

# REVEAL



## PROBLEM STATEMENT

Over the last decade, changes in the character of warfare have created new complexities on the battlefield. Our warfighters require capabilities that allow the analysis of several variables while not losing the speed of decision-making. The need for real-time intelligence, surveillance, and reconnaissance (ISR) to make data-driven decisions is at an all-time high.

Teams operating at the tactical edge face even more unique challenges. Their missions often lead them far from headquarters, where access to intelligence support is limited. Despite the ever-increasing data available to decision-makers back at headquarters, operators must often wait for slow-moving intelligence that doesn't match their fast-paced tactical environments.

In non-permissive environments without requisite manning and infrastructure, warfighters must be able to organically process and analyze data at the edge without reliance on backhaul capabilities and bringing scaled processing hardware into the field.

## INTELLIGENCE AT THE TACTICAL EDGE

Farsight by Reveal Technology, Inc. (Reveal) is a software solution that provides disconnected and distributed teams access to actionable ISR, rapid modeling, and advanced analytics at the edge. By automatically processing sensor video data, Farsight builds maneuver-quality real-time 2D mapping and near real-time 3D models. Models are available for post-processing analysis in as little as 2 minutes. All processing is completed at the edge with no network connection required making it unlike any other commercial-off-the-shelf or government-off-the-shelf solution on the market.

Users can perform real-time analysis on models using Farsight's artificial intelligence (AI) toolkit. Available analytics include:

- Line of Sight Analysis
- AI Route Planning
- Digital Elevation Mapping
- HLZ Surveying
- AI Measurement Tool
- Terrain Analysis & Graphing



Farsight is platform agnostic and interoperable with the DoD's legacy, current, and future UAS arsenal. All Farsight-produced modeling and analytics can be integrated into Android Tactical Assault Kit (ATAK) via plug-ins and shared across the tactical network.

Through research and development alongside the DoD, Farsight is designed to have an easy to learn interface, require minimal integration, and be customizable depending on mission requirements.



# TECHNICAL BACKGROUND

## INTELLIGENT REDUCTION OF DATA

Using AI, Farsight reduces the amount of data processed at the end-user device (EUD) or onboard the UAS. First, Farsight intelligently down-selects available data to achieve time and quality-optimal results regardless of the volume. Once all input data is computed on the Farsight platform, the resulting model will be a fraction of the size of the original input data.

When processing data, Farsight initially displays a real-time 2D map of the area for situational awareness and initial tactical planning. Users can then select areas for further analysis. From here, multiple regions of interest (AOIs) can be selected to produce 3D models that support line of sight and the full suite of Farsight capabilities.

By providing the end-user control over AOI selection, operators do not have to make any committed trade-offs between capture area and system time and performance. Data can be collected over a wide area without impacting the user's ability to get focused results. Subsequent areas can quickly get upgraded analysis without requiring costly and redundant data acquisition.



Fig 1: A Farsight generated 2D map of an rural area

These process improvements overcome a perpetual issue for tactical squad's bandwidth. In future near-peer warfare, the United States' traditional information battlespace dominance will not be a given. Embedded ISR solutions that can utilize sparse visual data but still generate actionable intelligence are prerequisites for battlefield success. The ability to be distributed, yet capable, will be a deciding factor in future unit success. Farsight is predicated on patented edge computing techniques, which puts ISR resources within the unit on tactical users' handheld devices, not in a server stack in another timezone. This makes Farsight squads more lethal, more maneuverable, and less vulnerable to SIGINT exploitation.

## OPERATIONAL VIGNETTE

### CENTCOM AOR, UNDISCLOSED LOCATION

Capt Jones and his Rangers are preparing to seize an enemy airfield. Capt Jones sends his JTAC element forward for final pre-mission reconnaissance; the last known ISR coverage of the airfield was over 24 hours ago. The JTAC and his team launch two small Farsight-enabled UAS and they quickly fly over the entire airfield. An up-to-date 2D map of the entire airfield is generated on their handheld devices in real-time. This map is fed into the entire team's ATAK screens. Still in radio silence, Capt Jones notices on his ATAK screen that there are significantly more armored vehicles than previously reported and adjusts his phase lines and attack angles accordingly. Capt Jones' new INFIL and EXFIL routes are sent, alongside the exact MGRS of all relevant objectives to the entire unit.

The JTAC successfully identifies the HQ hangar and tasks his Farsight-enabled UAS to build a 3D model of the facility. Minutes later, Farsight's 3D model allows multiple users back at the last cover and concealment to simultaneously and independently analyze the new target, allowing for rapid planning and movement onto the HQ objective. The team can visually verify building surface composition and updated breach points while wall heights and enemy personnel's line of site data is fed directly into ATAK. With this information, Capt Jones tweaks his final plan of attack before closing with the enemy. The Farsight-enabled Ranger Unit provides Capt Jones with embedded, AI-powered ISR capabilities in a network denied environment.



## MODERNIZATION THROUGH TACTICAL AI

Farsight meets the operational needs of our tactical warfighters and supports the National Defense Strategy (NDS) in modernizing our military to build a more lethal force. The DoD is looking towards ethical AI/ML to maintain a competitive advantage over adversaries in the Indo-Pacific and Russia. The NDS argues the need for advanced, commercial-off-the-self (COTS) AI/ML autonomous capabilities to enhance strategic position and battlefield resilience.

Incorporating AI into models allows operators to make faster, data-driven decisions in high-risk environments by reducing cognitive burden. Farsight delivers applied, tactical AI reducing head-down time and increasing situational awareness to its users.

To support the procurement of COTS AI/ML solutions, the DoD has identified AI and edge computing solutions as high-priority acquisition objectives .



## VISUAL SENSOR BASED MAPPING TECHNIQUES

The ability to build 3D maps without LIDAR equipment allows Farsight to be integrated with almost any sensor with a camera. It also reduces the required payload of future sUAS systems with which squads will deploy. This technology removes the need for endurance-reducing, heavy LIDAR systems on sUAS.

Farsight's 2D and 3D mapping capabilities rest on techniques that stitch together visual information from a UAS's FMV feed. Using visual feature extraction techniques (SIFT), combined with geoinformation (EXIF info or KLV metadata embedded in the video stream) contained in the input imagery, Farsight identifies like images as candidates for the mapping process. These candidate images are then matched and projected over a ground elevation model using ray casting techniques.

## PLATFORM AGNOSTIC

Farsight is designed to work with the spectrum of UAS deployed by the DOD. Users can install Farsight directly onto EUDs or natively onboard the UAS GCS, depending on the tactical need. The platform is compatible with COTS sUAS, like the Parrot Anafi, government of the shelf UAS, like the AeroVironment RQ-20 Puma, and major program of record UAS systems, like MQ-1C Gray Eagle and MQ-9 Reaper.

## HARDWARE & OS ENABLED

Farsight integrates and supports interoperability with various hardware devices already in the DoD's inventory and is operationally proven on Android, Windows, and Linux operating systems. Unlike traditional "platform-based" ISR capabilities, Farsight is a software-based solution that works with existing deployed sensors and operator-borne technology.



SAMSUNG GALAXY S10



SAMSUNG GALAXY S20



PANASONIC TOUGHBOOK



GAMING LAPTOPS

## INTEGRATIONS

ATAK has become a standard across the broader DoD and USG security enterprises. Its ability to reduce comms loads, provide up-to-date blue-force tracking, and integrate with a wide range of sensors and capabilities have made it an essential Farsight feature. The Farsight Android Plugin allows operators to see 3D models laid over operating areas inside of ATAK. Maps, line of sight, and other features can be shared via ATAK Server or radio networks to teammates without needing access to the raw video data.

## EXPORTABLE

Operators can directly export files generated in Farsight to ATAK and other DOD programs. Farsight exports in common GIS formats, including KML, KMZ, and GeoTIFF.





# ACTIONABLE INTELLIGENCE FOR EVERY SQUAD

## COLLECTION & DATA CAPTURE

Operator launched sUAS or other on-station ISR asset gathers information on a target.

## EDGE DISSEMINATION

Farsight automatically distributes operator annotations and AI-generated insights via the tactical network (i.e., ATAK). Farsight gives operators an organic tool to drastically enhance PED – increasing SA and improving decision-making on the battlefield.



## EDGE PROCESSING

Farsight locally processes UAS FMV into live 2D Maps and 3D models and measurements of selected AOIs. Farsight's suite of AI-based tools conduct LOS analysis on possible targets. Relevant tactical terrain information is presented. All with no network connectivity of backhaul required.

## EDGE EXPLOITATION

The operator consumes AI-generated insights and cueing, adjusts team route planning, fields of fire, breach locations, or INFIL and EXFIL routes, all with no need to consume a raw FMV feed.



# PLATFORM CAPABILITIES

## REAL-TIME 2D MAPPING

Operators on the tactical edge, in signal-denied environments, often use sUAS for operational ISR. With Farsight, operators equipped with an sUAS and mobile device can launch and immediately access on-demand intelligence with as much range as the UAS allows. This eliminates dependencies on larger ISR platforms and increases situational awareness.



Fig 3: A Farsight generated 2D map of an urban region near Idlib, Syria.



Fig 4: A Farsight generated 3D model of a the same urban center in Idlib, Syria.

## NEAR REAL-TIME 3D MAPPING

Farsight gives operators near-real-time 3D (NRT3D) mapping capabilities in the palm of their hands. Models are available to users in as little as 2 minutes. Accurate 3D mapping helps to streamline mission planning.

## LINE OF SIGHT ANALYSIS

Once 3D modeling of an AOI is achieved, users can utilize Farsight's line of sight (LOS) tool to quickly understand vantage points. Whether using LOS to avoid detection on a reconnaissance mission or to specifically plan a diversion, Farsight allows the tactical teams to be more creative on the battlefield.

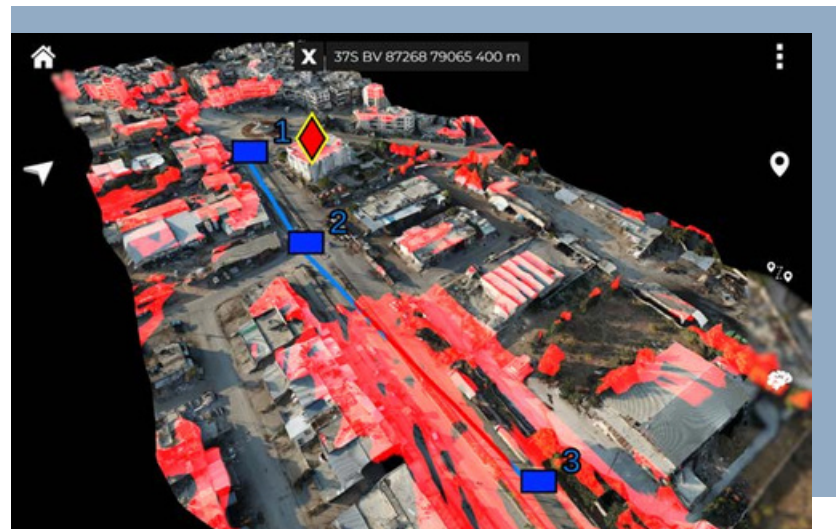


Fig 5: In this image, red force personnel, located at red diamond one, have their field of view overlaid on a 3D model of the urban battlespace. The blue troop commander has placed a proposed route down the street, (blue squares) but it is clearly within the red force's line of sight.

## ROUTE PLANNING

Once a 3D model has been processed, users can drop routes, phase lines, and other maneuver mechanics right into the model. Operators can assess and then push planned routes into ATAK. If LOS analysis has been run, the route will be evaluated for enemy awareness, giving team leads the information necessary to move covertly through the battlefield.



Fig 6: The team leader has created a new route in Farsight. All route information MGRS, elevation data, and other relevant information can then be transmitted to ATAK.



Fig 7: Farsight-generated route showing AI Route Planning Tool. This route keeps blue forces out of the OPFOR's line of sight.

## AI ROUTE PLANNING

Farsight's AI Route Planning tool intelligently suggests the most advantageous path from Point A to Point B. Routes are suggested based on maximum concealment (avoiding the LOS of an enemy) and terrain.

## ROUTE TERRAIN ANALYSIS & GRAPHING

Farsight's AI is constantly analyzing the terrain in your AOR. Recently constructed route lines can be assessed on the end-user device for elevation, grade changes, and more. User-generated routes can be rapidly analyzed and evaluated at a glance for ease of movement, micro-terrain features, and concealment.



Fig 8: A blue force user is assessing the elevation an enemy (red route) will cross as they ingress towards the blue forces' proposed HLZ.

## HLZ SURVEYING

Forward operators are often tasked with conducting HLZ surveys in advance of an operation. Rather than sending an element forward just for an HLZ survey, Farsight allows users to conduct HLZ surveys, record grid information, and transfer to air assets via ATAK in real time. Farsight considers doctrinal limits and airframe capabilities to suggest HLZ locations. Users can input the size of the landing zone required and the maximum allowable slope to find a Farsight-suggested HLZ on appropriate clearings or rooftops.

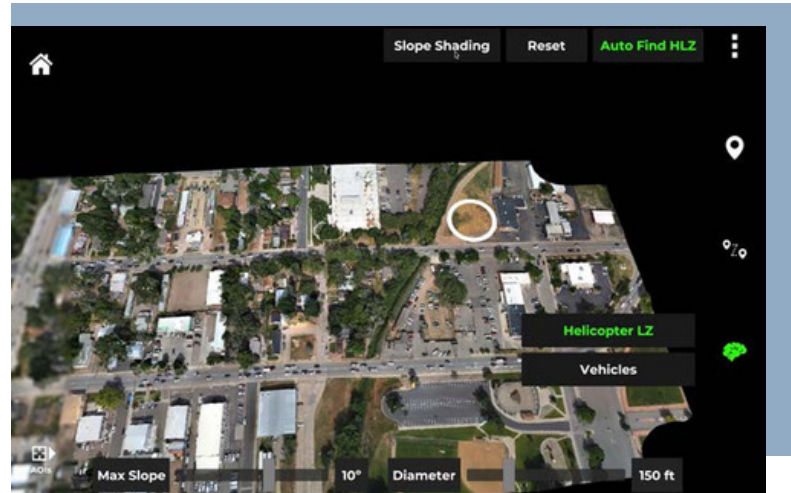


Fig 9: Based on doctrinal limits, AI has identified one area in the top right that is suitable for this team's helo.



Fig 10: Using the AI Measurement Tool, Farsight measures the length, height, and diagonal from a specific point.

## AI MEASUREMENT TOOL

Using the AI Measurement Tool, operators can rapidly mission plan knowing the barriers in their environment. When analyzing 3D models, users can easily measure building heights, angle of inclination, length of roads, and more.

## ATAK STREAMING UAS WORKFLOWS

Farsight is built to keep operators in the fight instead of heads down. Farsight integrates with various ATAK streaming UAS workflows to stream, record, and process data generated by a massive variety of UAS, ground controllers, and software integrations.

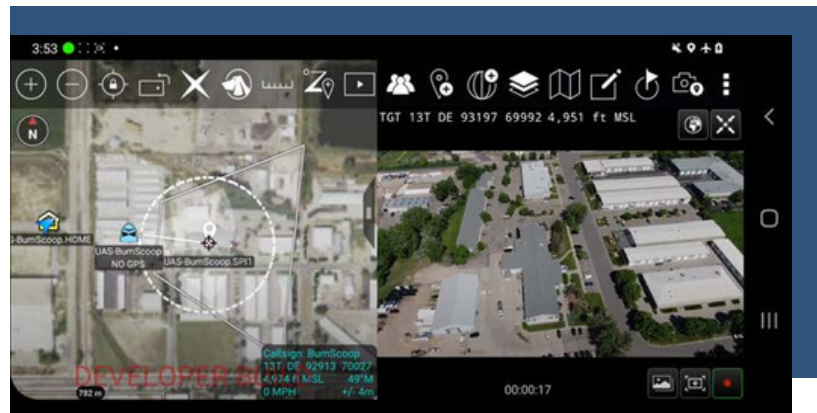


Fig 11: An example of a UAS plugin tool within the ATAK environment. Farsight integrates with a variety of ATAK Streaming UAS workflows.

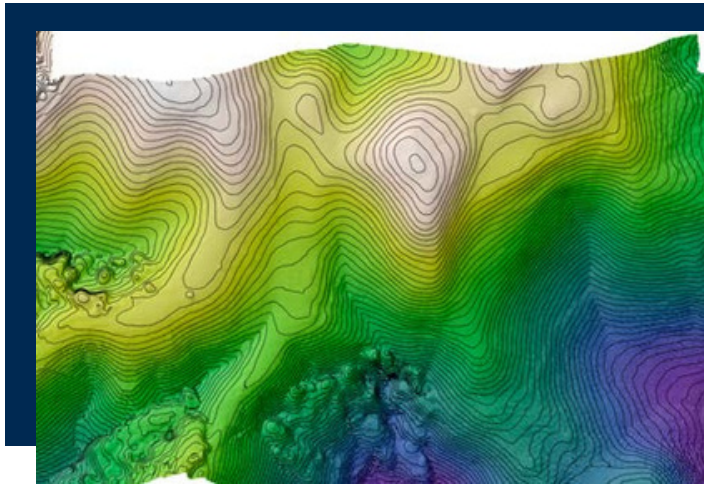


Fig 12: Farsight produced digital elevation map (DEM)

## DIGITAL ELEVATION MAPPING

In addition to modeling capabilities, Farsight can export high-resolution digital elevation maps (DEMs). DEMs are useful in both the planning and execution phases of operations. DEMs can allow operators surveying a valley to locate advantageous micro terrain prior to an assault. Slight elevations can be used to establish sniper positions, identify useful cover, and plan phase lines and fields of fire. DEMs can also be used to assess the viability of ridge ascents or other terrain features during an operation.

## RAW MEDIA INTERROGATION

Users can access visual snapshots of placed points, landing zones, and routes for further interrogation using Farsight's Raw Media feature. All user-placed markers are inserted in the images to assist with orientation and analysis.



Figure 13: The user is analyzing the raw media images of an HLZ. The landing zone is marked in all the raw images.

## OPERATIONAL VIGNETTE

INDOPACOM AOR, UNDISCLOSED LOCATION. 23,000 FEET, SOUTH CHINA SEA.

SFC Evans and his four-man sniper team prepare their kits for a HAHO jump. The two, two-man teams are tasked with verifying pre-mission planning for tomorrow's assault on a key red force military leadership compound. Each jumper packs a small, backpack portable Farsight-enabled sUAS.

On the ground and within 10 minutes of launching their sUAS, both teams have high-quality 2D mapping of the battlespace, 3D models of the surrounding area, and have used digital elevation maps to set up advantageous sniper positions. This has been accomplished without an ISR stack and a backhaul connection to CONUS. Satisfied with the updated mapping, the sniper teams begin to use the sUAS to locate possible enemy locations. Once located, the possible targets are updated in ATAK, marked on the soldiers' Augmented Reality visor, and transmitted to the Air Force.

The team then maps out the beach landing zone and uses Farsight's AI Route Planning Tool to highlight the most advantageous routes from the shore to the objectives. That information is also loaded into ATAK and shared with the units on the ships moving toward the island.

Thanks to the intel provided by the advance sniper teams, all assault force elements are able to decisively verify all pre-mission requirements to launch. They've made significant changes to the EAP, INFIL and EXFIL routes, and have a better understanding of enemy force disposition, greatly reducing the risk to the force and increasing the efficiency and effectiveness of the assault force.











# FARSIGHT CONFIGURATIONS

The Reveal team has worked alongside numerous DOD partners to develop other configurations in support of ever-changing operational needs. Each configuration builds off the core solution and adds specific capabilities based on end-user demand. These configurations come in two flavors: **Farsight Mobile** and **Farsight Node**.

## FARSIGHT MOBILE









DEPLOYED ON SMARTPHONE & TABLETS

-  High-Fidelity Data Processing
-  Real-Time 2D Mapping
-  Near Real-Time 3D Modeling
-  Tactical AI Tool Kit
-  Integrated with ATAK
-  Compatible with EO & IR
-  Hardware & OS Agnostic
-  No network connection required

- ✓ Processed locally on End-User Devices
- ✓ Squad-embedded ISR capability
- ✓ Drastically reduces SIGINT signature

## FARSIGHT NODE

DEPLOYED ON COMPUTER DEVICES

-  High-Fidelity Data Processing
-  Real-Time 2D Mapping
-  Near Real-Time 3D Modeling
-  Tactical AI Tool Kit
-  Exportable to TAK
-  Compatible with EO & IR
-  Hardware & OS Agnostic
-  No network connection required

- ✓ TOC-based enterprise level compute
- ✓ Rapid mission planning capability
- ✓ Wide area, high volume mapping

## SOLE SOURCE ELIGIBLE

Reveal Technology, Inc. was awarded an SBIR Phase II with the United States Air Force. Under SBIR/STTR Policy Directive, Reveal is now eligible to receive sole-sourced awards from any US Government Agency.

Eligibility under this policy directive allows customers with a mission need for Farsight to bypass competition requirements. This drastically reduces the acquisition timeline and enables Farsight to get into the hands of operators faster. There are no restrictions on the contract vehicle (firm-fixed-price, IDIQ, cost, etc.), so we are able to work with our customers to develop a scope that meets their strategic need with reduced contracting documentation.

## WANT MORE INFO?

Contact Dave Caudle at [dave@revealtech.ai](mailto:dave@revealtech.ai)

