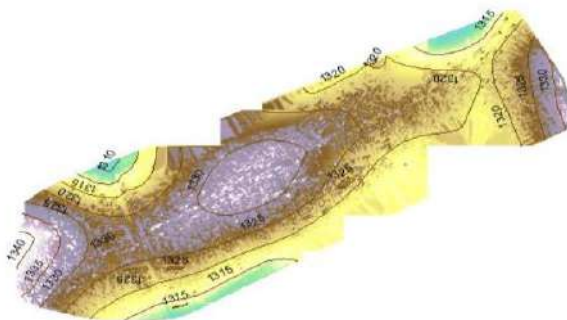


Nakivale refugee settlement mapping for infrastructural planning and development



Orthomosaic aerial image generated in Pix4Dmapper



Contour map and DSM



Uganda Flying Labs team surrounded by local community during flight

OVERVIEW

Flying Labs	Uganda Flying Labs
Geographic area	Nakivale Refugee Settlement, Isingiro District (Uganda)
Date	16 - 18 February 2020
Sector program	AidRobotics
Main SDG	Goal 10: Reduced Inequality

SCOPE	
Stakeholders (clients)	ALIGHT Former (American Refugee Committee Uganda)
Beneficiaries	Refugees in Nakivale and the Office of the Prime Minister
Challenge	Nakivale refugee settlement is located in Isingiro district in western Uganda and is seated on over 185 square kilometers of land. Political instability in the neighboring regions and the proximity of Nakivale camp resulted in an increase of refugee influx as of December 2019. The existing infrastructure was insufficient to cater for the increase in the refugee influx and could put the community at a higher risk for COVID19 spread. Development of infrastructure, land use and buildings was difficult due the lack of up-to-date geographic information. The latest map to be published of Nakivale refugee settlement was from July 2018.
Scope	The scope of the project was to map 12 different grounds in the refugee camp with centimeter level precision. This was to identify the existing infrastructure and land use and allow the client to plan for future infrastructure, schools, land use and reception centers to accommodate for the increased influx of refugees. We mapped 1.95 square kilometers of the total area of 185 square kilometers, which includes the 12 different grounds.
Outcome	<p>The methodological approach was divided into five steps:</p> <ol style="list-style-type: none"> 1. Community engagement 2. Site visit 3. Flight mission planning 4. Drone data acquisition 5. Data processing and analysis <p>The data analysis provided high quality 2D and 3D data products such as orthomosaic images, which were used by the client to identify the existing infrastructure and map the land use. The client was able to determine expansion areas to cater for the influx and also the DSM was used to analyse and understand the terrain for infrastructure planning.</p>
Next steps	<ol style="list-style-type: none"> 1: Support the client in their efforts to decongest the camp as a response to COVID-19. 2: Identify free land to move the refugees into those areas, using the map that was created. 3: Identify water and sanitation points, health facilities and access to roads.

COMMUNITY ENGAGEMENT AND STAKEHOLDER SUPPORT	
Consent for data acquisition	ALIGHT has great ties with the Office of the Prime minister as they were granted permission to capture images and alongside were vetted for security clearance.
Activities to engage with the community	The community engagement was mostly done by our client.
Community groups engaged with	The community groups in the refugee camp were Children, adults, professionals who work with the refugee camp and service providers
Community attendance	The meeting that was held before the start of work had 35 people (representatives from different villages within the camp).
Community feedback	The community was excited, especially children because they were exposed to a drone. However, the ultimate goal was to identify areas that would be suitable for building schools for the community. Development is always cherished in such an environment.
Stakeholder support	not relevant

DATA ACQUISITION	
Size of area	195 ha (1.95 sq km)
Drone	DJI Phantom 4
Sensor(s)	DJI Phantom camera (RGB)
Flight plan software	DroneDeploy
Flight height	50 m above ground
GSD (Accuracy)	2.68 cm/pix
Number of images acquired	4000
Number of flights	9
Time invested in data acquisition	3.5 hours
Georeferencing	Onboard GPS

DATA PROCESSING & ANALYSIS	
Processing software	Pix4Dmapper
Processing time	140 hours
Data products	Orthomosaic, DSM and 3D mesh
Analysis tools	ArcGIS Desktop
Analysis outputs	Contour map
Final outputs shared with stakeholders	Orthomosaic, DSM and 3D mesh
Data sharing	Hard Drive