

FIG
2018
ISTANBUL



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XVI FIG Congress 2018
6-11 May 2018
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FIG Congress 2018



EMBRACING OUR SMART WORLD WHERE THE CONTINENTS CONNECT:
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Unmanned Aerial Vehicle (UAV) Photogrammetry, Observing, Analysing and Reporting of the Big Construction Projects, Ethiopia Application

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UAV Photogrammetry

- widely-used in Turkey and World in recent years
- the capabilities of UAV platforms increase in parallel with the scale of projects



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Ethiopia Railway Project

- Starting from the North-East of Awash city and arriving at Weldia through the city of Kombolcha

- All works including;
 - design, construction,
 - earthworks, viaducts, bridges,
 - tunnels, trackworks,
 - passenger stations, depot ,
 - workshop, power supply, catenary,
 - signalling, telecommunication etc.

were completed by Turkish **Construction Company (Yapı Merkezi)**





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Why the project needed?

- Early detection of erroneous construction
- Controlling payments
- Linking the building process with the project calendar
- Contributing to team / equipment plan
- More effective management of the project budget

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Determination of Project Requirements

- Project purpose
- Project size
- Topography and wheather conditions,
- civil aviation regulation
- Targeted accuracy
- Project duration
- Project budget
- Expected products

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Why we prefer UAV photogrammetry?

- Mobilization
- Basic Operation
- Getting Flight Permits
- Affected less than weather conditions

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Period of Flights?

Flights were realized at intervals of two months

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Project Parameters

Parameter	Value
Project Length	270km
Corridor Width	80 m-340 m
Photo GSD	<5 cm
Flight Height	205m
Target Accuracy	<10 cm (horizontal and vertical)
Flight Lines	3 lines on route axis
GCP interval	500 meters

Project Phases

- Jeodetic Works
- Preparation of Flight Plans
- Flight
- Photogrammetric Data Process Activities
 - Radiometric Enhancement of Images
 - Block Adjustment and Aerial Triangulation
 - Point Cloud Generation
 - Point Cloud Classification and Digital Terrain Model (DTM) Generation
 - Orthophoto Production
- Calculate the Volume of Cut/Fill and Analyzing & Reporting



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UAV and Flight Characteristics

Parameter	Value
Duration of the Flight	160 minutes
Camera / Sensor	Sony A6000
Data Link Distance	40 km
Launch	Catapult
Landing	Parachute / Belly (skid) landing
Body frame material	Carbon/Kevlar
Operating Speed	60 km/h
Operating Temperature	-25C between +45C
GNSS System	L1&L2 PPK



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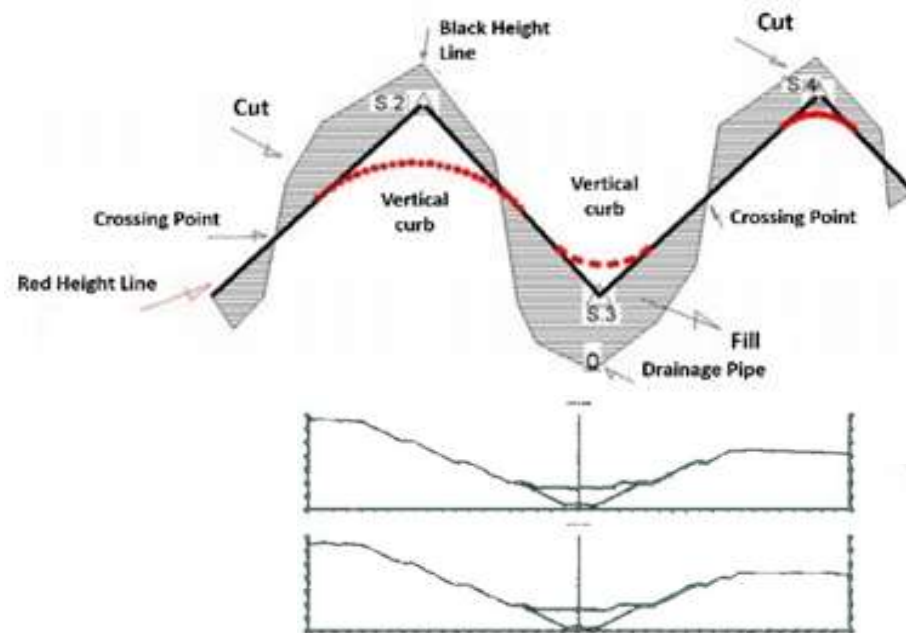


Softwares

- **Pix4D**
 - Bundle Block Adjustment & Point Cloud/DSM / Orthophoto Generation
- **Terrasolid**
 - Point Cloud Classification & Key Points Generation
- **Microstation**
 - Vector editing
- **LPS (Leica Photogrammetry Suite)**
 - Stereo Drawing
- **Bentley InRoads**
 - Section Drawing a& Volume Calculating

Calculate the Volume of Cut/Fill Analysing & Reporting

- Volume calculating method with parallel sections,
- The cross sections with 5m intervals,
- Calculated volumes by using existing excavation level, design level and raw terrain level,
- Reported for every flights on each kilometer basis



CONCLUSIONS

from the perspective of the project

- better planning and made more true decisions
- the possible cost and time losses were prevented
- the high accuracy of the obtained data, time and cost advantages



CONCLUSIONS

from the perspective of UAV photogrammetry

- Faster method for making higher quality, more reliable, and more diversity of products
- UAV based photogrammetry is a serious alternative to conventional photogrammetry.



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Thanks for your attention

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