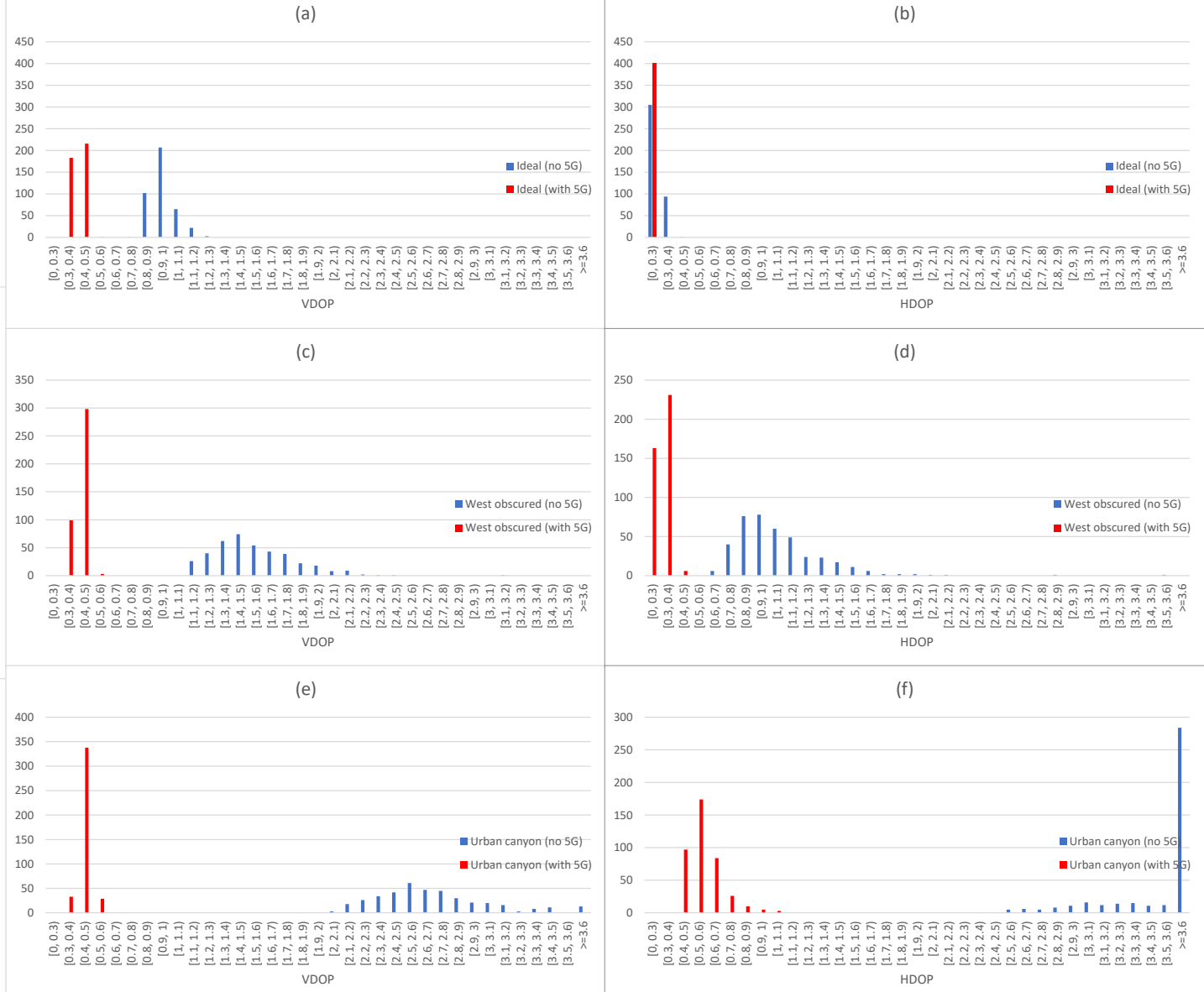
Obscured to west



Urban Canyon



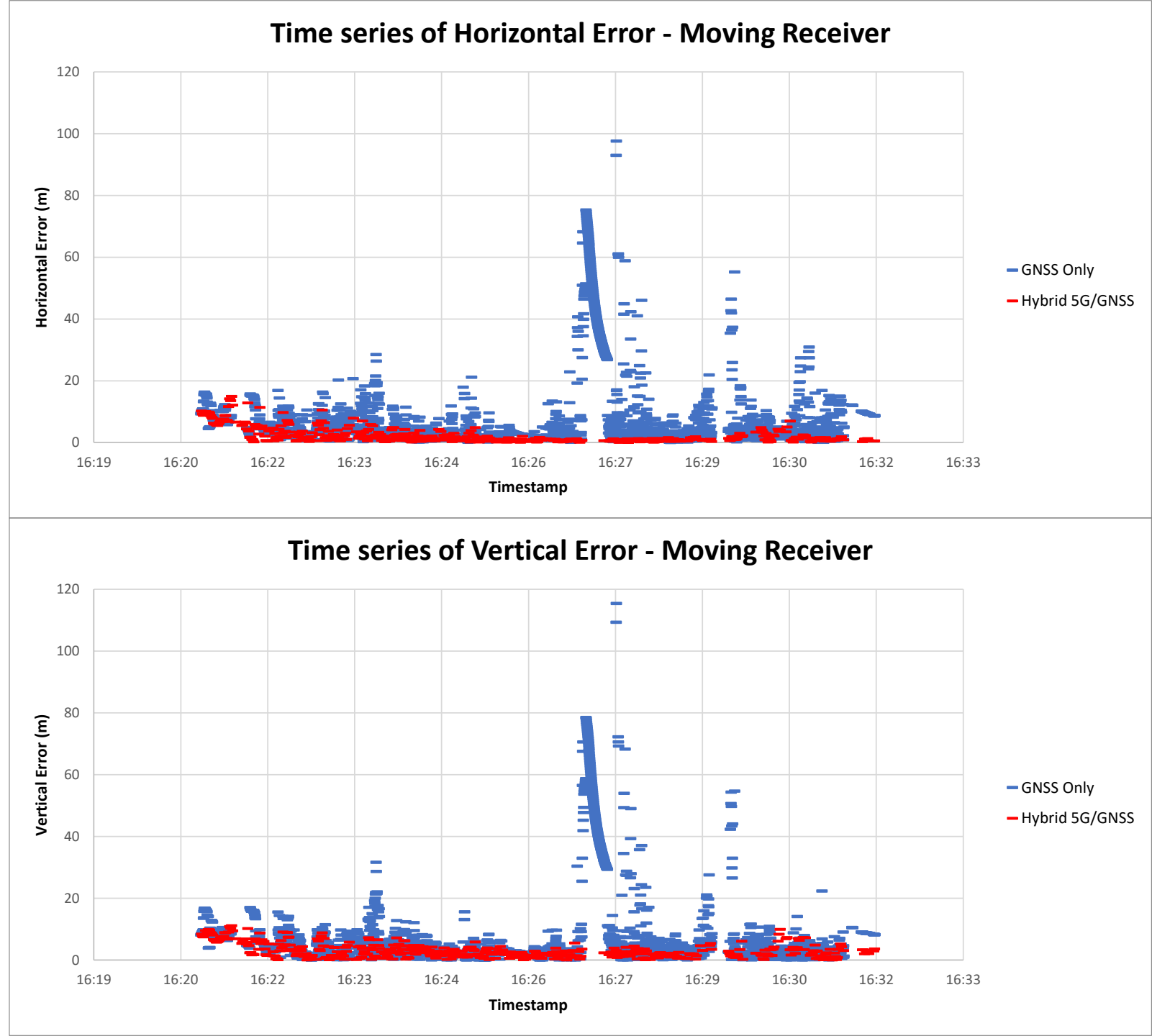
VDOP



HDOP

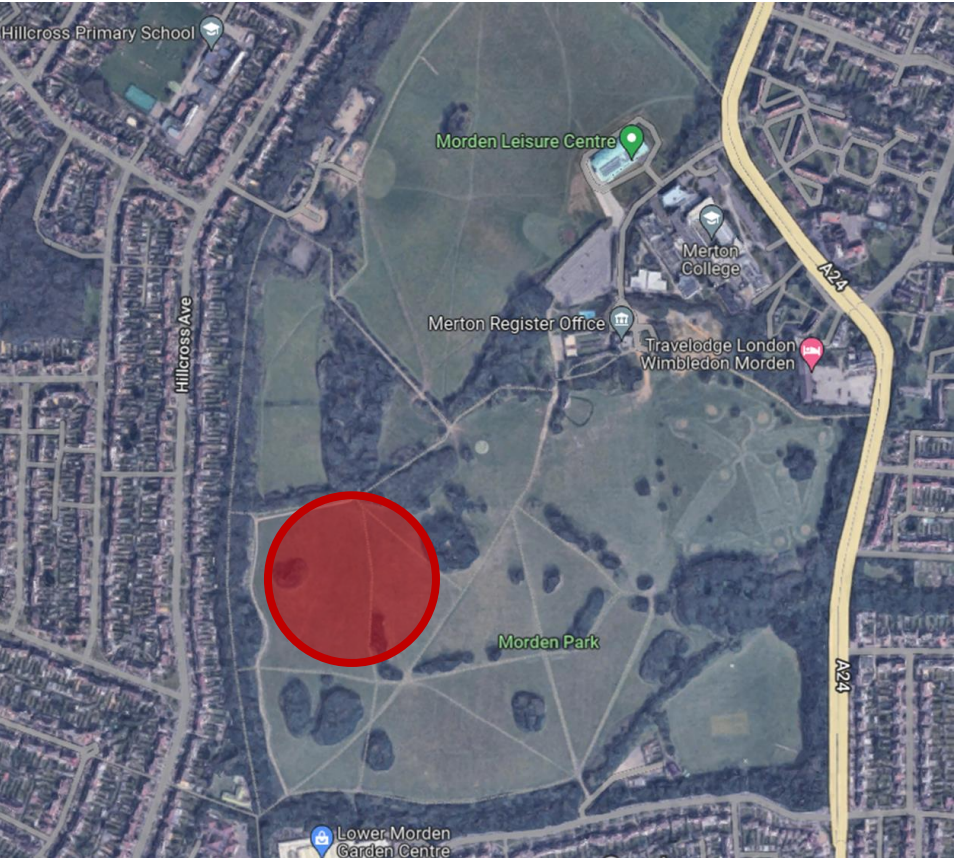
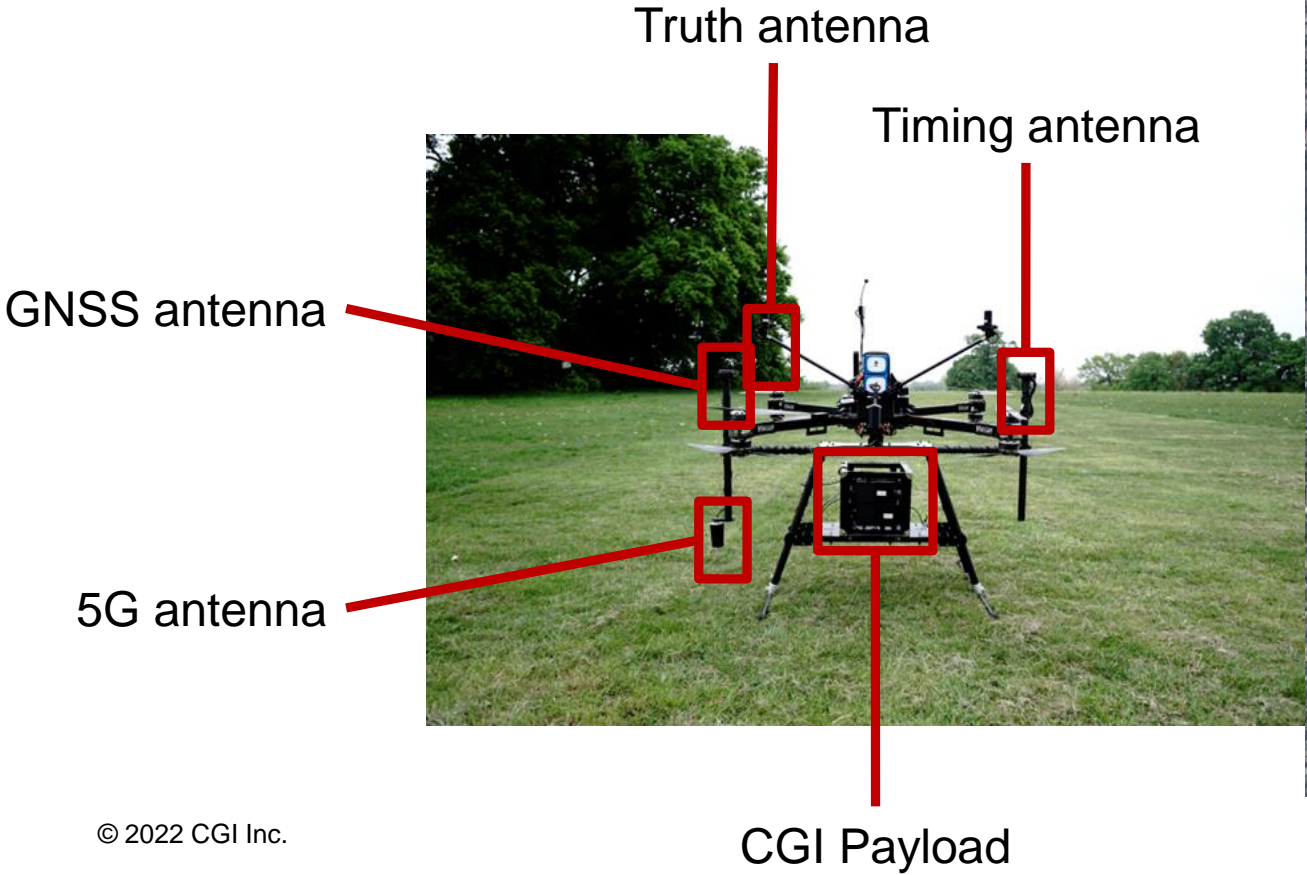
Factory test results

Navigation accuracy horizontally and vertically shown to be significantly improved in challenging GNSS conditions when hybridised with 5G

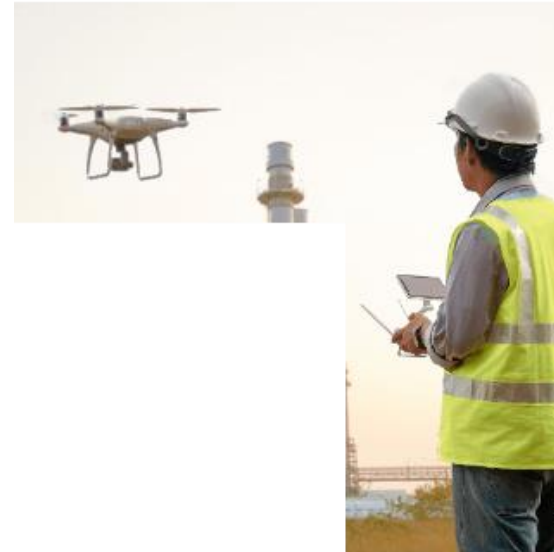


Real World Demonstration

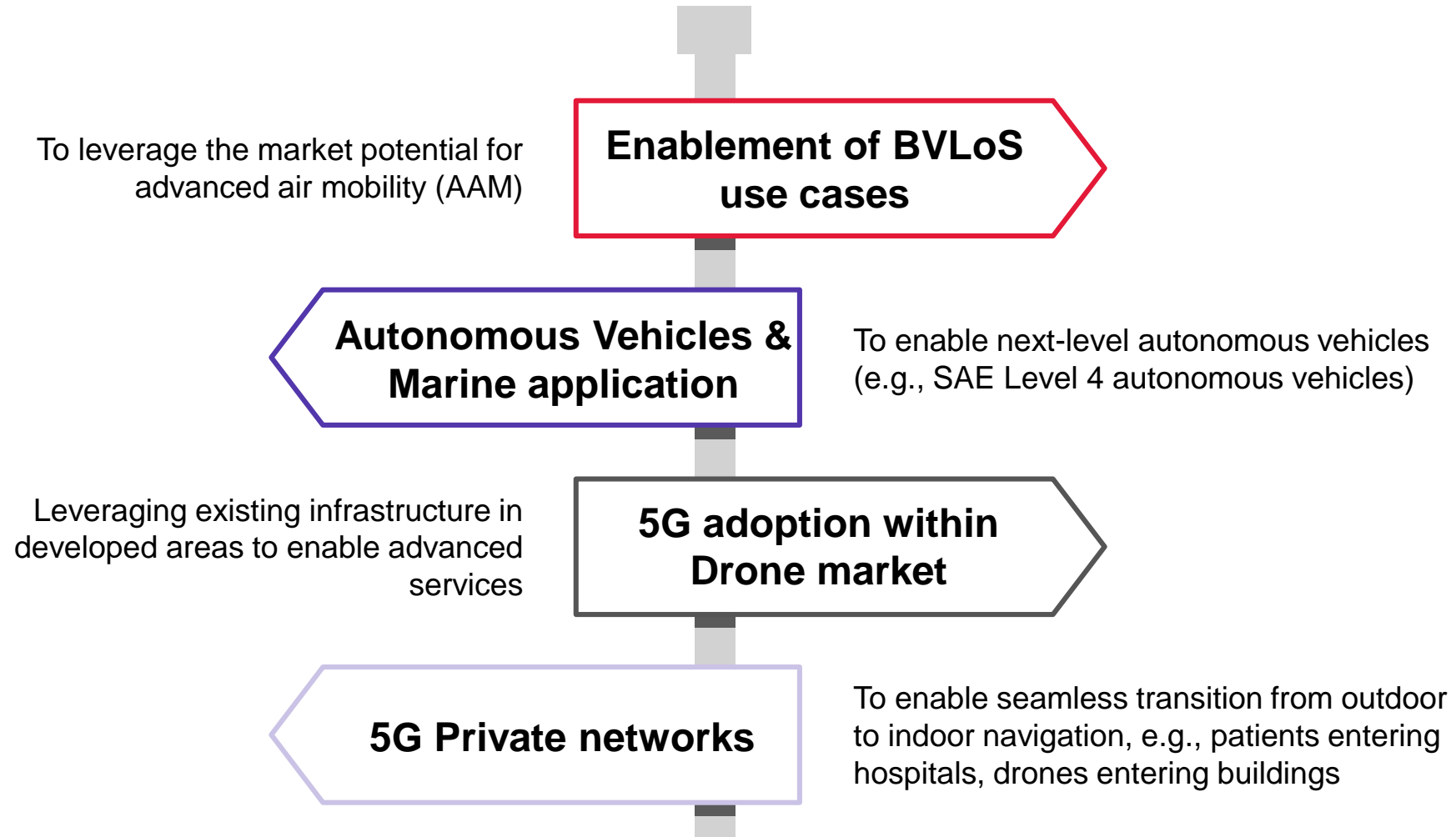
Flight trial using real 5G base stations planned for 21st June 2022



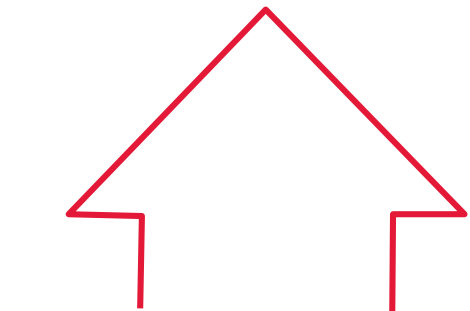
Market Potential



Benefits from eventual service/product – External impact

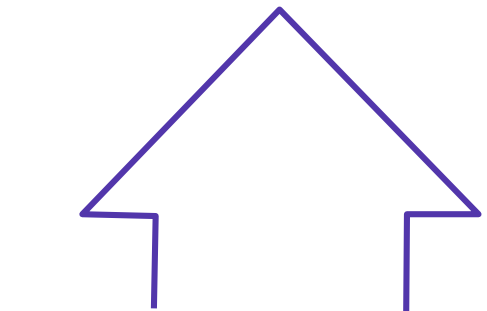


Benefits to CGI

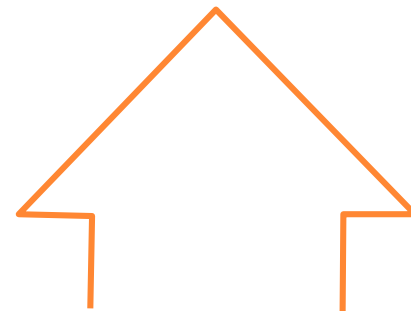


ESA/UKSA Contribution
Funding enabled CGI to develop the proof of concept

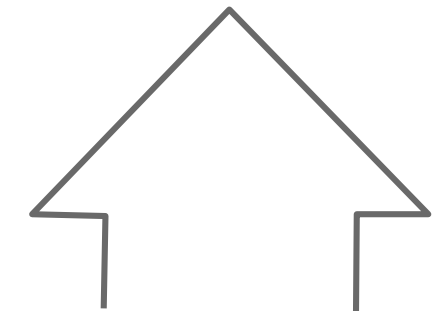
Technical feedback provided during the project offered valuable insights



Hybrid Navigation focus
Forms a key capability in CGI's UAV strategy, which includes secure and assured communications, resiliency against denial-of-service threats, and UTM integration



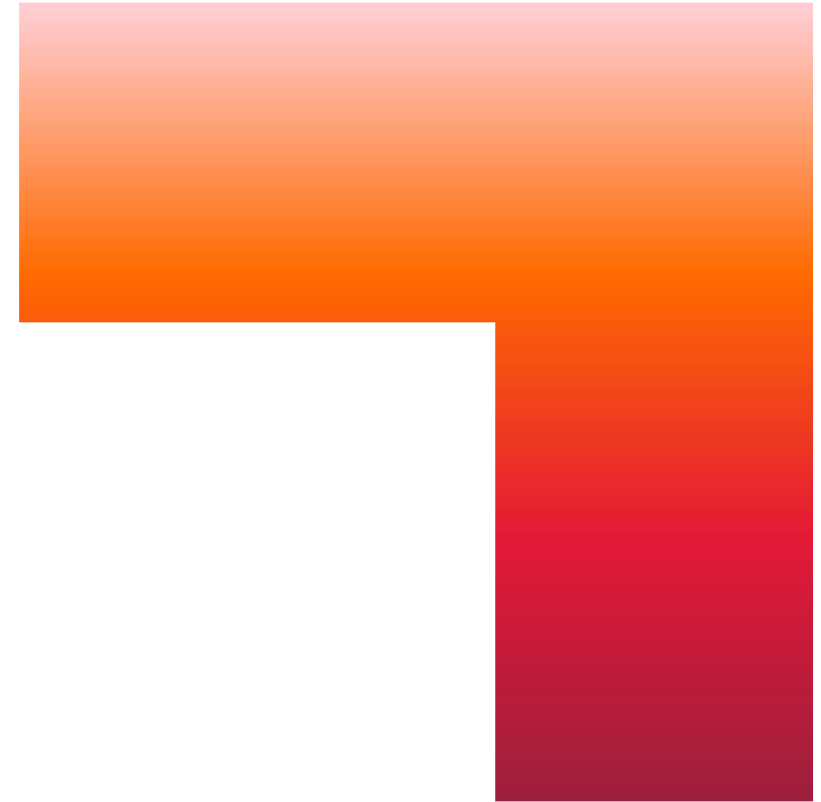
Knowledge Growth
Adds to our experience in spectrum monitoring, signal of opportunity ranging and hybrid navigation and communications solutions



Stakeholder Engagement
Consortium based work enabled rich stakeholder engagement, strengthening project deliverables

CGI thank ESA and the UKSA for their
Support via the NAVISP Element 2
programme

cgi.com



CGI