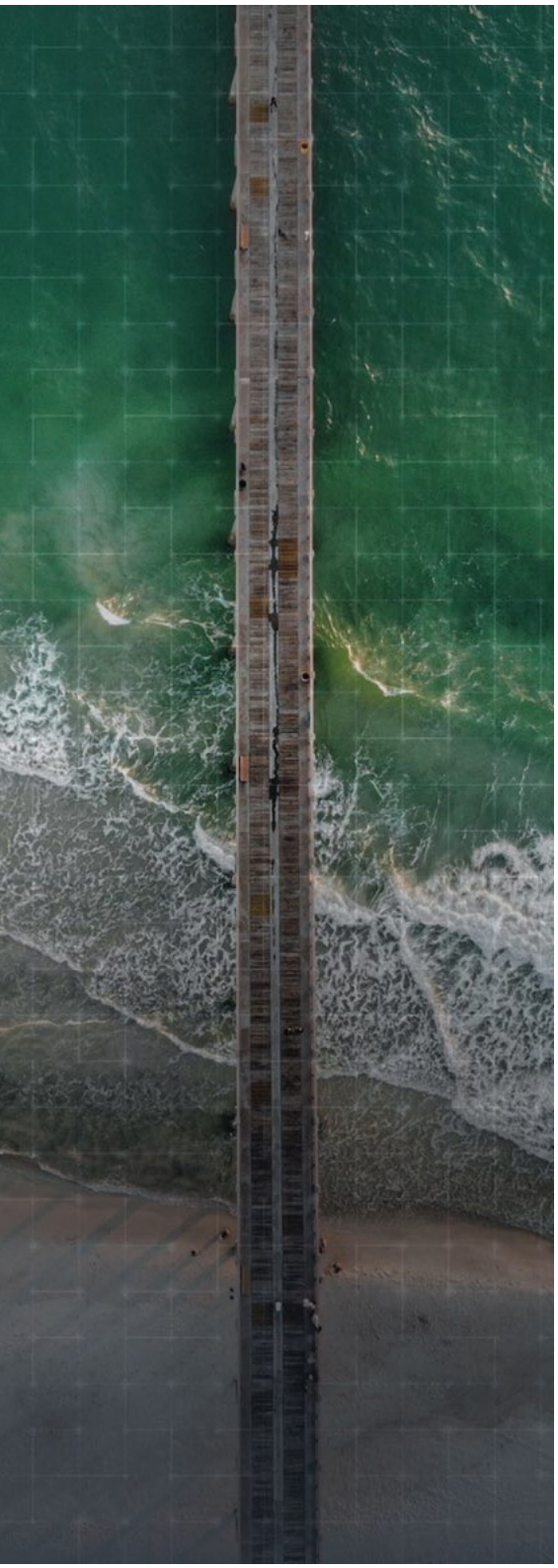


Mapware

CASE STUDY

Mapware Provides Rapid 3D Scanning for Emergency Management Following Hurricane Michael

Belfor, a nation-wide leader in property restoration, relies on its extensive, highly-trained logistics and ground operations workforce to provide rapid recovery services that are critical to their clients' business continuity.

Mapware, a leading nationwide provider of drone-based aerial data, is an expert in rapidly providing emergency-management support data.

Executive summary

In October 2018, Belfor Property Restoration ("Belfor") partnered with Mapware to provide drone-based photogrammetry mapping data to their teams, who were conducting emergency management operations in Florida in response to Hurricane Michael.

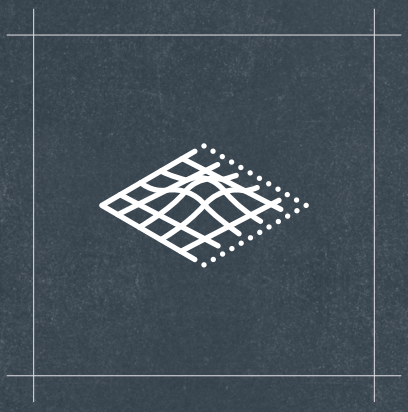
Mapware mobilized to the site within 24 hours and scanned damaged buildings using remote sensing technology. Over a 6-day period, Mapware provided roughly 300 GB of photogrammetry data, available both in-app and as "hot copies" delivered by hand to personnel in the field as requested by Belfor staff. This project was conducted

as a continued proof of concept that built on a successful, smaller-scale emergency management data mission executed in April, 2018.

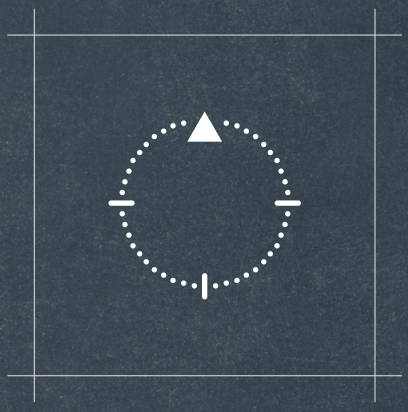
In the wake of a disaster, valuable data was delivered that significantly assisted field crews. The first datasets were captured within 24 hours of Belfor's request for data, and they were processed and available in-app within 24 hours of Mapware's arrival on location, to provide delivery within 48 hours total from initiating request.

Deliverables included:

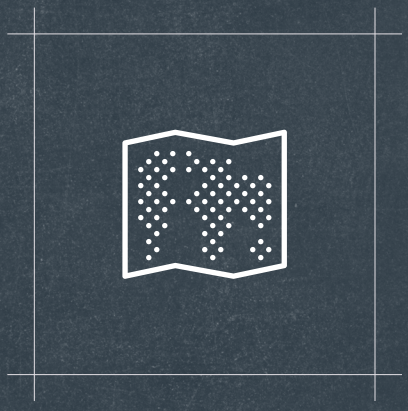
High-resolution photos (tiles)



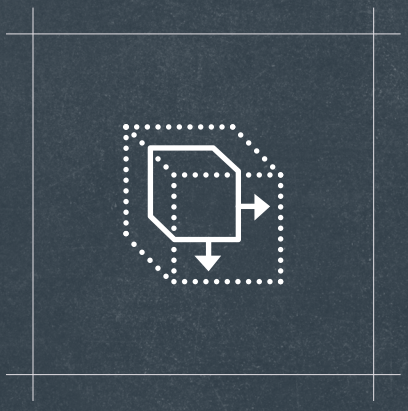
Wide-area assessment-grade 3D models



High-altitude orthomosaics for progress tracking



2D orthomosaics



High-resolution 3D models

Hurricane Michael

Hurricane Michael was the seventh hurricane (and second major hurricane) of the 2018 Atlantic hurricane season. After quickly developing from a tropical depression in the Gulf of Mexico on October 9, Michael peaked as a Category 4 hurricane with wind speeds of 155 mph.

The hurricane made landfall near Mexico Beach, FL, on October 10, 2018, and eventually dissipated over the Iberian Peninsula on October 16. Over the course of seven days, Michael claimed 60 lives, including 45 in the United States, and caused an estimated $14.58 billion in damages.

The hardest-hit locations in the United States—Mexico Beach, FL and Panama City, FL— suffered catastrophic damage resulting from extreme winds and storm surge.

The challenge

This proof of concept (PoC) project was initiated shortly after Hurricane Michael made landfall, on the morning of Friday, October 12 (Day 0).

Belfor requested data for several buildings and college campuses in the vicinity of Panama City, FL. The scope of the project at the time of deployment was limited to an estimated 60 GB of data, with possible expansion pending inspection of the initial datasets.

Mapware teams were outfitted and dispatched by 9:00 p.m. on Day 0 and arrived on scene amid active flooding at 3:00 a.m. the morning of October 13th. At the time, Belfor's emergency operations center (EOC) had not yet been established.

It's important to note that **PoCs often differ from full-scale engagements** in mission-critical ways. Those include (but are not limited to):

- Response times for Emergency Management PoCs may be slower than full-scale engagements due to resource limitations.
- Client training and workflow integration typical of full-scale engagements are not possible in PoCs, possibly limiting the client's ability to ingest and act on data delivered.

Data delivered within 24 hours

Despite challenging conditions, Mapware was able to capture valuable photogrammetry data, which Belfor used in the field for response efforts.

On Saturday, October 13, within 24 hours of the initializing order, Mapware teams were on site launching technology to collect data at Gulf Coast State College. Internet connectivity was a considerable obstacle in-situ, but Mapware delivered the first data sets on time, within 24 hours of the first flight.

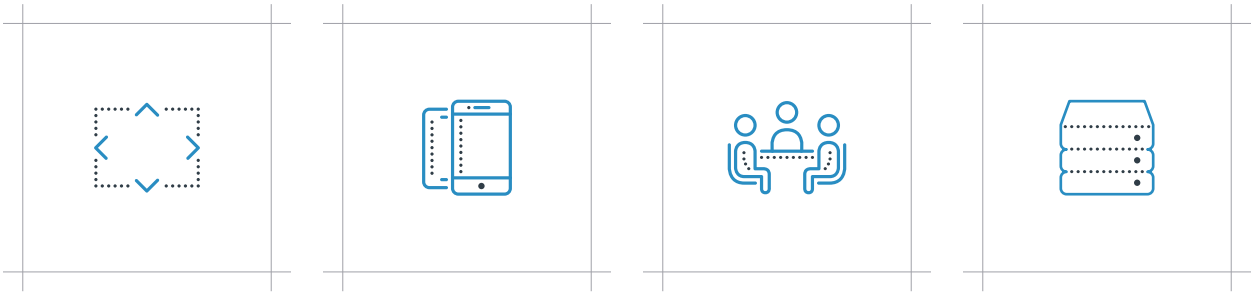
The initial data sets were reviewed by Belfor. After the initial delivery, Belfor more than doubled the scope of the operation.

The data Mapware collected had the greatest impact for responders who needed to survey roofing, enabling them to plan their work without the risk of sending personnel to scale potentially unsafe buildings to inspect damage.

Situational awareness

When used for mapping and 3Dmodeling, photogrammetry data provides critical situational awareness for first responders, enabling them to act faster, safer, and more confidently than ever before.

Mapware creates this awareness by providing up-to-date 3D maps and models, along with the tools, collaboration, and software that first responders need in order to execute their missions:



Rapid scanning, rapid results

Secure, mobile-friendly software

Team collaboration

Data analytics tools & up-to-date data

Notes from the field

In accordance with its standard operating procedures and internal quality control policies, Mapware thoroughly debriefed the ground teams deployed for this project after final operations were concluded. Mapware crews highlighted two opportunities for improved data delivery times and utility, as well as an expansion opportunity.

Accessible data licenses

At several points in the operation, Mapware created “hot copies,” or on-the-ground hard-disk copies of captured/processed data files. These were distributed to Belfor personnel upon request and put to immediate use.

It was unclear if the personnel who requested hot copies had access to their own Mapware software data license. Mapware crews noted that wider access to data licenses would be helpful in future operations.

Assets augment operations

Mapware crews believed that response times for data collection could be improved in future operations by uploading the GIS information for Belfor's client assets into the software to allow Mapware crews to plan access routes while Belfor's teams decide which targets to image. This wealth of baseline data would provide a foundation for ultrafast operations in which scanning target buildings and obtaining results is achieved at record speeds, with increased safety.

A new use case: easy claims filing

At multiple points during the operation, Belfor crews noted how useful the processed models would be for filing insurance claims. This was identified by Mapware team members as a rapidly developing use case for photogrammetry that highlights the value of Mapware's service offering, which provides complete, accurate data that translates quickly into damage assessments and clean reporting.

Additional notes

Mapware crews were extremely positive about their experience working with Belfor's team on the ground, and they noted that Belfor's crews were excellent hosts on-site. They also enjoyed how many of Belfor's team members had functional and professional knowledge

of drones, a shared interest that improved engagement with Belfor crews and increased the usefulness of immediate access to available data. This rapid feedback loop of collaboration in the field adds efficacy to remote sending operations.

Conclusion

This proof of concept mission was an unqualified success. Belfor's substantial emergency management prowess makes it a demanding client in the field, but the missiont highlights the value of Mapware's data in challenging operations that can be augmented with rapid scanning and 3D modeling.

Even without training or common digital data access, Belfor's teams were able to quickly obtain insights from Mapware's data and refine their actions accordingly, as rapid results flowed in.

This outcome is in perfect alignment with the Mapware mission: to make advanced geospatial intelligence available to everyone, so organizations can perceive, comprehend, and predict the world around them and act decisively within it.