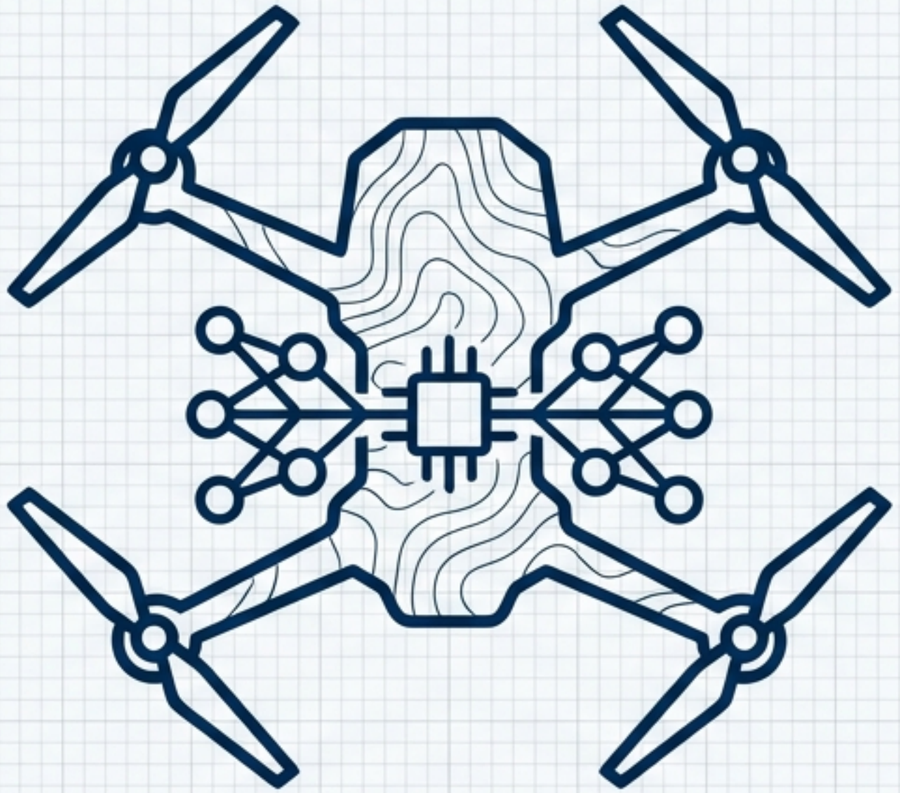
Operation Geo-Synth

The 25-Day AI Drone Mapping Sprint: Strategic Plan & Execution Blueprint



January 2024 | Confidential

The Mission Objective

Develop and deploy a complete, end-to-end AI pipeline for automated feature extraction from high-resolution drone imagery.

Key Parameters

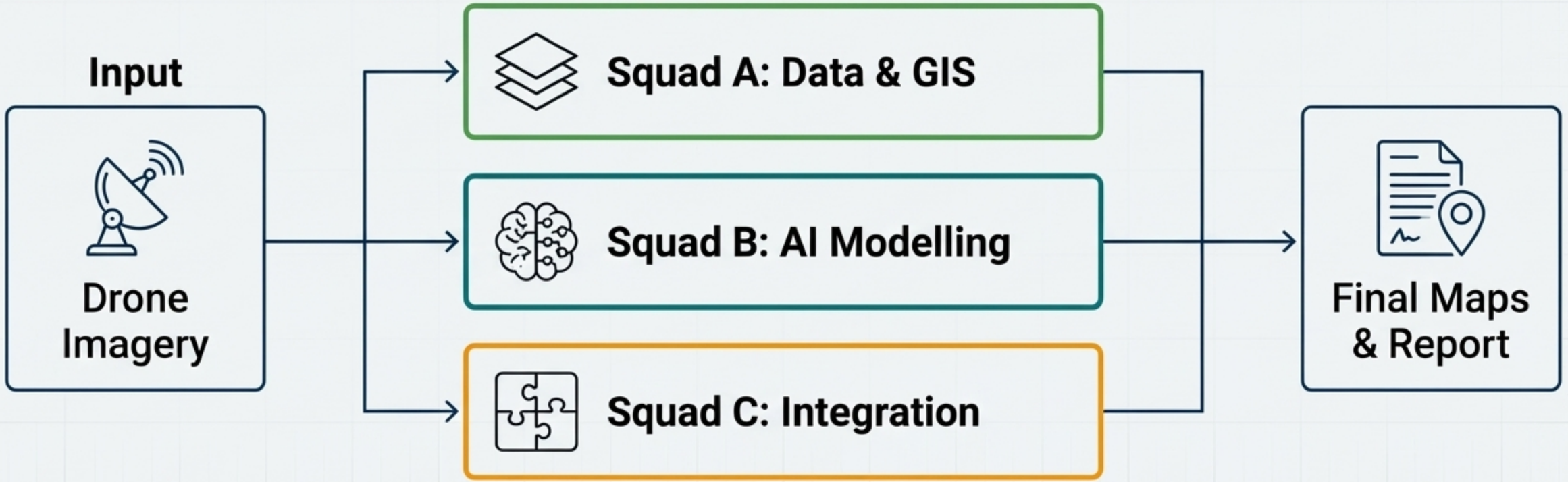
Unit Strength: 8 Specialists

Operational Window:
25 Days (3 Jan – 27 Jan)

Primary Target:
Production-ready models and a repeatable workflow.

Our Strategy: Specialise to Succeed

To meet our aggressive deadline, we cannot be generalists. We will operate as three distinct, specialised squads, each mastering their domain to ensure parallel progress and flawless integration. Speed is **key**, and this is a hackathon-style schedule.



Unit Briefing: Squad A (The Map Makers)

Data & GIS Dominance

Personnel: 2 Members

Core Directive: To process, slice, and reassemble the vast geographical source data, serving as the pipeline's input and output custodians.

Must-Master Arsenal

Tools

- QGIS
- Google Earth Pro

Code

Python: `Rasterio`, `GDAL` (crucial for reading geographical data)

Concept

Sliding Window Tiling & Stitching

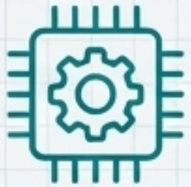
Unit Briefing: Squad B (The Brain Builders)

AI Model Development

Personnel: 4 Members (Organised as two specialist pairs)

Core Directive: To train, tune, and validate a suite of computer vision models to identify and delineate key features with high accuracy.

Must-Master Arsenal



Platforms

Google Colab
Roboflow
CVAT

Code

Python: `PyTorch`, `Ultralytics YOLOv8` library

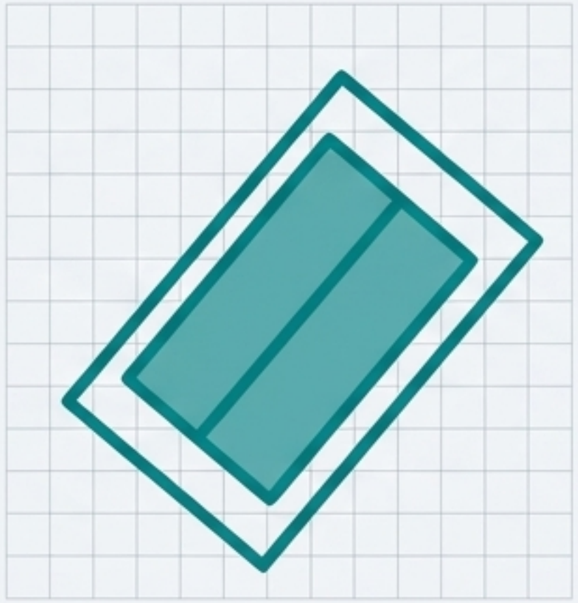
Concept

Transfer Learning & Data Augmentation

Squad B: Dual-Front Engagement

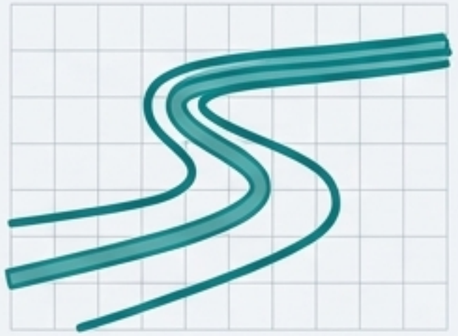
Target: Building Footprints

Model: Mask R-CNN



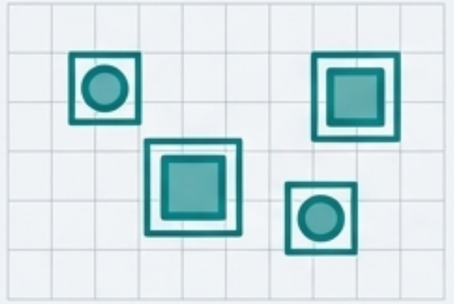
Target: Roads & Water

Model: U-Net



Target: Tanks & Wells

Model: YOLO



Unit Briefing: Squad C (The Integrators)

Pipeline & Reporting

Personnel: 2 Members

Core Directive: To architect the end-to-end workflow, connect all components, and translate our technical success into a compelling final report and presentation.

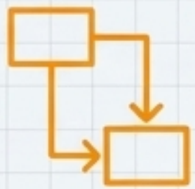
Must-Master Arsenal

Tools

PowerPoint/Canva
GitHub

Code

Python Scripting



Concept

End-to-End Pipeline Automation & Documentation

The 4-Week Engagement Plan

	Week 1 (Jan 3-10)	Week 2 (Jan 11-17)	Week 3 (Jan 18-24)	Final Days (Jan 25-27)
Squad A Map Makers	Prep Training Data: Download & Tile	Finalise Data Slicing	Create Stitching Script	Generate Final Maps
Squad B Brain Builders	Setup & Initial Annotation	Train Draft Models (v1)	Refine Models: Augment & Tune	Package Final Weights
Squad C Integrators	Repo & Doc Foundation	Develop Prediction Saving Script	Full Pipeline Test & Metrics	Finalise Report & Deck

Tiled Data

Model Predictions

Phase 1: Environment & Setup (Jan 3 – 10)

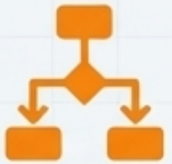
Goal:* Establish a functional environment and process initial test data.

Squad A (Map Makers)

- Download the 10 training villages' data.
- Write the initial Python script to chop one large image into tiles.

Squad B (Brain Builders)

- Set up Google Colab environment.
- Watch tutorials: "Train YOLOv8 on Custom Data" & "Train U-Net on Satellite Images."
- Annotate the first 50 test images in CVAT to validate the process.



Squad C (Integrators)

- Create the GitHub repository for all project code.
- Draft the "Problem Statement" section of the final report.

Phase 2: The Training Phase (Jan 11 – 17)

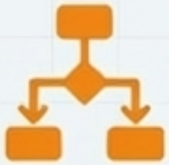
Goal: Achieve a working ‘draft’ of each AI model. Functionality over perfection is the priority.

Squad A (Map Makers)

- Finish slicing the image data for all 10 villages.
- Assist Squad B with data annotation to accelerate data preparation.

Squad B (Brain Builders)

- Pair 1: Train the initial Mask R-CNN model for buildings.
- Pair 2: Train the initial YOLO model for Wells/Tanks.



Squad C (Integrators)

- Develop the Python script to take model predictions from Squad B and save them as result files.

Success Metric: Models can successfully identify a target feature (e.g., a house) in a test image, even if the output is not yet precise.

Phase 3: Refinement & Integration (Jan 18 – 24)

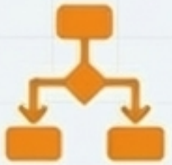
Goal: Push model accuracy to the target (>95%) and achieve the first full pipeline run.

Squad A (Map Makers)

- Write the 'stitching' script to reassemble the predicted tiles back into a single, large GeoTIFF map.

Squad B (Brain Builders)

- Tune models with augmented data (e.g., rotated images).
- Add more training data for confusing areas (e.g., ‘Roads’ vs. ‘Empty Land’).



Squad C (Integrators)

- Run the full, end-to-end pipeline on the validation dataset.
- Calculate the official Accuracy % metrics for the final report.

Phase 4: Finalisation & Delivery (Jan 25 – 27)

Goal: Package all components for a clean and professional final handover.

Key Directives:

- **All Squads:** A hard code freeze is in effect from 26 January. No further model or script changes.

Squad A (Map Makers)

- Generate the final, high-quality output maps for all 10 villages.

Squad B (Brain Builders)

- Package and save the final, trained model weights.

Squad C (Integrators)

- Finalise the PowerPoint presentation and PDF report, ensuring the 'Accuracy Metrics' slide is clear and impressive.

Victory Conditions: Final Deliverables

Final Maps: 10 complete GeoTIFF output maps showing extracted features.

Trained AI Models: Finalised weights for the Mask R-CNN, U-Net, and YOLO models.

Project Report: A comprehensive PDF and PPT documenting the process, methodology, and results, including accuracy metrics.

Code Repository: A fully documented, repeatable pipeline on GitHub.

Immediate Action Required: Form Squads

Roles will be assigned based on primary expertise and interest.

Squad A (The Map Makers)

Who here excels with maps and geographic data?

Squad B (The Brain Builders)

Who here excels with mathematics, statistics, and model building?

Squad C (The Integrators)

Who here excels with writing, organisation, and process management?

Let’s Begin.