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Managing Large Projects using Enterprise Technologies

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Abstract

Large photogrammetric projects with challenging schedules require creative approaches to ensure successful completion. The integration of enterprise technologies (MS SQL Server, ArcSDE, ArcMap, ArcIMS, MS IIS) are key to the management and production of such projects.

This paper uses a case study to illustrate the benefits of integrating enterprise technologies. The case study involves the National Agriculture Imagery Program (NAIP), administered by the United States Department of Agriculture Aerial Photography Field Office, and a production team led by Surdex Corporation. This project required the production of 1 or 2 meter resolution Digital Orthophoto Quarter Quadrangles for the states of Missouri, Oklahoma, and Kansas over a three month time period in the summer of 2003. More than 31,000 frames of photography covering 220,000 square miles were acquired and processed into nearly 16,000 digital orthophotos.



Overview

- Development Background
- Development Goals
- Proposed Solution
- Enterprise Tools Used
- Result: Applications and Data



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Development Background

- Award of the 2003 USDA NAIP Contract
 - 3 States of DOQQ 1 and 2 Meter Imagery (220,000 square miles)
 - 68,000 Linear Flight Miles
 - 31,000 Frames of Photography
 - 16,000 Digital Orthophotos
 - 3 Months To Acquire Imagery (June – August)
 - 1 Month to Delivery Final Products (September)
- Special Requirements of the Project:
 - 5 Team members, 7 Aircraft
 - Daily Coordination of Team Flight Crews
 - Daily Reporting of Progress
 - Extensive Project Metadata Requirements



Development Background

- The need was identified for robust tools to ensure Schedule and Cost.
- Existing Project Management Tools:
 - MSProject, MSOffice & various specialized applications
 - Work Well for “Typical” projects, but may not scale well for the NAIP effort.
 - Not based on Distributed, Multi-User Technologies
 - Do Not easily Integrated to for Analysis and Decision Making



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Development Goals

- Enable timely and well informed decision making
- Promote detailed record keeping of process input, outputs and results
- Reduce record keeping overhead and allow operators to focus on the processes, not the record keeping
- Enable process automation where appropriate



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Development Goals

- Provide robust data for historical analysis
- Improve project collaboration using distributed, easily accessible communication tools
- Support a comprehensive Quality Management System, with a goal of ISO 9001:2000 QMS support



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Proposed Solution

- An RDBMS to store key Process Status and Metric data.
 - Collect and Integrated Disparate data sources into a single Central Store
- Dynamic Web Pages to Enter and Display data from the RDBMS.
 - Multi-User, Distributed Application
 - Consistent Input Forms for Uniform Data Collection
- GIS Tools for Analysis and Display of Spatial Data
 - Much of the Data has a Spatial Component

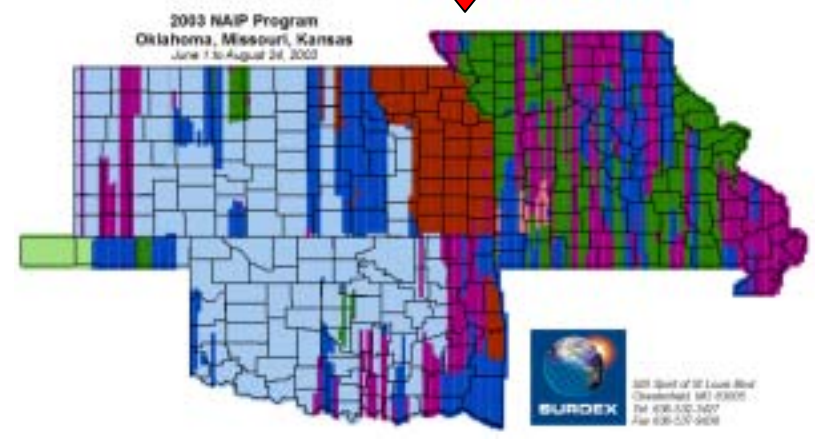
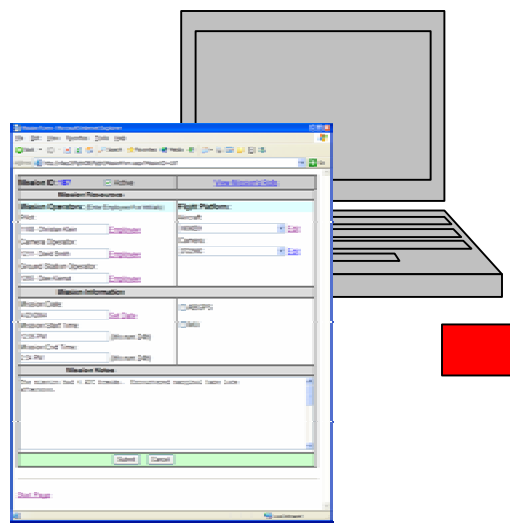


Enterprise Tools Used

- Microsoft SQL Server 2000
 - Appropriate for Organization and Application Size
- Microsoft IIS Web Server with Active Server Pages (ASP)
 - Readily Available Dynamic Content server
- ESRI ArcGIS Products
 - Integrate readily with SQL Sever and IIS
 - ArcMap, ArcSDE, ArcIMS, MapObjects



Data Flow





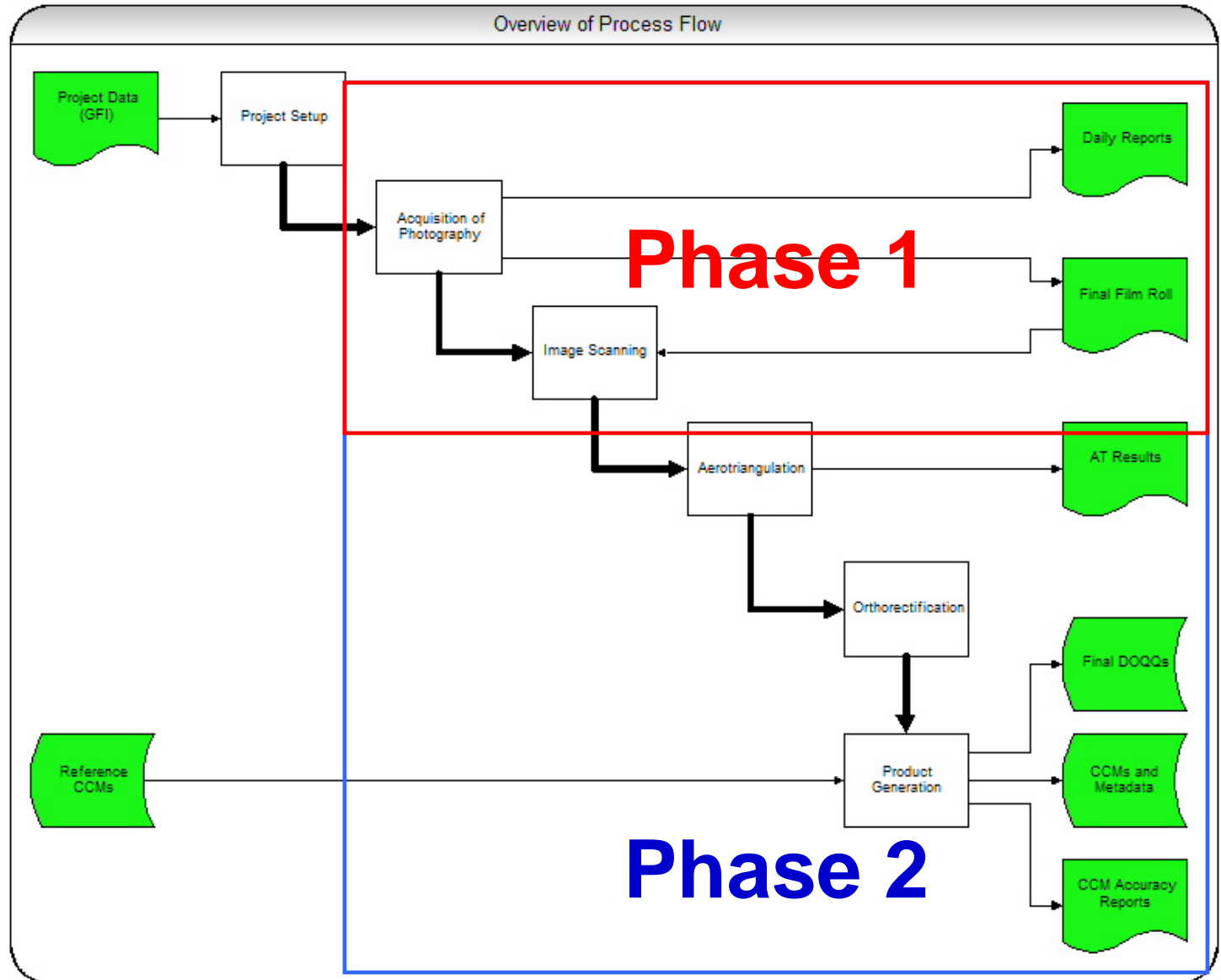
Results

- Development Focused into 3 Phases
 - Phase 1 (2003)
 - Focus on Flight and Lab operations
 - Develop Robust Data Structure
 - Phase 2 (2004)
 - Extend Applications to AT, Ortho, Compilation and Final Delivery
 - Enable Customer Status Reporting via Internet
 - Phase 3 (2005)
 - Extend Applications to Field Crews and Sub-Contractors



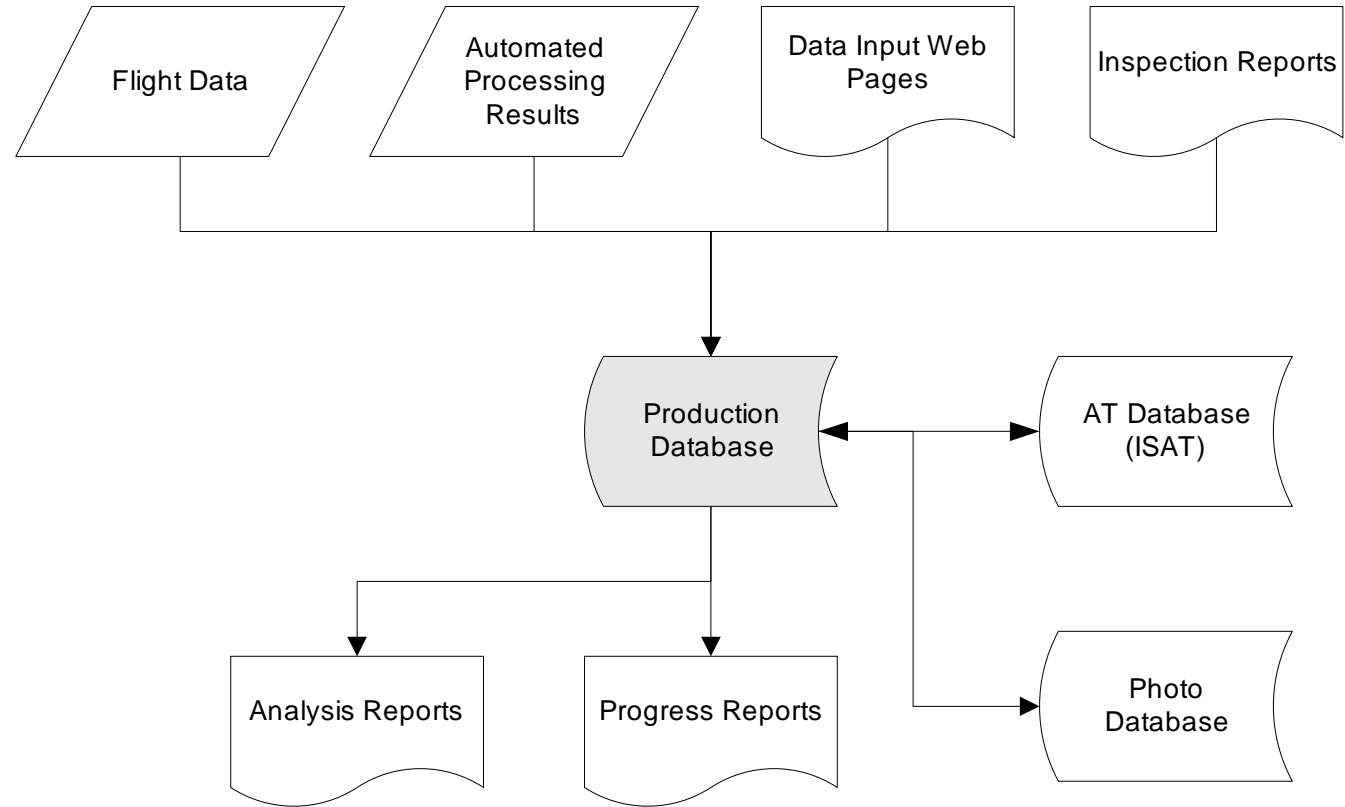
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Workflow





Data Base Interaction





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Project Status Page

Displays:

- Flight Acquisition Status
- Film Scanning Status
- AT Status
- Image Processing Status

Estimated Time to Complete Report - Microsoft Internet Explorer

http://naserver10production/hap_research/estimated_time_to_complete.asp

NAIP 2003 Estimated Time to Complete
As of 5/18/2004

	Oklahoma (1300011)	Missouri (1300512)	Kansas (1300513)
Flight Operations			
End Flight Date	05/31/2003	06/30/2003	06/30/2003
Flight Days Remaining	-261	-261	-261
Total Exposures (Planned)	8849	10172	11501
Exposures Froom	10254	11047	12401
Exposures Remaining (includes reflights)	0	0	0
Average Number of Exposures Required per Day	0	0	0
Film Scanning (Counts are for Dodged Images)			
Scan Days Remaining	-246	-246	-246
Total Number of Scans (Planned)	8848	10172	11501
Actual Scans to Complete (Accepted Frames + Remaining Frames)	10146	10475	11994
Scans Complete	10261	10666	11753
Scans Remaining	-115	-427	211
Average Number of Scans Required per Day	0	2	-1
Scan Hours Required per Day		8.1	
Aerotrangulation			
AT Days Remaining	-241	-241	-241
Total AT Counties (Planned)	77	115	105
AT Counties Complete	77	114	1
AT Counties Remaining	0	-1	104
Average AT Counties Required per Day	0	-4	-9
Image Processing (By County)			
Image Processing Days Remaining	-231	-231	-231
Total Number of Counties	77	115	105
Counties Complete	0	-49	0
Counties Remaining	74	66	105
Average Number of Counties Required per Day	-4	-4	-9
Image Processing (By Quarter Quad)			
Image Processing Days Remaining	-231	-231	-231
Total Number of Quarter Quads	4945	5043	5600
Quarter Quads Complete	320	3847	0
Quarter Quads Remaining	4625	1196	5600
Average Number of Quarter Quads Required per Day	-30	-5	-35

NAIP 2003 Progress Reports | Choose Different Project | Choose Detail of Report



Line Mile Report

Displays:

- Line Miles Flown for Each Aircraft (for Billing Information)
- Estimated Percent Complete using Line Mile Calculations
- Estimated Film Waste

Line Mile Report - NAIP 2003 - Microsoft Internet Explorer

http://mapserver01.tlproduction.com/reports/line_mile_report.asp

NAIP 2003 Current Line Miles

As of 5/15/2004

	Oklahoma (1300511)	Missouri (1300512)	Kansas (1300513)	TOTAL
N100BA <small>(Cessna 400)</small>	823	0	0	823
N191TA <small>(Boeing P31A)</small>	0	586	0	586
N200EH <small>(Boeing PA-24-320)</small>	448	0	5,621	6,069
N249AB <small>(Cessna 400)</small>	2,541	7,832	1,688	12,061
N27EH <small>(Cessna 330)</small>	300	8,800	461	9,561
N441MD <small>(Cessna 441)</small>	12,994	0	12,514	25,508
N690EH <small>(Cessna 690)</small>	3,677	5,399	4,748	13,824
TOTAL	21,883	22,617	25,032	69,532
Percent Complete <small>(Number is calculate from estimated total line miles flown. Please see E&I for an explanation of the calculation)</small>	100.7%	104.4%	102.1%	102.4%
Percent Excess Exposures <small>(Excess exposures = stations that have been flown more than once. Number is calculated as: "excess exposures/total exposures")</small>	0.92%	1.58%	2.38%	1.64%

NAIP 2003 Progress Reports | Choose Different Project | Choose Option or Report



Building Missions

Typical Data Input Page

- This page “Builds” a Roll of Film
- Planned Exposures are assigned a roll
- Ensures frame sequence and identification for Inspection and Scanning

The screenshot shows a web browser window with the URL http://shaser-ver11production/build_mission/prepare_form.asp. The page displays mission information for Project 1300012 and MissionID 100. It includes a 'Roll Information' section with input fields for Roll Name (Serial), Processor Speed, Processor Temperature, and Developer Tanks. A 'Current Mission Rolls' table shows a single roll: 1-071412001050000. Below this are 'Station Display Name Options' (Surdex, CCHS-ASCOT, Client) and 'Planned Stations' (Planned Line 1 - 0000V). The 'Planned Stations' table lists frames 1-145 to 1-150 with their coordinates. The 'Station Operations' section includes controls for Altitude (MSL), F-Stop, Shutter Speed, Flight Direction (Positive/Negative), and Add Options (End, Insert). The 'Flown Stations' table shows a list of frames with their coordinates and status (Blank or specific coordinates). At the bottom, there are 'Frames Selected' counters and navigation links.

Planned Line	Frame	Coordinates
1	145	09950W-0528
1	146	09950W-0529
1	147	09950W-0530
1	148	09950W-0531
1	149	09950W-0532
1	150	09950W-0533

Roll	Frame	Coordinates	Status
1-071412001050000	Blank		
1-071412001050000	28 - 31	0942E-0414	(28 - 16)
1-071412001050000	28 - 32	0942E-0415	(28 - 17)
1-071412001050000	28 - 33	0942E-0416	(28 - 18)
1-071412001050000	28 - 34	0942E-0417	(28 - 19)
1-071412001050000	28 - 35	0942E-0418	(28 - 20)
1-071412001050000	Blank		
1-071412001050000	71 - 32	0914W-0415	(71 - 17)
1-071412001050000	71 - 31	0914W-0414	(71 - 16)
1-071412001050000	71 - 30	0914W-0413	(71 - 15)
1-071412001050000	Blank		
1-071412001050000	25 - 106	0943W-0489	(25 - 81)
1-071412001050000	25 - 105	0943W-0488	(25 - 80)
1-071412001050000	25 - 104	0943W-0487	(25 - 88)
1-071412001050000	Blank		
1-071412001050000	24 - 104	0944E-0487	(24 - 89)
1-071412001050000	24 - 103	0944E-0488	(24 - 90)
1-071412001050000	24 - 106	0944E-0489	(24 - 91)
1-071412001050000	Blank		
1-071412001050000	30 - 74	0935E-0457	(30 - 59)
1-071412001050000	30 - 73	0935E-0456	(30 - 58)
1-071412001050000	30 - 72	0935E-0455	(30 - 57)
1-071412001050000	Blank		
1-071412001050000	Blank		
1-071412001050000	Blank		
1-071412001050000	Blank		



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Post Project Analysis

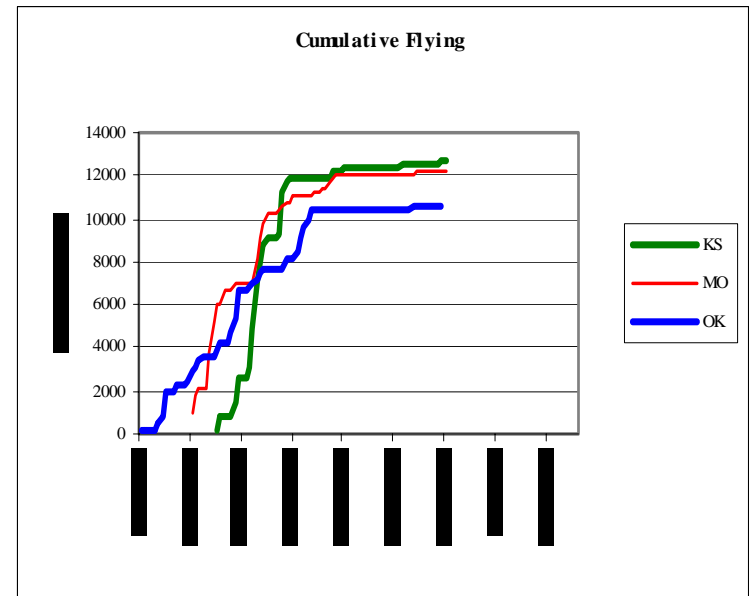
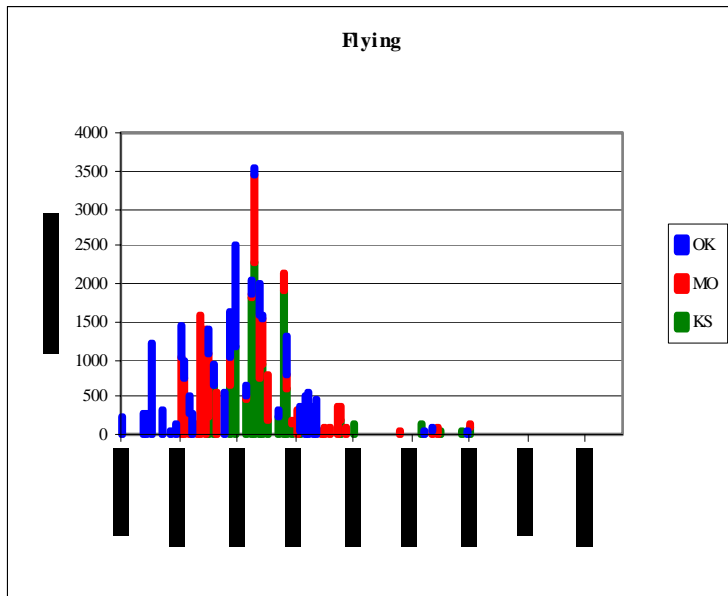
- Review Project Progress to evaluate Performance and Areas for Improvement
- Identify Modifications to DB Structure and Applications to improve Data Content and Quality
- Identify Utility of Reports and other Outputs to aid Timely Decision Making



Flight Progress

Flight Operations

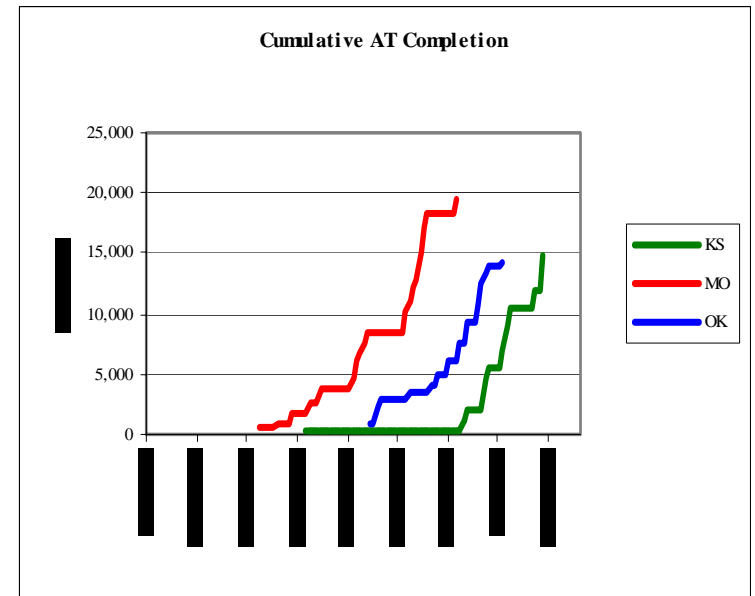
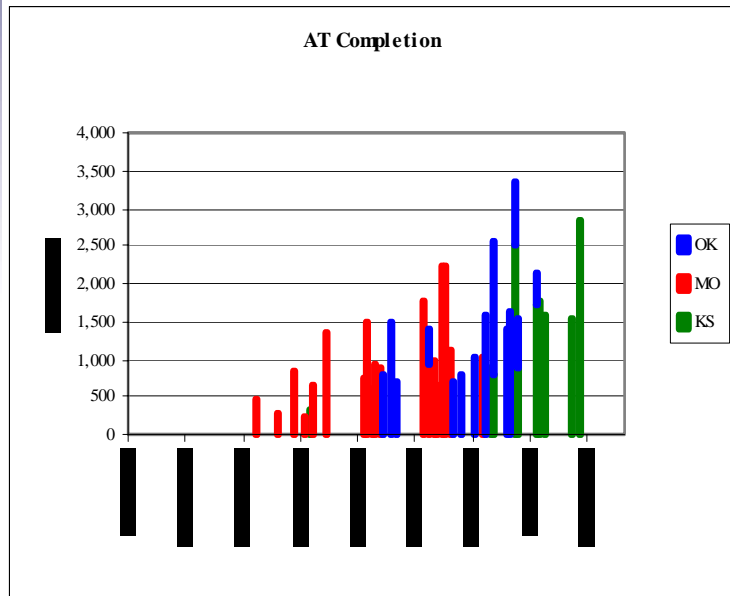
June 1 to August 31, 2003





AT Progress

Aerotriangulation Progress June 1 to September 30, 2003



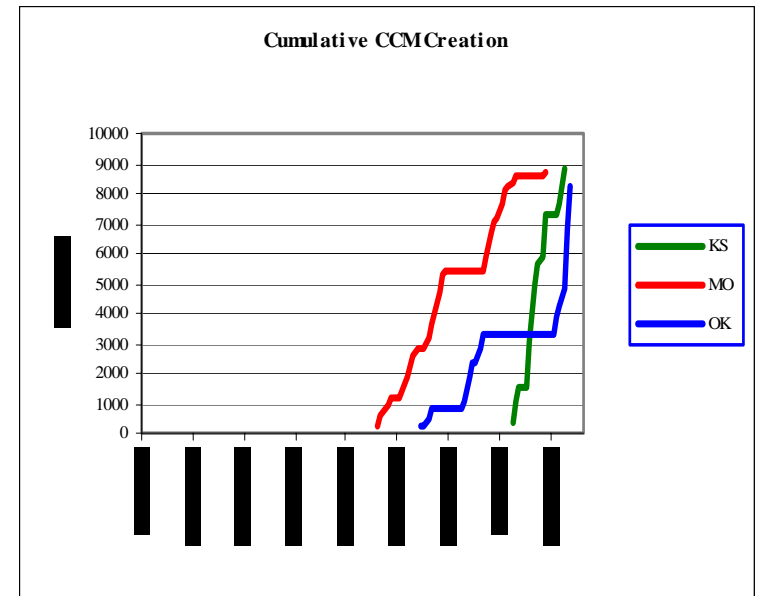
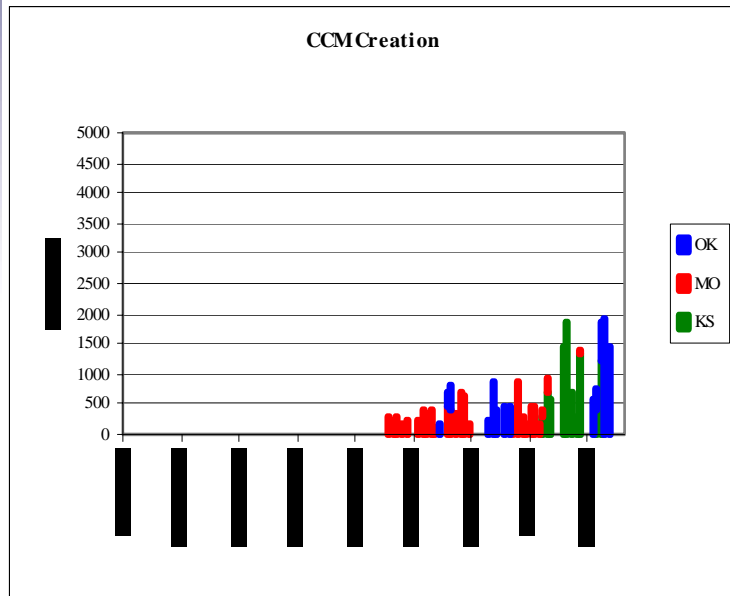


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Ortho Progress

County Mosaic Production

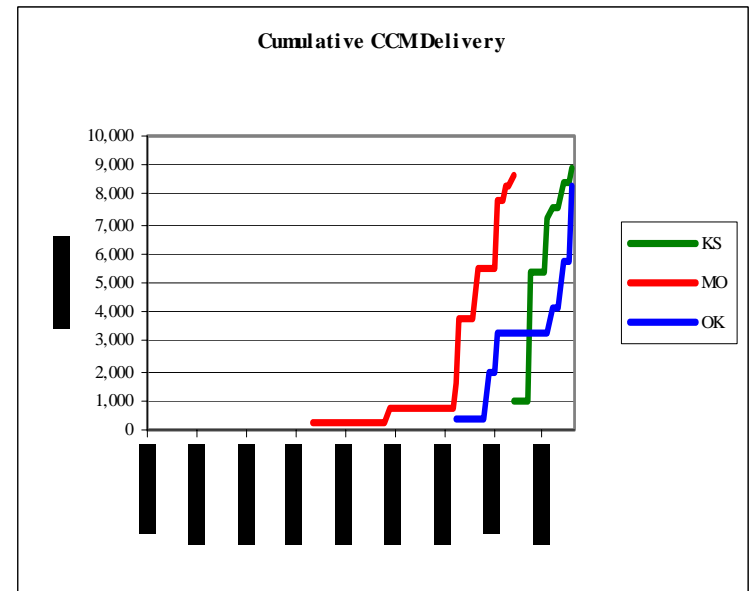
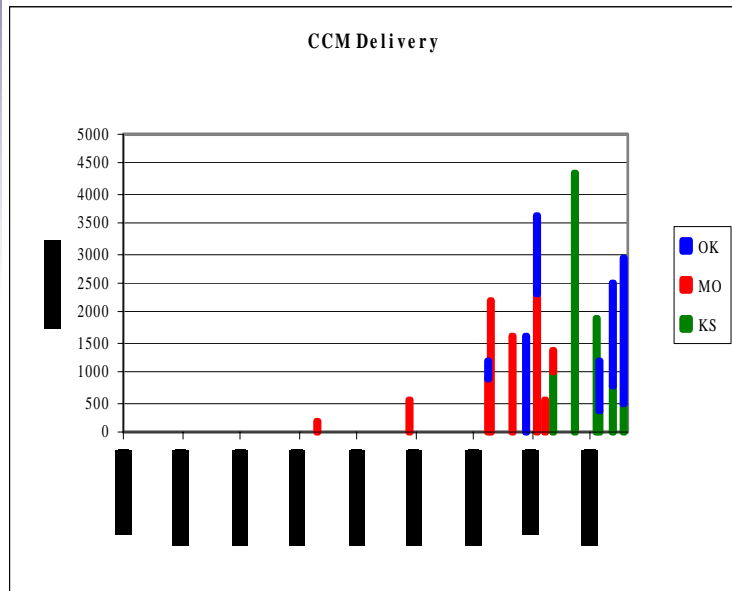
June 1 to September 30, 2003





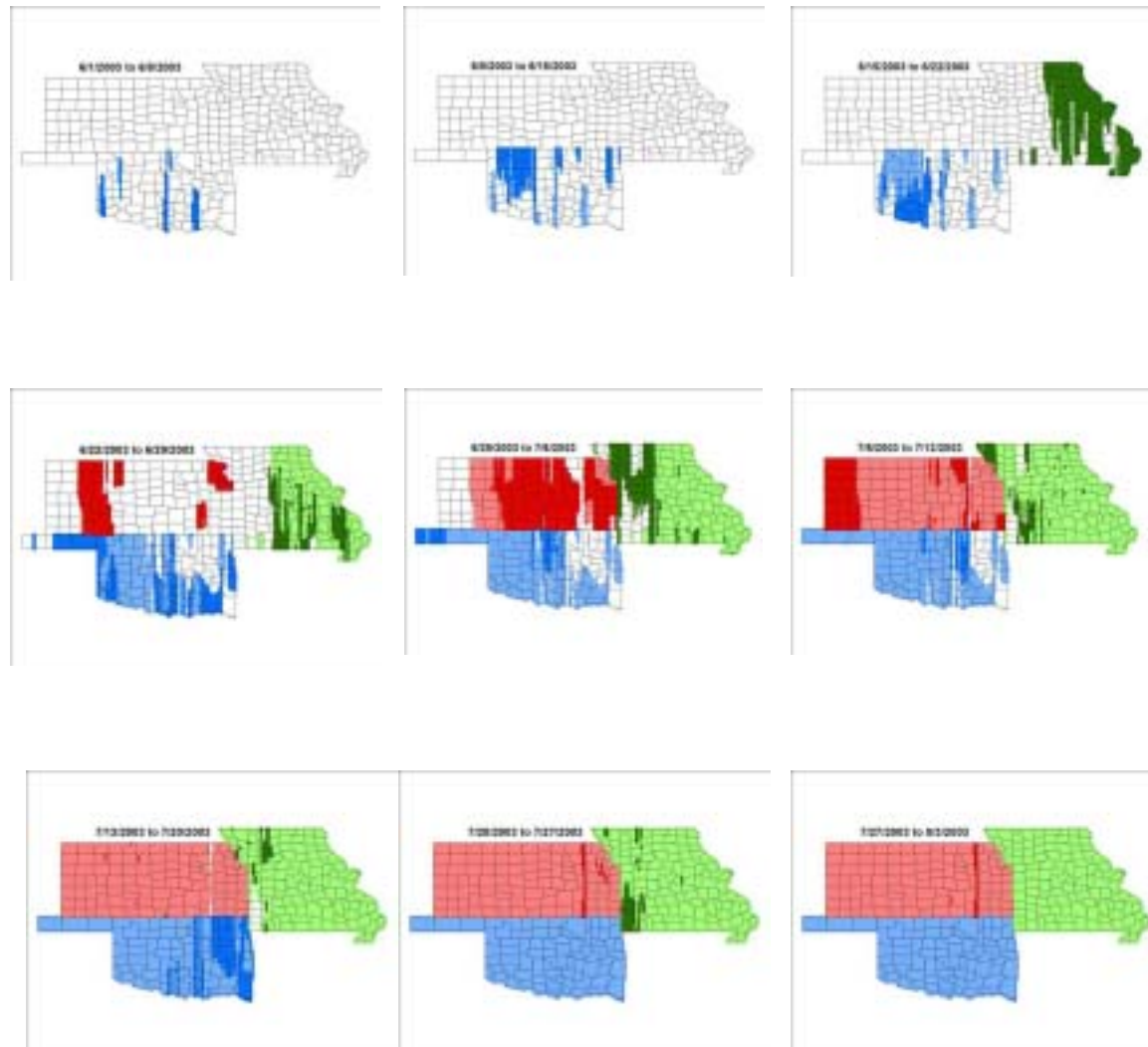
Delivery Progress

County Mosaic Deliveries June 1 to September 30, 2003





Weekly Progress

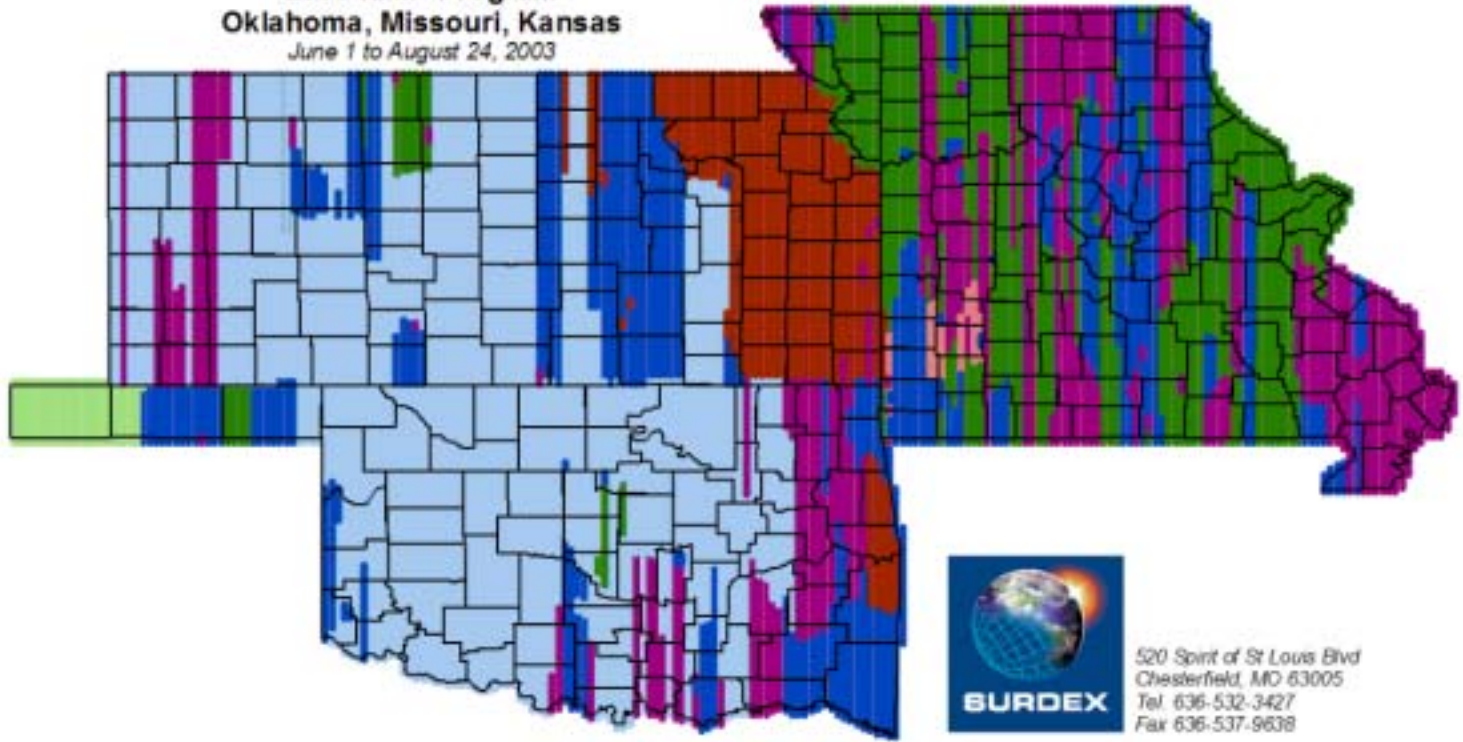




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Aircraft Utilization

2003 NAIP Program
Oklahoma, Missouri, Kansas
June 1 to August 24, 2003



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Date Span of Photography by County

