The Olympus Flyer

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The A B C's of Successful Aerial Photography

The Environmental and Social Conditions Required for Aerial Photography.

Ross Rogers
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The radio crackled slightly as the air traffic controller's voice came over informing us that although we had permission to be in the Class B airspace, we now had to move into a holding pattern circling over the Great Salt Lake. What was supposed to be a simple 1/2 hour job was now turning into a 1 1/2 hour ordeal. Two of the four flight lines had been shot, the job had to be finished. We circled the lake waiting for the airspace to clear. We watched our sunlight and opportunity disappear as the clouds moved in from the west.

This actual event illustrates just a couple of the myriad of challenges facing an aerial survey firm on virtually every flight. In planning and executing any flight many issues need to be taken into consideration and planned for. As in the example mentioned, whether the job is in or crosses Class B airspace (commercial airspace) it becomes a consideration. When in Class B, the commercial aircraft always take precedence, there are few windows thoughout the day when traffic is low and firms, such as ours, can gain permission to be in the area.

Another challenge is that of weather. It is obvious that it is not possible to execute a successful survey flight

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The Undistorted World of Orthophotography

The Characteristics of Accuracy in Orthophotography.

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Orthophotography in its narrowest definition is an aerial photograph with the inherent photographic displacements removed. These displacements are the typical perspective features experienced in our visual perception. Others include camera tilt, terrain relief, as well as corrections that are applied to all aerial cameras. In order to eliminate or minimize these distortions there are practices that are established before the photo is taken, and there are actions taken afterwards.

There are many issues related to securing a high degree of accuracy in orthophotography. Unfortunately there is not enough space within this newsletter to effectively address them all. Consequently, I will focus on the aspect of useability with orthophotography. By useability I am referring to the planimetric and topographic features seen within an aerial photograph, that have been rectified and geo-referenced (orthophotography). The distances between these features and within the features themselves can be measured quantitatively.

Achieving this useablility, or the ability to measure distances and areas within an orthophoto depend greatly on a base reference for the rectification of the aerial photography. Two forms of base references an orthophoto can use are pre-existing maps, and surveyed field control. Two factors can determine which form of base reference the orthophoto should have. They are cost and level of accuracy. Using a U.S.G.S. quad map to rectify aerial photography is less expensive than securing a survey crew to go out into the field and acquire coordinates and laying out panels.

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during bad weather. But, what many people do not consider is that 'bad weather' does not just mean rain and snow to an aerial photographer. Bad weather includes high altitude winds and/or thin clouds that may not be detected when on the ground. High humidity, smoke or smog in the atmosphere can also effect whether photographs are usable. These factors can and do show up on the final product compromising image quality.

Time of year will always be a challenge as the angle of the sun affects the available light. During the middle of summer the available light is the greatest and the window of flight time is the longest. However, from late summer through late spring flight times need to be carefully planned and a delay of even 1/2 hour can mean the difference of completing a job that day and having to re-plan it for another day.

Along these same lines, as technology progresses we are becoming more and more precise about the area covered by a specific flight line. We now utilize Airborne GPS (Geographic Positioning System) for specific types of jobs. This means that we have to plan our flight times not just regarding weather and sun placement, but we also have to coordinate all of this with the Airborne GPS system to receive the best constellation of satellites for the specific project site.

Finally, all these factors need to come together at the same time that the ground targets are placed. Targets are temporary and if the flight is not completed before they are removed or destroyed, then the targets need to be replaced causing a delay in the completion of the job. Being aware of the completion date of the target placement and being able to schedule flights to coincide with this is critical to the success of any flight mission.

While none of these factors can be completely controlled (and some cannot be controlled at all), there are strategies that can be implemented to plan for and work around all of them. At Olympus Aerial Surveys we have learned and developed many lines of attack to combat these challenges faced by all aerial survey firms. Our experienced flight crew is knowledgeable about the rules and regulations of Class B airspace and other FAA rules and regulations. We understand the procedures involved in attaining permission to work in restricted airspace and are aware of the best times of day to work in these areas.

Weather is a challenge that cannot be controlled. However, our flight crew is constantly assessing the conditions and checking with the National Weather Service as well as local contacts regarding the current conditions for a planned flight. Additionally, the crew is cognizant of lighting conditions and understands how to plan for and adjust settings or angles in order to attain the highest quality product.

Additionally, the crew has had extensive experience working with the TrackAire Aerial Survey System that utilizes GPS satellite systems and information. This has given Olympus Aerial Surveys a foot up in understanding and utilizing the GPS systems available to increase accuracy.

Our experience and equipment all come together to help Olympus meet and defeat these challenges head on. What this means for our customers is one of the highest quality products available on the market with accuracy, speed and confidence.

The Cessna Centurion 210 used for all our aerial surveying projects. Below shows a list of the equipment and associated products:

- *Zeiss Aerial Camera 9 inch format*
- *Mamiya 2 1/4 inch format camera*
- *TrackAire Aerial Survey System*
- *Airborne GPS System*
- *Vertical Photography*
- *Obliques - custom and/or four cardinal dirctions*
- *Scales from 1:2000 to 1:50000*
- *Black and White, Color, and Color infrared photography*

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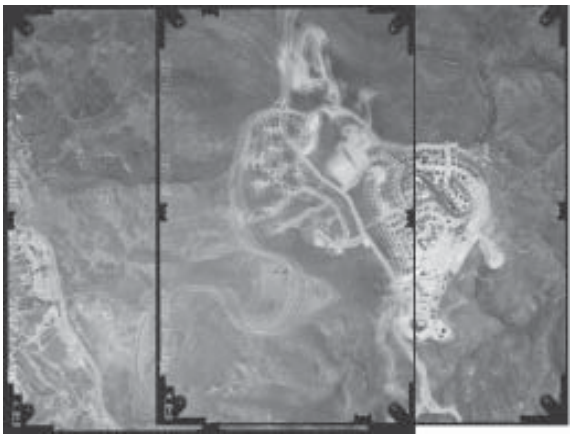
The cost savings between the two is noticeably different, but then again so is the level of accuracy. In fact, a true geo-referenced orthophoto uses field control to establish ties to the ground and set the stereo model up for generating the orthophoto. When using a quad map, graphic features on the quad are matched with visual features in the photography (see Example 1 below). The level of accuracy using the U.S.G.S quad is only as good as the accuracy of the quad map. In other words, construction and other changes in terrain features can be detrimental to the accuracy when using a U.S.G.S quad to control this type of product. This is the main reason why the Photogrammetric Engineering field considers this type of vertical photography as 'Mosaic'. The fact of the matter is accuracy of the orthophoto that employs surveyed field control is accurate to within 1/40" of the final scale of the orthophoto (see Example 2 below). Aerial photography matched to a U.S.G.S. quad map is accurate to within 20 to 200 feet on average.

True orthophoto is created by tying a series of digital aerial photographs together using field control as is shown in Example 2. The accuracy of this method is dependent upon the photo scale, and established map and surveying standards that are related to the final scale of the ortho product. In other words, a surveyor could utilize NGS (National Geodetic Survey) control monuments as a datum base. The control should have a relative horizontal accuracy of 1 part in 10000 parts or better.

Example 1 illustrates the idea of using a U.S.G.S quad map to correct for photographic image perspective distortions. The U.S.G..S map shows features that no longer exist or have been altered in the photo thus reducing the quanitative accuracy or its useability as an engineering tool.

It is easy to see the value of this type of visual document whether it is planning for new waterlines or for broader concerns such as GIS (Geographical Information System). Here is perhaps where the main difference lies regarding useability of an orthophoto as it pertains to method, accuracy and cost. An orthophoto is more flexible and has a broader application for its use when compared to the less expensive form using a U.S.G.S map for referencing aerial photography.



Example 2 shows how a specialist would use surveyed field panels to rectify an aerial photo model. Securing new photography and surveying the area for control provides accuracy levels appropriate for engineering projects.

New Products and Services

Color Photography of Southwest Utah

The new color mosaics of both the St. George and Cedar City areas are available. The final scale for these mosaics varies from 1”=400’ to 1”=2500’.

New Black and White Vertical Photography

We have recently secured new black and white photography of the Weber/Davis County area. Black and white photography of the Salt Lake Valley was also acquired on May 6, 2002. The photo scale for both areas is 1:24000 or 1”=2000’.

Weber/Davis Mosaic

The above mentioned, Weber/Davis photography, taken April 2, 2002 has been put together for a black and white U.S.G.S. geo-referenced mosaic. This mosaic extends from the North leg of the I-215 up to North Ogden, and from the Great Salt Lake on the West heading East up to Ogden Canyon. The scale is 1”=2000’.

The 2002 Salt Lake Valley Mosaic is Now Available

Olympus Aerial Surveys, Inc. has prepared its new 2002 Salt Lake Valley Mosaic. For this year’s mosaic we are able to provide it in color. The photography was taken August 5, 2001, with a final scale of 1”=2000’. It is 48”X68” in size, and would fit into the existing frame should you have an older mosaic. The price for a hard copy is $500.00, mounting and framing are additional. We are offering the mosaic in digital form for $2500.00. It is in TIF format with a 5’ pixel on 3 CD-Roms. It is geo-referenced to the U.S.G.S. map. It is great for general planning, and reference purposes.

Additional Mosaics

Year 2002 Elko area, black and white, hardcopy prints at 1”=800’, are priced at $120. Available in digital format with a 2.5’ pixel resolution for $400. The Park City year 2000 mosaic is at 1”=1500’, hardcopy prints are $400, also available digitally with a 5’ pixel, the cost is $1200. Please stop by or call to get further information about pricing and sizing for any of the above mosaics. Portions of the mosaics can also be purchased.

RETURN SERVICE REQUESTED

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