Acquisition of Aerial Photographs and/or Imagery

From time to time there is considerable interest in the purchase of *special-purpose photography* contracted through commercial survey firms.

Even though commercial firm may have the technical expertise to handle almost any type of photographic mission, the client still may be responsible for:

1. defining objectives,
2. drawing up preliminary specifications or flight plans,
3. estimating costs, and
4. determining whether the finished product meets interpretation and mapping requirements.
Ground Coverage vs. Focal Length Variations

In practice, the range of scales actually employed is usually from 1:1,000 to about 1:50,000.

Where simultaneous coverage at two different scales is desired, certain aircraft can be fitted with two mapping cameras employing different focal-length lenses.

Seasonal Considerations

Data must meet the requirements of the project objectives.

1. Forest and vegetation
2. Geological and topographic mapping
3. Wetland survey
4. Urban planning
5. …

Forest study, for example, the best timing for infrared coverage is from mid-spring to early summer, a period when all trees have produced some foliage but before maximum leaf pigmentation…. 
Seasonal Considerations

In the northern latitude the best results of true color imagery have been obtained in late fall, just before deciduous species, such as aspen and oak, shed their leaves.

For a brief time period, foliage color differences will provide good tonal contrasts between most of the important tree species and communities.

Leave on or off? With or without snow cover on the ground? ……
Seasonal Leaf-on vs. Leaf-off
Spring 2007, 6” spatial resolution, South Kingstown, RI

Spring 2008, 4” spatial resolution, Block Island, RI
Facility Considerations vs. Other Requirements

- Weather condition,
- Airport facilities and distance to work area,
- Time windows
- …

Time-of-Day Consideration

This is the consideration of shadow effects.

The sun's elevation angle above the horizon is a function of latitude, season of the year, and the time of the day.

When extensive shadowing is not wanted, ground scenes should be photographed within about two hours of local apparent noon (solar noon).
Time-of-Day Consideration

A consequence of selecting the wrong combination of season and time of day is a phenomenon known as a hotspot, or sunspot. A loss of photographic detail with overexposed areas.

Hotspots are most likely to occur with certain sun-angles, at lower latitude, at higher flight altitudes, and with wide angle lenses. After the season and latitude of photography have been determined, it is possible to calculate and thus to avoid those times when hotspots will likely to occur.
Technical Specification for New Photography/Imagery Acquisition

When the decision to purchase new photography/imagery has been made, technical specifications are usually detailed in a formal contract. The following items are usually covered to some degree in all contracts:

- **Business Arrangements**: include the cost of the aerial survey, a provision for periodic inspection of work completed, criteria for reflights, and schedules for delivery and payment.
- **Study Area**: the tract to be photographed is accurately delineated on maps supplied by the client.
- **Film-filter Combination or digital data**: the specific type of film and filter or digital format are specified by clients.
- **Mapping Cameras**: a report should be furnished to the client that specifies the methods and the resolution power of the lens.
- **Digital Products**: Projections, atmospheric corrections, media types, …

Technical Specification for New Photography

**Flight Lines**: Lines should be parallel, oriented in the correct direction, and within a stated distance from positions drawn on the flight maps. When possible, flight lines should run north-south or east-west. For maximum efficiency, they should parallel the long axis of the study area. As a margin of safety, an extra flight line should be added to each side of the study area to assure complete coverage.
Technical Specification for New Photography

**Overlap and Sidelap:** For stereo coverage, overlap is usually 55 to 65 percent (average 60%) along the line of flight and 15 to 45 percent (average 20-30%) sidemap between adjacent flight lines. At the end of each flight line, two photos should be added as a margin of safety to assure total coverage.

[Diagram showing overlap and sidemap]

Landsat Imagery of DuPage County, IL

[Map showing areas in need for aerial data acquisitions]
Technical Specification for New Photography

**Photo Alignment:** Crab or drift should not affect more than 10 percent of the print width for any consecutive photographs.

**Tilt:** Tilt should not exceed $2^\circ$ to $3^\circ$ for a single exposure or average more than $1^\circ$ for the entire project.

![Diagram of photo alignment and tilt](image)

Technical Specification for New Photography

**Required Timing and Cloud Cover:**
Both season of year and optimum time of day are usually specified by the client. An allowable cloud cover (percent) should also be specified; cloud-free coverage is desirable for most mapping project.

**Flight-Plan Map:** It is customary for a final version of the flight-plan map to be supplied to the client. It should show the actual locations of the flight lines and the photographic center points (exposure stations) along each line.
Technical Specification for New Photography/Imagery
(Con't)

Inspection of Contract Photography
Following the completion of a photographic survey, it is customary for the client, or a representative, to make a technical inspection of all photographic products.

Acceptance or rejection often requires checks for such items as tilt, overlap, sidelap, scale, plus film and print quality.

Photographic quality is the most difficult item to evaluate.