ANGELSWING

Innovative technology **for all.**

Disaster Workbook

for Immediate and Efficient Disaster Recovery

Last Update: May 11, 2020

ANGELSWING, Inc.

Contents

Preface 2

I. Drone Mapping for Disaster Recovery 4
- Application of Drone Mapping by Stage 4
- Key Values 5

II. What ANGELSWING Can Provide 6
- Key Functions of Our Platform 6
- Value Proposition 6

III. Case Study 10
- Palu, Indonesia (September 2018) 10
- Kathmandu, Nepal (April 2015) 11

IV. How to Request Free Accounts 13
- Process 13
- In Case You Don’t Have a Drone Pilot 14
- Be Our Partner 15
  - Drone Pilot 15
  - Experts & Specialists 15
- Fund Our Projects 15
- Contact Points 16

Preface

"Drone data solution company that makes accessible and affordable drone data service in Asia"

Angelswing was founded with the mission of '*Innovative Technology for All*'. The seed that grew to become Angelswing was planted following the events of the deadly earthquake in Nepal. As we watched from afar the destructions of cities, we wondered if there was something we could do. Roads were broken, buildings had collapsed, and all means of transportation and communication suffered. Nepal required a solution that could leapfrog the ruins.

This is where our relationship with drones first formed. Drones could not only physically overcome the chaos of ground infrastructure, but could also collect crucial data needed for disaster recovery. Today, this mission still holds as we continue to share our solution with those in need. The reach of technology should not be discriminatory; it is *for all* to experience.

With the mission in mind, Angelswing continuously works on disaster projects for helping the affected regions. Though we've got some experience, for drone data to be used more effectively during/after the disaster situation, the scope of work and expected outcome should be well defined in advance. Also, for data analysis, we need expertise including geospatial, remote-sensing, earthquake, liquefaction, etc. It means we need hands from organizations/companies out there.

This workbook is created for empowering organizations in charge of disaster response/recovery. They can grasp some ideas to cope with emergent situations with

highly accurate data with Angelswing. It is composed to three sections: why drone mapping can help during the emergency situation, how Angelswing can help, and guide to utilizing Angelswing's drone data platform (which is free for the emergency sites).

To note, this workbook is not the final, but keep edited as per your feedback and requests. So feel free to comment on the docs and contact at info@angelswing.io for any ideas/suggestions/feedbacks. Your comments make us keep proceeding this wonderful work ahead!

I. Drone Mapping for Disaster Recovery

Application of Drone Mapping by Stage

1. Early Stage of Disaster Response

For an effective response, acquiring high-resolution and up-to-date geographic data is critical to make the right decision at the right time. The high-resolution aerial data taken by a drone can be used to detect missing personnel and potential hazards as well as to give disaster manager bird-eye-view(holistic view) of the disaster site. The aerial data can be used as a base map for coordinating the distribution of early aids based on the degree of damage that can be determined from the image.

2. Middle Stage of Disaster Response

Drone can be constantly used to update the regions that have not been covered to find out the damage done by the disaster. The same area can be mapped again to find out the progress of the disaster recovery and it can be shared with other organizations for cooperation. Up-to-date and high-resolution data will provide organizations insights how the target area is damaged and what is most needed in the situation timely.

3. Late Stage of Disaster Response

The data will be used for the base layer during the planning for the reconstruction and rebuilding process. The data can also be used for accurately measuring damage compensation for the local government as well.

Key Values

a. Accurate - Super accurate spatial data can be collected by drone. It is 10~30 times more precise than satellite imagery. You can also view the vivid site as a 3D model with perspective.

b. Timely - Collect the site info at the right time. Even the area that can be dangerous for people to access, a drone can safely obtain the data. Spatial info can be obtained immediately. It is possible to collect area up to 700ha in one day and utilize it for planning the village reconstruction.

c. Easy to Use - Collect the site info at the right time. Even the area that can be dangerous for people to access, a drone can safely obtain the data. Spatial info can be obtained immediately. It is possible to collect area up to 700ha in one day and utilize it for planning the village reconstruction.

II. What ANGELSWING Can Provide

Key Functions of Our Platform

Processed aerial imagery, which can be used to monitor the disaster region with 10~30 times higher resolution than satellite imagery.

- Provide a high-resolution 2D/3D visualization for disaster-affected areas
- Identify and assess the damage (damage location, type, and scale)
- Monitor the progress of disaster recovery
- Provide a channel for real-time information-sharing among multiple stakeholders
- Access accounts for Indonesia to utilize Angelswing site-monitoring platform (Online collaborative platform for geospatial image data processing & visualization)

Value Proposition

a. **Usability**: No file management required (especially useful as the data normally exceeds 3GB), simple and easy-to-use platform lessens the hurdle for high-volume data usage. simple and easy-to-use platform without needing an education. Easy data handling with the platform that lessens the hurdle for big data management.

b. **Visualization**: The platform is specialized in data visualization with the various data types available on one single page. As the timeline data accumulated, the value of data visualization and management just grows.

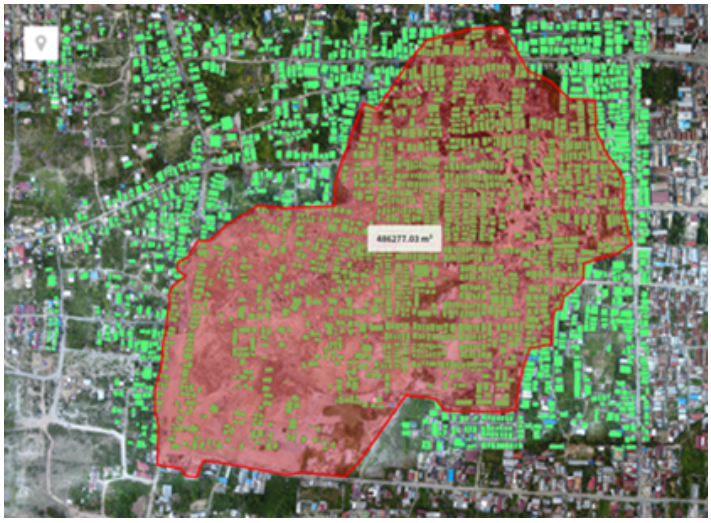
c. **Scalability**: Our “platform’ is based on web and cloud computing, which means you can visualize and manage as many data as you want. Our “platform’ is based on web and cloud computing, which means you can visualize and process data faster than on-premise data processing software. We will help you process data that is too big for you to handle without any hassle.

d. **Analysis**: With the accumulated data and hands-on experiences, computer vision and artificial intelligence gradually implemented for advanced data analysis. With the accumulated data, we are creating, computer-powered vision and artificial intelligence engines that will detect what humans eyes cannot and make the advanced data analysis possible.

Grasp an Idea by Overviewing <Before vs. After>

By using <2-Screen/4-Screen> and <Slider Comparison> features, you can visualize the disaster-affected area with a high-resolution image. 2-screen/4-screen and slider feature allows you to compare a site before and after the disaster at once. If you have previous map data, you can upload to Angelswing platform. If there is no previous map data for the damaged area, we can use a satellite map for comparison.

Easily Get A Disaster Impact Data with Overlay and Measurement



By using <CAD Overlay> feature, If you have GIS/statistics designed files, you can upload and adjust the file size and location. By comparing the previous status data and the current orthomosaic map, you can roughly evaluate the disaster impact. It's a rough data but it's fast to evaluate.

3D Point Cloud Viewer

3D visualization is the best way for you to take a realistic view of the disaster sites. You can grasp the realistic model without much load, which can provide you intuitive information.

Volume Calculation of Solid Wastement

You can measure length, area, volume using angelswing measurement tool. These tool give you information about the area of damage, length of the hole in the house, volume of the waste. Using the measurement you calculate the length, area, volume on your office with Angelswing's platform. You don't have to go to the job site.

III. Case Study

Palu, Indonesia (September 2018)

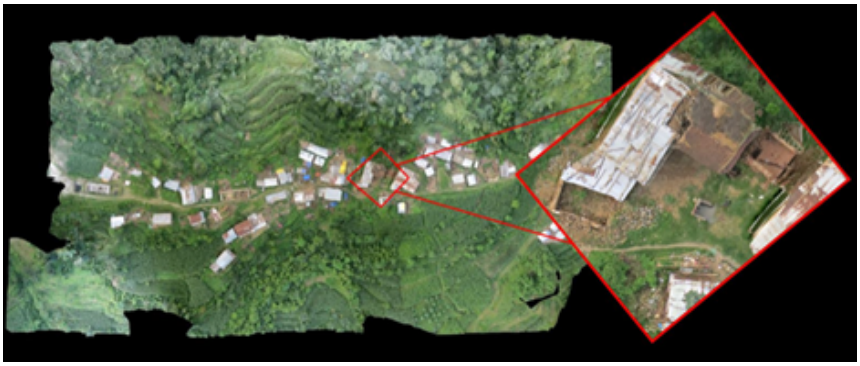
Earthquake and tsunami struck Palu city on September 28 causing thousands of casualties in the Indonesian province of Central Sulawesi. Collaborating with the Green Technology Center, a national think tank of South Korea which promotes green technologies through policy, mitigation and adaptation platforms, and international cooperation, the project aims to map the disaster-impacted area and assess disaster impact to support the development of recovery recommendation to the local government and relevant organizations.

From our on-site field investigation from October 25~27, aerial images were obtained in the area of 3,500ha, covering the main shoreline area struck by the tsunami and several regions damaged by enormous liquefactions. Through the Angelswing's platform, the aerial images were processed to orthomosaic map (4cm per pixel), 3D point clouds, digital surface model. The platform becomes a channel for real-time information-sharing among multiple stakeholders from 6 organizations. The users from

various backgrounds such as GIS, geology, and disaster monitoring, they can collaborate with assessing the damage (location, type, and scale).

For a reliable and lawful approach of data collection, we partnered with two local drone service providers in the city and they keep providing the up-to-date mapping data to the stakeholders.

Kathmandu, Nepal (April 2015)



In 2015 April, Nepal was struck by 7.5-degree earthquake that destroyed buildings and houses in Kathmandu Valley. At least 15 organizations used drones to collect the data and shared with organizations in charge of disaster response. Drones were used to inspect the building's cracks and damages on infrastructures, and mapping the region for damage assessment.

Angelswing has tested the use of drone in disaster in Kuttal Village in Nepal during the year 2015. The generated high-resolution map was given to the authorities for their future uses. Technological seminars were also held at Kathmandu University to promote the usage of drone technology for the disaster response.

Figure 2. The Result of Orthomosaic Analysis

D4: Totally destroyed | D3: Largely damaged, cannot be recoverable

D2: Partially damaged, can be recoverable | D1: Not damaged

Figure 3. Mapped with the camera angle 75'

Facet information can be featured, and more accurate 3D Modeling can be rendered.

IV. How to Request Free Accounts

Process

1. Submit a Request Form

(Link)

2. Create an Account

We will contact you right after we receive the request form and create an account for you.

3. Upload Data on the Platform

Once receiving an email for the account approval, you can upload source photo files directly on the platform. Data processing will complete within 24 hours.

In Case You Don't Have a Drone Pilot

If you don't have drone pilots in your organization or if you can't find someone who can work on data collection for you, please check available drone pilots on our list. If you can't find a drone pilot on our list, you can also request service to us, but please mind that the cost estimate can be expensive.

Below is our service brief:

1. Type of service: Project-based drone data delivery (End-to-end service)
2. Period: 2 weeks for the first operation (Available starting date can be varied by the local/national regulation on drone flight approval)
3. Cost estimate: Depends on the requested area's location and size
4. Activities:
    -
    - Drone flight approval from related authorities (1~15 days, highly tentative)
    - Collection of aerial images (1~5 days depending on the size of the area)
    - Data processing & delivery (1~3 days depending on the output)
    - *(Optional)* Drone mapping training (1~3 days)
        - *This is an option for an organization who wants to keep monitoring the region after receiving our service.*
5. Output:
    - Access accounts to utilize our platform (https://www.angelswing.io/en/) for data processing, viewing, managing, and analyzing.

V. Make an Impact Together

Be Our Partner

By becoming our partner, we can do something together what each one of us can't do.

Drone Pilot

Are you an enthusiastic drone hobbyist or a drone service provider? Register as a drone pilot on your region. When a disaster happens near your region, you can be the most proactive person, and make a huge impact by excelling your talents.

Experts & Specialists

Are you a GIS specialist or a disaster-related field specialist? Be our partner and be one who analyzes the data for actionable insights. Collective research can create a tremendous impact!

Fund Our Projects

We are aiming for making a real impact while helping disaster relief out there. To do so, we need your help. Fund our upcoming projects and be our partner for making an impact together.

Our past clients and donators:

Contact Points

- Email : info@angelswing.io
- Request : https://www.angelswing.io/en/contact/
- Facebook : https://www.facebook.com/angelswing.io
- Address : 00826, Seoul National University Research Park 512, Gwanak-ro 1, Seoul, South Korea