

An aerial photograph of a city, likely a university town, with a grid overlay. The city features a mix of residential and commercial buildings, a large stadium, and a winding river. The grid lines are thin and light blue, creating a technical, mapping-like appearance. The sky is a clear, bright blue with some light clouds.

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Midwest Aerial Selects Z/I DMC II 140 for Low-altitude, Engineering-grade Mapping

By Kevin P. Corbley

Grant Park is often called downtown Chicago's front yard. Home to world-famous museums and numerous entertainment venues, the park is the center of all things cultural in the Windy City. Located between Lakeshore Drive and North Michigan Avenue, the sprawling space plays host to the latest in art, music, architecture, technology, and landscape design. For decades, Grant Park has served as one of Chicago's most popular destination attractions for residents and tourists alike.

In spring 2011, redevelopment plans called for mapping a 45-acre section just west of Millennium Park, known as North Grant Park, at engineering-grade spatial resolution and accuracy. Fittingly for a site that prides itself in promoting cutting-edge cultural arts, project participants selected a state-of-the-art digital airborne camera system—the Z/I Imaging Z/I DMC II-140—to acquire the high-quality aerial mapping required for the redevelopment.

Engineering-grade Mapping

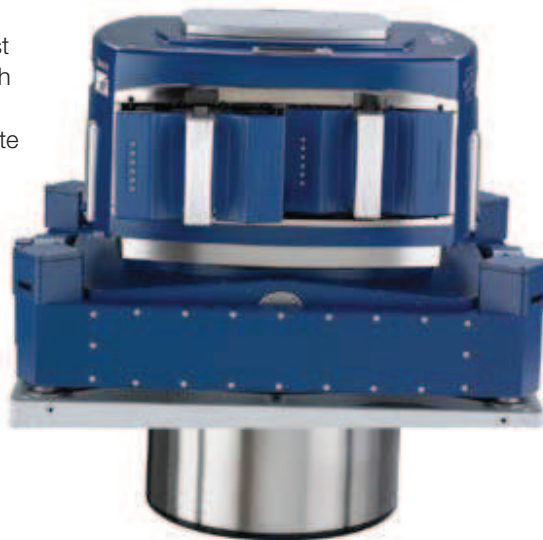
Environmental Design International Inc., a Chicago A&E firm, contracted to Aerocon Photogrammetric Services of Willoughby, Ohio, to perform photogrammetric mapping and generate a variety of deliverables. These included one-foot contours, a digital terrain model with six-centimeter vertical accuracy, and 1"=50' scale planimetric feature mapping. Producing these mapping products required collection of aerial imagery at 5-centimeter spatial resolution.

"This was a small, but high-profile project," said Jason Heywood, Aerocon project manager. "They wanted high-resolution details of features in the park with accurate elevation points."

For such a small project area, Aerocon initially planned to perform the aerial mapping with a film camera, but a major problem arose. To capture imagery at the requested spatial resolution, the

aircraft would have to fly at an altitude uncomfortably close to the tops of the downtown Chicago skyscrapers, the most notable of which is the 1,450-foot-high Willis Tower just west of the park. After careful consideration, the idea of flying film was dismissed.

Aerocon had worked with Midwest Aerial Photography in Galloway, Ohio, on earlier projects and knew the firm had purchased a Z/I Imaging Z/I DMC II 140 digital camera just a year earlier—with



Z/I Imaging DMC II-140 digital mapping camera system

outstanding results. Known for its crisp, sharp imagery, the digital mapping system satisfied the project specifications on many levels. Most importantly, it could capture the 5-centimeter imagery at 2100 feet AGL, about 1.6 times higher than the film camera, providing adequate vertical clearance above the buildings.

"Another reason the Z/I DMC II 140 appealed so much for this project was its radiometric resolution," said Ken Scruggs, Midwest Aerial president. "[Compared to film,] this digital camera captures a lot more feature definition and detail in the shadows of the tall buildings surrounding the park."

Midwest Aerial flew the Z/I DMC II 140 aboard a Piper Aztec and collected imagery of North Grant Park in well under an hour. Upon completing the flight, Midwest Aerial performed the initial post-processing of the imagery and GPS/IMU data and delivered that data set to Aerocon for aerial triangulation and production of final deliverables.

In addition to the GPS/IMU data, Aerocon surveyed several photo-identifiable points in the park to georeference the map products to the local coordinate system and to provide quality control and product validation.

"This was our first project with the Z/I DMC II 140, and we were very happy with it," said Heywood. "We have collaborated with Midwest on several other Z/I DMC II 140 projects since then."

More importantly, the end user, Environmental Design International, was extremely pleased with the final results of the project. All of the mapping deliverables met or exceeded the project specifications. Most impressive to the participants was the clarity of feature detail extracted from the shadow areas.

Cost Effective at Any Scale

The original Z/I DMC was introduced as the first digital large-format frame mapping camera in 2003, and the upgraded Z/I DMC II camera family was unveiled in 2010. Midwest Aerial was among the earliest purchasers of the Z/I DMC II 140 camera, and in 2011 became the first to buy a second Z/I DMC II 140.

"We felt this camera was the one to replace film because it has the geometry and accuracy to satisfy end users," said Scruggs. "Responses from our customers have been great because the Z/I DMC II 140 makes them more competitive."

Even in small projects like the North Grant Park mapping, the Z/I DMC II 140 system is cost-effective because its end-to-end



The DMC II features a single, ultra-large, monolithic PAN CCD plus 4-band multi-spectral sensors

digital acquisition and processing can reduce the turnaround time traditionally required for film-based production. With accurate control provided by the onboard GPS/IMU, the entire aerial triangulation process has become more automated, saving money at every step.

“The demand for the Z/I DMC II 140 far exceeded our expectations...that’s why we bought a second one,” said Scruggs.

Midwest Aerial has deployed the Z/I DMC II 140 across its full spectrum of jobs for federal, state, and local governments as well as private sector organizations. In every case, the sharp detail and accuracy have impressed the end users. The firm has routinely captured 5-centimeter GSD spatial resolution for operational projects and recently collected 3-centimeter

Custom-designed DMC II optics deliver superb image resolution and accuracy

imagery for a federal research project.

Designed specifically as a photogrammetric mapping camera, the Z/I DMC II 140 offers a monolithic 140MP panchromatic frame and four 42MP multispectral frames, both with a pixel size of 7.2µm. This, in combination with a custom-designed lens system, produces high-quality imagery with a very high geometric and radiometric resolution. All Z/I DMC II systems, from DMC II 140 to 230 and 250, collect four-band multispectral (red, green, blue, near IR) and black-and-white panchromatic imagery. Automated forward-motion compensation using TDI and rapid frame rate enable operators to fly the Z/I DMC II at low altitudes and high forward overlap for large-scale survey applications and at

higher altitudes for small-scale regional projects.

The Z/I DMC II cameras represent a significant evolution in the innovative digital technology introduced with the original Z/I DMC. The Z/I DMC II is the first large-format digital aerial camera family to use a single, ultra-large monolithic panchromatic (PAN) camera head to produce extremely wide ground coverage for capturing large-scale, high-resolution imagery. This improves overall geometric accuracy and radiometric quality, eliminating the need for image stitching and mosaicking during post-processing. The PAN-to-multispectral pixel ratio of the Z/I DMC II-140 is 1:2, resulting in extremely crisp pan-sharpened imagery.

Although the Z/I DMC II integrates with any commercial GPS/IMU navigation system, Midwest’s Scruggs believes the NovAtel SPAN-SE GPS receiver and the iMAR FSAS IMU equipment he uses contribute to overall mission success. The GPS and IMU are tightly coupled, which essentially means they communicate with each other during the flight. If the GPS temporarily loses satellite lock during the flight, the IMU maintains data integrity. Midwest Aerial has never lost any data due to GPS lock-loss in a mission.

“Those problems are gone now,” said Scruggs.

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CORPORATE PROFILE

Leica Geosystems and Z/I Imaging – Airborne Sensor Solutions from Hexagon Geosystems

Hexagon Geosystems’ newly formed Geospatial Solutions Division is bringing together Airborne Sensor solutions from Leica Geosystems and Z/I Imaging. With over 80 years experience, Leica Geosystems is a global leader in the design, delivery, and support of airborne digital and lidar sensors for the geospatial marketplace. Along with the well-known Leica RC30, Leica Geosystems’ airborne sensor portfolio today includes a wide range of innovative technologies and products such as the Leica RCD30 series of medium-format digital frame cameras, the Leica ADS pushbroom sensors, the Leica ALS LIDAR series, and the Leica IPAS GNSS/IMU solutions. For nearly the same 80 years, Zeiss and later

Z/I Imaging have set standards in the airborne photogrammetric market with such products as the RMK series and the DMC. Today, Z/I Imaging continues to drive innovation and productivity with the new DMC II range of digital mapping cameras. Sensors from Leica Geosystems and Z/I Imaging are fully integrated in a suite of end-to-end workflow solutions. These include flight planning, GNSS/IMU processing, as well as the most comprehensive post-processing tools for the delivery of map products and 3D models in the fastest time possible. Hexagon Geosystems’ combined airborne sensor portfolio of Leica Geosystems and Z/I sensors offers complete solutions for almost all

airborne mapping applications, plus all business models, and continues to give each sensor owner the highest and most consistent return on investment. In addition to world-class sensors, Hexagon Geosystems offers a full range of product support, service, and training with offices located in over 25 countries worldwide.

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