Digital Imagery Guideline
ASPRS/PDAD

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Objective of this Talk

• Present the work of ASPRS / PDAD on the Digital Imagery Guideline
10 Year Remote Sensing Industry Forecast

Overview of Results

• Industry growth:
  - Growth rate about 13% per year ($6B in 2010)
  - Aerial and Satellite segments not competitive
  - Biggest impediment to growth: User knowledge of new technology

• Top 25 issues in increasing the use of Earth science and technology capabilities by operational decision makers:
  User Awareness, More user-friendly systems...
The State of the Market

• GIS continues to grow rapidly at 20-30% per year
• Remote Sensing has grown slowly
• There is a huge pent up demand for data
• If RS does not deliver / users will find other means
• Upside: there is tremendous opportunity
The Digital Guideline Objective

• Build Imagery Markets By:
  – Facilitating User Purchasing
  – Improving Communication Between User/Supplier
  – Promoting Standards to Improve Market Education Level
  – Facilitating QA/QC Processes

• Promote Market Driven Technology Innovation
  – Improving Communication with Supplier/Mfg with common dialog
  – Brings Critical Technical Issues to Surface
Where We Are Going

1995 2000 Spring 2002

ASPRS Aerial Photography Draft Std

Digital Product

Guide

Tutorial

Req Form: User

Product Guide: Supplier

Tutorial: Equipment Mfg
Digital Imagery Guideline Concept

User

Web Tool Request Form

Spec/RFP

Supplier

Spec

Proposal

Digital Tutorial

Equipment Mfg

Digital Guide
Requirements Derived From User Needs

Image Gallery
- Civil Government
- Environmental
- National/Global Security
- Insurance
- Transportation
- Utilities
- Telecommunications
- Agriculture
- Exploration & Mining
- Real Estate
- Forestry
- Entertainment/Media
- Other

Image Product Requirements

Legacy Data Bases

Geolocation
- NMAS
- FGDC NSSDA

Spatial
- GSD
- Edge Response

Spectral
- Panchromatic
- Color
- CIR

Radiometry
- Cosmetic
- Relative
- Dynamic Range
Multiple Views and Needs

Component Vendors
Supply qualified equipment/software

Acquisition Services
Meet end user needs
Differentiate services

Image End User
Understand how to get the right image to make a decision

Component Characteristics → Systems & Process Calibration → Digital Image → Application Task → Viewing Device

Digital Imagery Specification Guideline
Digital Imagery Request Form
Digital Imagery Tutorial Guideline
Cost versus Imagery Type

- Pan
- Color
- CIR
- Multispectral

$
Cost versus Ground Sample Distance

- GSD
- Feature Size

\[ \text{Cost} \text{ vs. } \text{GSD} \]
\[ \text{Cost} \text{ vs. Feature Size} \]
Cost versus Horizontal Accuracy

- Rectified w NED DEM
- Rectified w Lidar or Full Ortho Imagery

$\text{Scale Ratio}$

$\text{Accuracy}$
Cost versus Collection Constraints

$\text{Collection Constraints}$
Digital Imagery Request Form

- Type (Panchromatic, CIR, Color)
- GSD or Scale
- Geolocation Accuracy
- Collection Area
- Collection Constraints
- Post Processing Requirements
- Delivery Format (datum, compression, tiling)
Digital Image Product Guide Form

1. Choose Imagery Type Required: Panchromatic

2. Do you want more than 8-bits per spectral band?  ☐ Yes ☐ No

3. Do you want to specify your requirement based on hard copy map scale or ground sample distance (GSD) [pixel size on ground]? Hard Copy Scale

Submit
Do you know what GSD you want?

- Yes - Enter GSD ______ Specify units ☑ meters ☑ feet
- No

Submit
Horizontal Accuracy Requirements

- Based upon NMAS, the default CE 90% Level
- Based on NSSDA the default RMSE at 95% Level
- Enter Horizontal Accuracy Requirement

Define Collection Area

<table>
<thead>
<tr>
<th>Latitudes</th>
<th>Longitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Left</td>
<td>Degrees</td>
</tr>
<tr>
<td>Lower Right</td>
<td>Degrees</td>
</tr>
</tbody>
</table>

Define Collection Constraints

Seasonal Constraint: Leaf On

Acquisition Period

<table>
<thead>
<tr>
<th>Begin Date</th>
<th>Month</th>
<th>Day</th>
<th>Year</th>
</tr>
</thead>
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### Acquisition Period

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</table>

Maximum Cloud Cover/Cloud Shadow Allowed **10** %

### Acquisition Time of Day

Local Time **OR** Sun Angle

Start ____ Finish ____ **OR** Sun Angle 30 degrees elevation

### Flight Direction

- **Not Important**
- Enter Direction ____ (N/S, E/W, W/W, etc.)

### Acquisition Height

- **Not Important**
- Enter Height ____
  - Meters
  - Feet
  - ag
Minimum Overlap
- Contractor Discretion
- Select Overlap
  - Forward: 25%
  - Side: 30%

Flight Continuity
- Refly entire Flight Line within ___ days
- Refly break within ___ days and ___ % overlap

Collection Geometry: NADIR

Other Constraints

Image Post Processing Requirements
- Level 0: Raw Images (No Geometric or Radiometric correction)
Image Post Processing Requirements

- Level 0 - Raw Imagery (No Geometric or radiometric correction)

- Level 1

  Geometric
  - Parametric (Lat/Long assigned to each other)
  - Systematic (Distortion corrected)
  - Georectified
  - Orthorectified

  Radiometric
  - Cosmic (Software adjusted)
  - Relative
  - Absolute

- Resampling method (if applicable)
  - CC
  - NN
  - BL
  - Other

- Level 2 (Mosaic) - Level 2 is based on Level 1 specification

Other Additional Processing

Select Delivery Format
Other Additional Processing

Select Delivery Format

Datum: NAD83

If Other, 

Projection: State Plane

Units: Meters

Data Format

Uncompressed TIFF

Compressed JPEG

Storage Media: 8mm

If Other, 

Submit
Imagery Gallery

Image Chips are produced from features from Emerge imagery of Lakeland Florida
Image Gallery Examples

• RGB image of Parking Lot 8 inch GSD
Image Gallery Examples

• RGB image of Parking Lot 16 inch GSD
Image Gallery Examples

• RGB image of Parking Lot 24 inch GSD
Image Gallery Examples

• RGB image of Parking Lot 32 inch GSD
Image Gallery Examples

- RGB image of Parking Lot 40 inch GSD
Image Gallery Examples

- RGB Road Intersection 8 inch GSD
Image Gallery Examples

• Pan Road Intersection 8 inch GSD
Acknowledgement

• NASA Stennis Space Center has been a strong supporter of this work
• Related activities are the product characterization work at SSC
Stennis Space Center Test Results for Emerge DSS System

- Flown Jan 2003
- 0.3m GSD mosaic product
- NED DEM used
- Evaluated against SSC test control
- No control used
- RMS: 0.33m
- CE90: 0.4775m
- CE95: 0.5446m
Next Step

• Complete sample imagery sets is the goal
  – RGB Color 8 inch GSD or better

• We need feedback
  – Please email comments to: digital_guideline@asprs.org

• Start using the form