THE FUTURE OF SOFTCOPY IN PHOTOGRAMMETRIC MAPPING FIRMS

Gary G. Brown, President, Aerial Services, Inc.

IWG II/III - Digital Photogrammetric Systems

KEY WORDS: Photogrammetry, Technology, Mapping, Softcopy, Experience

ABSTRACT

Aerial Services, Inc. History: The company was started in 1967 using conventional mapping techniques. In 1983 the company reviewed emerging technologies and decided that to stay competitive it was necessary to explore digital vector mapping techniques. After close scrutiny it was decided that it would be more cost effective to implement digital vector mapping techniques. Aerial Services purchased KORK Database Mapping Software. Within the next two years ASI fitted all existing analog stereoplotters with digital encoders to allow all mapping to be completed in digital form. During the next four years ASI added analytical stereoplotters, was instrumental in development of data translators and multitasking batch processing, and finally the porting of this software to PC platforms.

During the time period of 1984 to the present Aerial Services, Inc.(ASI) has continually monitored our client market and has attempted to educate our clientele to the advantages of digital vector mapping.

We quickly realized a need to review the client's need and provide input to software development staff so that the software could meet our growing digital data needs. During this time we realized that we were fast becoming an industry that no longer was dependent only upon hardware development but more importantly on software development.

In this same time frame, ASI staff and management consistently reviewed technologies being planned and implemented in all areas of photogrammetry. New aerial cameras were purchased with Forward Image Motion Compensation (FIMC) capabilities, gyro-stabilized camera mounts and Global Positioning System (GPS) computer controlled navigation systems. The photo laboratory was updated with new film processors, photo enlargers and dodging printers.

All of these changes and advancements were being implemented so that the end mapping products would be of higher quality, and therefore better meet the digital data needs of our clients.

From 1990 to 1994 the ASI client base increased substantially. In 1990 ASI acquired its first county-wide orthophoto mapping project. High accuracy Global Position System (GPS) surveying was utilized to control all mapping.

In 1992 ASI obtained a second county-wide mapping project, and accordingly, more pressure was being applied to our mapping production.

During the time period of 1990 to 1994 ASI management was continually monitoring the development of digital orthophotography technology. Early development was directly focused upon government needs being driven by the possibility of contracting with the United States Geological Survey. ASI was not seeing increased markets in this area, but pressure seemed to be coming from more local government areas such as cities and counties. ASI was consistently marketing in these areas and we saw the need to implement digital orthophoto technology for use as base maps for Geographic Information System (GIS) projects at the local level. Then in late 1993 and early 1994 ASI purchased a digital orthophoto system. Our prior experience with software systems told us to carefully examine the vendor to ensure that they know the science and technology of photogrammetry. More importantly, the company should guide development efforts with extensive user input in this newly developing market. During this time frame two of the companies (KORK Systems and Autometric); whose systems we were reviewing, joined forces. We felt that this combination was what we were looking for in our system, because none of the other systems we were reviewing were as mature. We wanted a software company that would be responsive to our future needs, and had learned previously larger hardware manufacturers usually do not fall into this category. More importantly, when we viewed the digital orthophoto hardware systems, we quickly realized that we were buying extremely fast computers with graphics capabilities and that software would be the core of the system. Our selection was based upon this fact, our prior experience with KORK Systems and because of their new partnership with Autometric. KORK brought strong client support and customer driven development culture and Autometric brought strong software development capabilities to this venture. With this in mind and a commitment from the newly formed company, Vision International, to be responsive to the needs of the mapping community, we chose the Vision Softplotter System.

During this selection process ASI was heavily marketing the digital orthophoto approach with some of our long term county clients. In late 1993 we contracted with our first county to supply digital orthophotography as a base map for cadastral mapping. Within the next three months we contracted with our home county to supply full county wide digital orthophotography for a GIS base map. From summer 1994 to spring 1995 we also contracted for two additional county wide digital orthophoto base mapping projects. One of the projects was for large scale maps of an entire county in color.

One of the projects is completed and a second is close to completion. The other two projects are well under way and on schedule. On two of the projects we are supplying 400 scale rural digital orthophoto products and 100 scale urban digital orthophoto products. For the 400 scale (1:4800) product we are supplying two-foot ground pixel resolution images with tiled image files in 6000 foot square tiles. For the 100 scale (1:1200) product we are supplying 0.5 foot ground pixel resolution images with tiled image files in 1500 foot square tiles. One of our projects is metric and we are supplying 1:4800 scale rural digital orthophoto products with 0.64 meter ground pixel resolution tiled image files in 2000 meter square tiles. For the urban areas we are supplying 1:1200 scale urban digital orthophoto products with 0.16 meter ground pixel resolution tiled image files in 500 meter square tiles. For the fourth project we are supplying 100 scale (1:1200) urban digital orthophoto. products with 0.5 foot ground pixel resolution tiled image file in 1500 feet square tiles. This project is in natural color.

To complete the above projects, our schedule of production required that we have systems operational by August 1994. ASI reviewed our production needs and our concerns with quality control and decided to install two full Vision Softplotter stations and an image scanner. The system consisted of two Silicon Graphics Indigo 2XL systems with 9 Gigabytes (GB) of storage on each, and a Vexcel 3000 Plus image scanner. All of the systems were networked with an additional X-terminal utilized to operate the scanner. All hardware and software was installed in July 1994 with initial production commencing on schedule by August. Within a few short months we realized that a major problem was the volume of data being generated by the systems during the production of digital orthophoto products. The data required an inordinate amount of time to backup and restore on a regular basis, to an Exabyte 8505 tape system. The amount of drive space available required backup of scanned images after scanning, but prior to utilization in the orthophoto process. To increase production to the needed level, staff and management discussed data storage needs. In the spring of 1995 an additional 18GB of storage was added to each system with a total of 45GB now available on the network; and a second Exabyte 8505 tape system was also added. This allowed backup and restore functions to occur simultaneously on the network. We also added a second 19" X-terminal to be utilized for mosaicking. With this system configuration our production levels were now approaching break even levels.

During the process of our hardware modifications, we were also in the process of providing feedback on necessary software modifications needed to allow more efficient mapping production. In late summer 1995 Softplotter release 1.5 became available providing us with added features and speed. Because of our increased delivery schedules being forced by four county wide projects active simultaneously, we added a third Softplotter system with an additional 18GB of drive space.

During our learning curve on the digital orthophoto systems, we found it painfully necessary to place into operation some quality assurance procedures throughout the digital orthophoto process. We already utilized a strict review process during our aerial film acquisition, and after this process the film moves to contact printing and film diapositive plate production. To obtain uniformity in scanning we needed to produce the most uniform and clean film diapositives possible. To ensure the highest uniformity and quality we installed a second Electronic Photo Controls UCP-2 dodging printer to produce the plates. We also worked closely with EPC to develop techniques to reduce static buildup during film handling that was causing dust particles on the plates. This has become a major concern because of the need for extremely clean film scans. We have also worked with Vexcel Corporation to install an automatic roll film scanning system. It is hoped that by using the original film with some static reduction techniques we will be able to provide even higher quality scans more cost effectively using the original film.

Our approach to training and personnel transition to the new systems was as follows. Three prime employees were assigned tasks on the system. One computer system supervisor was assigned the task of keeping the hardware and software loaded, configured and running. Two production employees were assigned the task of learning the software, starting initial production and training of additional compilation staff. Our compilation staff was asked on a seniority basis if they would be interested in learning and working on the Softplotter systems. By using this technique, each of the employees who has been trained on the system wishes to stay working with the system. Our initial computer system supervisor responsibilities are now being assumed by the two supervisory employees. It appears that transitioning of employees from conventional stereocompilation to Softplotter compilation will not be difficult. Because the Softplotter environment is different than the conventional stereoplotter we think operators will be more relaxed and comfortable. It will be necessary to implement full use of the softmouse for all mapping actions on the Softplotter to minimize any possible shoulder, wrist, arm and back problems which could be experienced by the operators.

ASI staff and management meet regularly to review problems and solutions to working with the Softplotter systems. We hope we can expand their use into our more conventional vector mapping areas. We feel that for the systems to be fully functional as a replacement for the analytical stereoplotter, it will be necessary to have all mapping functions operating smooth and efficient. We think that with proper software modifications and new computer speed enhancements, the Softplotter has the potential to assume all of the functions of the analytical stereoplotter in the near future. Additional developments with the integration of digital image scanning and the analytical aerotriangulation process hold hopes for highly increased automation in this area. If Vision International continues to aggressively develop Softplotter using customer feedback as a "roadmap" to full commercial productivity, the future .... bodes well.

If a company is considering the Softplotter as its next purchase we think it is necessary to review the client needs with major concentration being focused upon educating them on the use of digital image products. Also, all in-house procedures should be reviewed and modified as needed to best utilize the system; and the purchase of the equipment be limited to best fit the short term needs because of rapid hardware changes. Existing quality control procedures should be reviewed and modified to ensure the highest quality end product; and lastly, the employee transition should occur slowly and carefully so that

they want to be a part of this new and changing technology. Most importantly, the company should monitor future developments in softcopy photogrammetry with the idea of implementing these in future purchases.