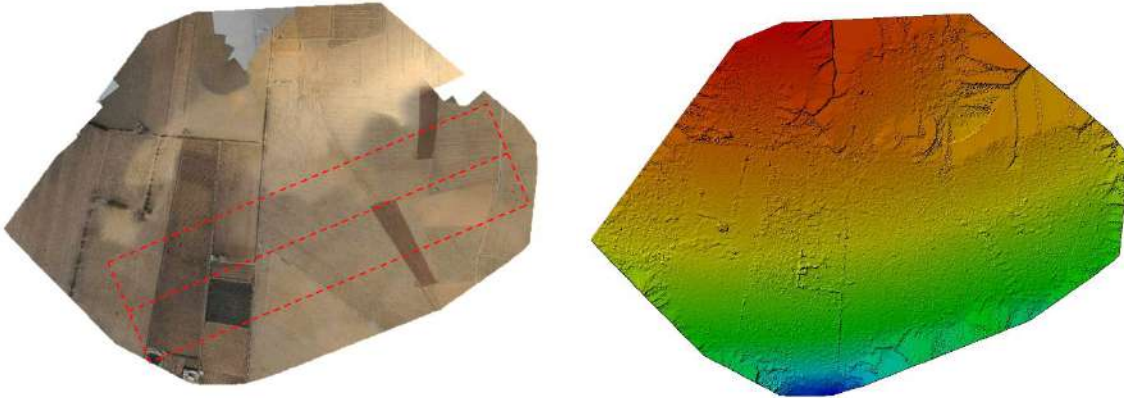


Mapping pilot project for inaccessible terrain in Moroccan remote areas



Orthomosaic and DSM of second flight area



Point cloud sample view of the target field

OVERVIEW	
Flying Labs	Morocco Flying Labs
Geographic area	Oriental region in Morocco
Date range	September 2018 - January 2019
Sector program	DevRobotics
Main SDGs	GOAL 6: Clean Water and Sanitation GOAL 7: Affordable and Clean Energy GOAL 8: Decent Work and Economic Growth GOAL 9: Industry, Innovation and Infrastructure

SCOPE	
Project stakeholders	ATLAN Space is the donor. Cegelec, a subsidiary of Vinci is the client.
Beneficiaries	About 1000 civil engineering companies in Morocco can benefit from this case study and deploy drone technologies in a more reliable way.
Challenge	Many infrastructure projects in remote Moroccan areas need expensive terrain surveys in difficult terrain. During the planning phase, a quick and low cost survey method is needed.
Scope	<p>This pilot was conducted for an electrification project where a land survey by drone was tested for use during the planning phase. The drone survey was expected to output DSM using photogrammetry.</p> <p>A terrain that was already surveyed by Cegelec has been identified for the project in order to compare the drone results with the existing “ground truth” measured elevation.</p> <p>The scope of the project included:</p> <ul style="list-style-type: none"> - Compare drone photogrammetry to other existing solutions for mapping/land survey - Demonstrate the use of drones operating BVLOS safely with up to 40km distance from takeoff site. - Check compatibility of output with existing engineering software - Identify success factors and difficulties
Outcome	<ul style="list-style-type: none"> - ATLAN Core unit is a mission controller embedded to the drone and connected to the flight controller. It enables BVLOS features with limited or intermittent connectivity. It was provided by ATLAN Space and used to demonstrate safe flight outside telemetry range. - The weather was not favorable - in the flight windows of only 3 days we had 12-15m/s winds and light rain. - Terrain was not favorable for runway takeoff and landing. It was sandy and did put a lot of resistance on the landing gear during takeoff. During landing, we chose deep stall landing to avoid damaging the airframe as the sand blocks the gears and provoques tipping. - Photo tagging tools were developed and used by ATLAN Space as we were not using off-the-shelf RTK/PPK solutions - The results were however satisfying even in non-optimal conditions
Impact	Remote terrain survey using drones will be more accessible, proven, and replicable for Moroccan Civil engineering companies

Next steps	<p>Development of a commercial drone mapping product using photogrammetry that is economically viable to sustain the deployment of the technology demonstrated during the pilot project.</p> <p>Adaptation to fixed wings VTOL (Vertical TakeOff and Landing) technology for enhanced logistics</p>
-------------------	---

COMMUNITY ENGAGEMENT

Activities to engage with the community	<p>At the beginning of the project, official meetings were held with Cegelec at their headquarters. They represent a typical civil engineering company in Morocco so we wanted to understand their needs and challenges.</p> <p>We also met with local authorities at their office in Ain Sfa. Other on-site meetings were held with the land owner of the take-off site and law enforcement representatives before flights.</p>
Community groups engaged with	Government officials, community in general
Community feedback	Cegelec were very satisfied with the results. They even exceeded their expectations. The output formats were tested and found compatible with their tools and workflows.

DATA ACQUISITION

Size of area	100ha (1sqkm)
Drone	Custom build of Volantex Ranger Ex 757-3 with ATLAN Space avionics and payload
Sensor(s)	Canon RGB 20Mpx
Flight plan software	ATLAN Core
Flight height	200m above ground
GSD (Accuracy)	5 cm/pix
Number of images acquired	616
Number of flights	2
Time invested in data acquisition	30 minutes of in-flight data acquisition
Georeferencing	Georeferencing was used using both RTK and PPK using Here+ equipped with uBlox M8P modules. GCPs were also used to confirm results.

DATA PROCESSING & ANALYSIS	
Processing software	Pix4Dmapper
Processing time	3 hours
Data products	Orthomosaic GeoTiff, DSM Tiff, point cloud LAZ, 3D mesh OBJ/FBX
Analysis tools	-
Analysis outputs	-
Final outputs shared with stakeholders	All data products above
Data sharing	Cloud storage service