FEMA ERT-N Geospatial Intelligence Unit: Effective Response and Recovery in the Aftermath of a Disaster

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Introduction

- FEMA Overview
- FEMA GIS History
- Current Operations
FEMA Mission

“Reduce the loss of life and property and protect the Nation from all hazards, including natural disasters, acts of terrorism, and other man-made disasters, by leading and supporting the Nation in a risk-based, comprehensive emergency management system of preparedness, protection, response, recovery and mitigation.”
History of Geospatial Technology use at FEMA:

- **Originated in 1993 with Hurricane Andrew**

- **Field operations that GIS and RS use has taken a lead role in:**
  
  - Northridge Earthquake (1994)
  - Hurricane Floyd (1999)
  - Nisqually Earthquake (2001)
  - September 11, 2001
  - Salt Lake City Olympics (2002)
  - Shuttle Columbia Recovery (2003)
  - Hurricane Isabel (2003)
  - 2005 Hurricanes (Katrina, Rita, Wilma)

- **GIS is deployed in most medium to large scale disasters**
Current Operations

- **10 FEMA Regions**
  - 30 Cadre Members
- **Five Hardware Suites**
  - PC based workstations
  - ESRI GIS software
  - Enterprise Architecture
- **Region 10 Cadre**
  - 6 People
  - Deployable within 72 hours
Who we are...

- An aggressive and resourceful group
- Scattered across the US
- Inter-disciplinary professional backgrounds
- Reservist, Regional, and HQ Staff from State and other Federal Agencies
Geospatial Unit Staffing and Support

- Federal Emergency Management Agency
- Army Corps of Engineers
- National Geospatial Intelligence Agency (NGA)
- Department of Interior
- National Oceanic and Atmospheric Administration (NOAA)
- US CENSUS Bureau
- US Coast Guard
- NASA
- Environmental Protection Agency (EPA)
- Department of Defense
- Department of Health and Human Services
- Department of Energy (DOE)
- Red Cross
- Department of Transportation (DOT)
- Urban Search and Rescue (US&R)
- State Department of Emergency Management
- Others
What We Do...

The disaster lifecycle...

- Response
- Recovery
- Mitigation
- Preparedness

Presidential Disaster Declaration
FEMA Geospatial Activities in...

**Response**
- Respond to incidents, Special Security Events, or Presidential Disaster Declarations; Support ALL Emergency Support Functions in the National Response Framework; Support decision-makers at all levels of the operation; Build a Common Operating Picture; Provide Situational Awareness to Executives, Homeland Security Critical Infrastructure Protection (HSIP).

**Recovery**
- Develop decision-making tools for the rebuilding of communities and to support recovery operations; Support Individual Assistance and Infrastructure repair activities, support Environmental and Historic Special Consideration reviews.

**Mitigation**
- Work with the Geospatial community, Local and State governments to lessen the impact of Disasters; Research and Publication of recommendations, guidelines and standards; Map Modernization and National Flood Insurance (NFIP).

**Preparedness**
- Build regional Contacts and Data; Develop program support; Coordinate within the geospatial community; Create Regional “Go-Kits”; and Application Development, Develop Geospatial Preparedness capabilities at State and Local level.
Response Operations:

- **Day - 1**: Rapid Needs Assessment
- **Day - 2**: Intermittent Support
- **Day - 3**: Intermittent Support
- **Day - 4**: Intermittent Support
- **Day - 5**: Intermittent Support
- **Day - 6**: RRCC Transition
- **Day - 7**: RRCC Transition
- **Day - 8**: RRCC Transition

- **MAC**: Intermittent Support
- **RRCC**: RRCC Transition
- **ERT**: JFO Opens - Field Operations

**Expect 4-6 Weeks of Response Operations for Major Events!**
## Operations Section

### Emergency Support Function (ESF) Teams

<table>
<thead>
<tr>
<th>ESF #1 – Transportation</th>
<th>ESF Coordinator: Department of Transportation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal and intertransportation support</td>
<td>Transportation safety</td>
</tr>
<tr>
<td>Resilience and recovery of transportation infrastructure</td>
<td>Movement restrictions</td>
</tr>
<tr>
<td>Damage and impact assessment</td>
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</tbody>
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<table>
<thead>
<tr>
<th>ESF #2 – Communications</th>
<th>ESF Coordinator: DHS (National Communications System)</th>
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</thead>
<tbody>
<tr>
<td>Coordination with telecommunications industry</td>
<td>Restoration and repair of communications infrastructure</td>
</tr>
<tr>
<td>Protection, restoration and sustainment of national cyber and information technology resources</td>
<td>Oversight of communications within the Federal incident management structure</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>ESF #3 – Public Health and Medical Services</th>
<th>ESF Coordinator: Department of Health and Human Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public health</td>
<td>Medical</td>
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<tr>
<td>Mental Health Services</td>
<td>Mortuary services</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>ESF #4 – Search and Rescue</th>
<th>ESF Coordinator: DHS (FEMA)</th>
</tr>
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<tbody>
<tr>
<td>Lifesaving assistance</td>
<td>Search and rescue operations</td>
</tr>
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<thead>
<tr>
<th>ESF #5 – Oil and Hazardous Materials Response</th>
<th>ESF Coordinator: Environmental Protection Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and hazardous materials (chemical, biological, radiological, etc.) response</td>
<td>Environmental safety and short- and long-term cleanup</td>
</tr>
</tbody>
</table>

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<tr>
<th>ESF #6 – Agriculture and Natural Resources</th>
<th>ESF Coordinator: Department of Agriculture</th>
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</thead>
<tbody>
<tr>
<td>Nutrition assistance</td>
<td>Animal and plant disease and pest response</td>
</tr>
<tr>
<td>Food safety and security</td>
<td>Natural and cultural resources and historic properties protection</td>
</tr>
<tr>
<td>Safety and well-being of pets</td>
<td></td>
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</tbody>
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<thead>
<tr>
<th>ESF #7 – Energy</th>
<th>ESF Coordinator: Department of Energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy infrastructure assessment, repair and restoration</td>
<td>Energy industry coordination</td>
</tr>
<tr>
<td>Emergency response</td>
<td></td>
</tr>
</tbody>
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<tr>
<th>ESF #8 – Public Safety and Security</th>
<th>ESF Coordinator: Department of Justice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility and resource security</td>
<td>Security planning and technical resource assistance</td>
</tr>
<tr>
<td>Public safety and security support</td>
<td>Support to access, traffic and crowd control</td>
</tr>
</tbody>
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<thead>
<tr>
<th>ESF #9 – Long-Term Community Recovery</th>
<th>ESF Coordinator: DHS (FEMA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social and economic community impact assessment</td>
<td>Long-term community recovery assistance to States, local governments and the private sector</td>
</tr>
<tr>
<td>Mitigation analysis and program implementation</td>
<td></td>
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</tbody>
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<tr>
<th>ESF #10 – External Affairs</th>
<th>ESF Coordinator: DHS</th>
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</thead>
<tbody>
<tr>
<td>Emergency public information and protective action guidance</td>
<td>Media and community relations</td>
</tr>
<tr>
<td>Congressional and international affairs</td>
<td>Tribal and insular affairs</td>
</tr>
</tbody>
</table>
Planning Section

- Supports the overall disaster operations and executives
- Gathers, corroborates and disseminates information to support planning and decision making and situation awareness
- Determines Operational Period, coordinates Action Planning process
- Includes the Geospatial Intelligence Unit

Authorities and Capabilities...

- National Response Framework (NRF)
- Incident Command System (ICS)
- Interagency Coordination
- Information Collection and Management
- Common Operational Picture (COP)
Geospatial Intelligence Unit
Mission Statement

- The mission of the Geospatial Intelligence Unit is to support Emergency Response Team (ERT) situation awareness and operational decision making through the development and delivery of: Specialized Products and Services, Maps, Databases, Analysis, Subject-Matter-Expertise, and Customized Applications...
How is the Geospatial Intelligence Unit organized at the JFO?

Geospatial Intelligence Unit Leader
- Leads the Unit for ESF-5 Planning
- Coordinates Operations for GIS
- Administers Branch Resources
- Maintains High QA/QC for Mission Critical Projects

GIS Coordinator
- JFO Project Management
- GIS Special Projects
- External Coordination and Data Collection
- Other Federal Agency - ERT Coordination
- Database Management
How is the Geospatial Intelligence Unit organized at the JFO?

Remote Sensing Coordinator
- Coordinates Imagery Acquisition
- Commercial Sources
- Government Sources
- NTM Sources

GIS Specialists/Technical Specialists
- Mapping, Database, other project support
- Day-to-Day Operations
- Point-of-Contacts for Programs
- Subject Matter Experts (SMEs)
- Local GIS Community Experts
Operational Mapping and Situation Awareness

- Common Map Production
  - Damage Assessment
  - Population Impacts
  - Infrastructure Impacts
  - Natural Hazards

Support for **ALL** ERT Program Elements
Damage Assessment
Recovery – Public Assistance and Individual Assistance

Hurricane Katrina (2005)
Shuttle Columbia Recovery Effort
Lufkin, TX (2003)
Tracking Hurricane Rita Population Displacement...

...and Damage.
Washington Nisqually Earthquake (2001)
WTC- 911/Recovery - Debris
Computer Modeling Tools and Remote Sensing

- Includes HAZUS, ALOHA, CAMEO, SLOSH, HURREVAC, NARAC and custom tools

- Customized tools take into account factors such as:
  - Toxic Release Inventory Sites
  - Critical Infrastructure
  - Threatened & Endangered Species
  - Elevation
  - Hazmat Incident Extents
  - Population Density
  - Land Use
  - Existing Roads (Infrastructure)
  - Repetitive Loss Sites
  - Repetitive Loss Frequency
  - Structural Damage Levels
  - Flood Zones
  - Wetlands
  - Rivers

- Flood Zones
- Wetlands
- Rivers
HAZUS Modeling
Provides Quick Preliminary Estimation of Impacts and Loss
NOAA Coastal Services Center – Provides Meteorological Expertise and Response Support...

Hurricane Rita (2005)
<table>
<thead>
<tr>
<th>Satellite</th>
<th>Imagery Type</th>
<th>Nationality</th>
<th>Spatial Resolution</th>
<th>Swath Width</th>
<th>Revisit Time</th>
<th>Cost / km²</th>
<th>Archived Cost / km²</th>
<th>Tasking Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>QUICKBIRD</td>
<td>E/O, Pan, MSI</td>
<td>USA</td>
<td>0.61m Pan</td>
<td>16km</td>
<td>3-4 Days</td>
<td>$9.00</td>
<td>$2.25</td>
<td></td>
</tr>
<tr>
<td>IKONOS</td>
<td>E/O, Pan, MSI</td>
<td>USA</td>
<td>1m Pan 2.4m - 4 x Band MSI</td>
<td>11km</td>
<td>3-4 Days</td>
<td>$10.00</td>
<td>$7.00</td>
<td></td>
</tr>
<tr>
<td>ORBVIEW 3</td>
<td>E/O, Pan, MSI</td>
<td>USA</td>
<td>1m Pan 2.5m &amp; 5m Pan 4m - 4 x Band MSI</td>
<td>6km</td>
<td>3-4 Days</td>
<td>$0.90 - $1.78</td>
<td></td>
<td>$950.00</td>
</tr>
<tr>
<td>SPOT 5</td>
<td>E/O, Pan, MSI</td>
<td>France</td>
<td>1m Pan 4m - 4 x Band MSI</td>
<td>60-120km</td>
<td>2-3 Days</td>
<td>$0.50</td>
<td>$0.10</td>
<td>$950.00</td>
</tr>
<tr>
<td>SPOT 2,4</td>
<td>E/O Pan, MSI</td>
<td>France</td>
<td>10m Pan 20m 4 x Band MSI (Vis) &amp; 10m 1 x Band Pan</td>
<td>60-120km</td>
<td>2-3 Days</td>
<td>$0.02</td>
<td>$0.01</td>
<td>$950.00</td>
</tr>
<tr>
<td>RESOURCESAT-1</td>
<td>E/O Pan, MSI</td>
<td>Canada</td>
<td>8m - 100m</td>
<td>50km</td>
<td>2-5 Days</td>
<td>$0.11 - $1.02</td>
<td>$100 - $500</td>
<td></td>
</tr>
<tr>
<td>EROS A1</td>
<td>E/O Pan</td>
<td>Israel</td>
<td>1.8m Pan</td>
<td>12.5km</td>
<td>2-3 Days</td>
<td>$10.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EO1- ALI</td>
<td>E/O, MSI</td>
<td>USA</td>
<td>10m Pan 30m 9 x Band MSI</td>
<td>37km</td>
<td>5 days</td>
<td>$0.07</td>
<td>$0.02</td>
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<tr>
<td>LEO- HSI</td>
<td>E/O, Pan, MSI</td>
<td>USA</td>
<td>15m Pan 30m 6 x Band MSI</td>
<td>185km</td>
<td>14 Days</td>
<td>$0.18</td>
<td>$0.02</td>
<td>$750.00</td>
</tr>
<tr>
<td>LANDSAT 7</td>
<td>E/O, Pan, MSI</td>
<td>USA</td>
<td>15m 3 x Band MSI (VNIR) 30m 6 x Band MSI (VIS/WMIR) 90m 5 x Band MSI (M/LWIR)</td>
<td>5 days</td>
<td>$0.07</td>
<td>$0.02</td>
<td>$750.00</td>
<td></td>
</tr>
<tr>
<td>RADARSAT 1</td>
<td>Synthetic Aperture Radar (SAR)</td>
<td>USA</td>
<td>8m - 100m</td>
<td>50km</td>
<td>2-5 Days</td>
<td>$0.11 - $1.02</td>
<td>$100 - $500</td>
<td></td>
</tr>
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