

**STATE OF OKLAHOMA  
DEPARTMENT OF TRANSPORTATION  
SURVEY DIVISION**

**ENGINEERING CONTRACT  
ATTACHMENT A5**

**SPECIFICATIONS FOR AERIAL PHOTOGRAPHY**

**July, 2022**

**THE CONTRACTOR AGREES:**

To furnish all materials, labor, and equipment necessary to provide precision aerial photography of the areas as specified by the Oklahoma Department of Transportation (ODOT), and to deliver to ODOT the materials specified in Section 11. All work shall be executed to the satisfaction of ODOT in complete accordance with these specifications.

**1. COORDINATION OF PHOTOGRAPHY WITH GROUND TARGETING**

On certain projects where the ground control points are targeted prior to the flight, operations must be coordinated with the ground crew so that a minimum of time elapses between the targeting and photographic flight. ODOT will notify the contractor when the projects can be flown.

**2. AIRCRAFT**

Aircraft used on this contract shall be maintained and operated in accordance with the regulations of the Federal Aviation Administration and shall be capable of flying at an operational ground speed to ensure ODOT accuracy standards.

**3. PRECISION AERIAL DIGITAL MAPPING CAMERA**

Digital cameras utilized in conjunction with this contract must be large or medium format, direct digital, frame-based camera systems (e.g. Z/I DMC Camera, Vexcel's UltraCam-D, etc.). Large format system is preferred. Small frame format systems, or Line Scanning (push broom technologies) will not be considered.

**3.1. CAMERA SYSTEM CAPABILITIES**

- 3.1.1.** Ground Sample Distance (GSD) of less than 2 inches, at a flying height suitable for design mapping.
- 3.1.2.** Four band imagery from separate red, green, blue, and infrared bands.
- 3.1.3.** High geometric accuracy and forward motion compensation.

**3.1.4.** Images that are directly compatible with existing softcopy photogrammetric environments, to include Intergraph Photogrammetry Suite.

**3.1.5.** Stereo Pairs, suitable for high accuracy Engineering Design Mapping Applications.

### **3.2. GPS REQUIREMENTS**

The camera utilized shall be interfaced to a GPS receiver capable of computing coordinates with accuracies acceptable for use in ODOT analytical adjustment programs. Operation of ground-based GPS receivers will be the responsibility of the contractor.

The contractor will provide Airborne Global Positioning System (ABGPS) and Inertial Measurement Unit (IMU) data, and shall be responsible for the post processing of all data. At a minimum the consultant will provide the Frame number, GPS Coordinates, Omega, Phi, Kappa values of the photo centers, and the time stamp information for each frame of project photography. Processed data will be delivered in an ASCII format on specified media. The contractor will retain a Professional Land Surveyor, currently licensed to practice in the State of Oklahoma. The Land Surveyor will directly supervise and certify the procedures and accuracy of the GPS Control, and Ground Control (if applicable).

ODOT reserves the right to restrict the use of any camera based on operational results.

## **4. TIME FOR UNDERTAKING PHOTOGRAPHY**

**4.1.** Photography shall not be taken when the sun is less than 30 degrees above the horizon. Excessive shadows will be cause for rejection.

**4.2.** Photography shall not be taken when streams are at flood conditions, when standing water, or snow cover is on the ground, or when the ground is obscured by haze, smoke, or dust.

**4.3.** Clouds or cloud shadows shall not exceed five percent of any image.

**4.4.** Windy conditions causing motion in vegetation may be grounds for rejection.

## **5. IMAGERY**

**5.1.** Photography shall be taken at an altitude that will ensure a ground sample distance of less than 2 inches.

**5.2.** Digital imagery shall be tiled tiff format, and shall be compatible with ImageStation Photogrammetric Workstations

**6. FLIGHT LINES**

**6.1.** The center of the first and last exposure shall be outside the limits of the designated flight line.

**6.2.** A horizontal deviation from the designated flight line of more than ten percent of the flight height shall be cause for rejection.

**7. TILT**

Tilt shall in no case exceed three degrees from the vertical and shall not average more than one degree for the flight line. Relative tilt between any two successive images exceeding four degrees may be cause for rejection.

**8. OVERLAP**

The overlap in the line of flight shall average approximately sixty percent and 30% side lap. Any overlap of less than fifty-five percent or more than sixty-five percent shall be cause for rejection of the entire flight line.

**9. CRABBING**

Any series of two or more consecutive images crabbed in excess of three degrees as measured from the line of flight shall be cause for rejection of the entire flight line.

## **10. ITEMS TO BE DELIVERED**

**10.1.** Digital Images as described above, delivered on an acceptable media.

**10.2** ABGPS IMU Data in ASCII Format

**10.3** Metadata of flight height and equipment parameters, including date and time of photography, APC number, and Task Order number, in ASCII Format.

**10.4** KMZ/KML flight map.

**10.5** Camera calibration report.

## **11. TIME OF COMPLETION**

Ground targeted projects must be coordinated with the ground survey crews. On these projects, the contractor will notify ODOT by phone or email as soon as the photo mission is completed. All deliverables must be received within fifteen days of the flight, unless otherwise specified in the Task Order.