Intro to Wildland SAR for GISS

SARGIS10: GISS Track, Day 2
October 26, 2018
ESF-9 Primary Agencies

FEMA
- Department of Homeland Security

U.S. COAST GUARD (USCG)
- Department of Homeland Security

NATIONAL PARK SERVICE (NPS)
- Department of the Interior

DEPARTMENT OF DEFENSE (DoD)
- USNORTHCOM/USPACOM
DURING AN INCIDENT.....

- Follow the chain of command.
- Maintain appropriate span of control.
- Use appropriate ICS forms.
- Use appropriate ICS terminology.
Role of GIS in Emergency Management

Incident Commander

- Public Information Officer
- Liaison Officer
- Safety Officer

Operations Section
- Branches
- Air Ops Branch
  - Divisions
  - Groups
  - Strike Team
  - Task Force
  - Single Resource

Planning Section
- Resource Unit
- Demob. Unit
  - Situation Unit
  - Document Unit

Logistics Section
- Service Branch
- Support Branch
  - Commun. Unit
  - Supply Unit
    - Medical Unit
    - Facilities Unit
    - Food Unit
    - Ground Support Unit

Finance/Admin Section
- Time Unit
- Cost Unit
- Compensation Claims Unit
- Procurement Unit

Geospatial Information Unit

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Geospatial Information Unit

- Responsible for producing all incident specific geospatial products (such as maps, reports, and GIS data). The GIU works closely with other units in the Planning Section to develop the products that are needed to support all phases of the incident (prevention, protection, mitigation, response and recovery). Supporting the decision makers utilize resources and prioritize activities.

- The use of GIS products and analysis helps provide context for decision makers and gives them a clearer picture of what is occurring at the incident level (i.e., better situational awareness of the incident).

- GIU Responsibilities
  - Generating geospatial products
  - Managing geospatial data
  - Ensuring compliance with established policies and protocols
  - Providing geospatial coordination and customer service
  - Operating specialized hardware and software applications
Elements of a deliberate risk management process

- Identify hazards
- Assess hazards
- Make risk decisions
- Implement controls
- Maintain supervision
Identify Your Local Hazards In Advance

It is important that these are adequately addressed during a SAR response.

Some local examples include terrain, weather, flash flood prone area, insects, snakes, poison oak & ivy, etc.
Applying “good situational awareness” also means taking appropriate action on information that is received.

Emergency incidents are dynamic and information-sharing is a key factor to successful and safe operations. Poor situational awareness is a primary factor in accidents attributed to human error.
During an incident, personnel develop a personal “mental model” based upon their image of what the mission involves and the expected plan.

A mental model may be filled with inaccuracies or assumptions, which differ from other team members on the incident. This can be avoided with a thorough and accurate briefing.
Thorough mission briefings and sharing of critical updates among team members leads to an accurate shared mental model, which increases situational awareness.
“Initial Actions” of a Search Incident

- **Investigation** – generates valuable intelligence about subject behavior and ultimately where to search.

- **Containment** – Search personnel located in a position such as a trailhead, trail junction, road block, perimeter patrol, etc. to passively intercept search subject or prevent them from leaving search area.

- **Hasty Search Team** – 2 to 3 trained SAR personnel with knowledge of search area, self sufficient and well equipped team, record coverage using GPS. May be on foot, horseback, bicycle, boat, vehicle, etc. Clue conscious team focused on efficiently searching high probability “travel aids” such as established trails, ridgelines, game trails, streams, power line right-of-ways, railways, roads, etc.

EXPERIENCE YOUR AMERICA
Travel Aids

The majority of search subjects follow “travel aids” along a path of least resistance. This includes trails, roads, ridgelines, streams, washes, utility corridors, games trails, etc.
SAR Points

- **PLS** – Point Last Seen; established by an eyewitness.

- **LKP** – Last Known Point; established by clues discovered during the incident that provides updated information on the subject. Such as a signature in a trail registry.

- **IPP** – Initial Planning Point; reference point that does not change during the incident. (Can be the same as PLS or LKP.)

- Clues – Search team members are looking for clues as well as the subject. The information, objects or physical sign including subject sightings, tracks, clothing, and other items associated with the subject. **NOTE:** Clues may be valid or not, this is important to properly symbolize this on the map.
SEARCH OPERATIONS

Importance of Containment

The theoretical search area grows with every passing hour...

After two hours the search area is four times larger

After three hours the search area is nine times larger!

Employing Containment Of The Search Subject Keeps The Search Area From Expanding
Establish Initial Search Area

METHODS

- **Theoretical search area** – Possible distance that a subject could have traveled from the IPP if the subject was able to travel in any direction unhindered by terrain. Circle.

  \[ \text{Rate of travel} \times \text{Time} \]

- **Statistical search area** – Based on data derived from previous incidents that reflects the distance other subjects have traveled from the IPP given similar conditions.

  \[ \text{Lost Person Behavior: such as 75\% runners within 2.1 miles} \]

- **Subjective Factors** – Specific factors for that individual incident and location are considered. Such as terrain and environmental conditions, history from previous searches, and “gut feelings”.

- **Deductive Reasoning** – Systematically analyze the circumstances surrounding the subject who is lost/missing. This is applied to the establishment of search area.
SEARCH OPERATIONS

INITIAL ACTIONS- Using Confinement To Limit Search Area
SEARCH OPERATIONS

INITIAL ACTIONS - Hasty Search Efforts
Hasty Search

- Usually during OP1 (Operational Period 1).
- Often displayed on a map as buffered trails or drawn in as lines based on GPS tracks. Some IC’s give these a different weight than others depending on the situation/team/terrain/timeline.
Search Segments

- Once the initial hasty is completed and an updated search area has been established, then subdivide into manageable units for searchers (1 OP)
- Utilize breaks that can be seen in the field by searchers – ridges, drainages, fences, etc.
- Inviting routes for travel (travel aids) should be separate segments.
- Part art, part science. Institutional knowledge is key.
- May be pre-segmented in some places (consider doing this for your jurisdiction!)
- GISS should not be creating these in a vacuum – either predefined by IC/Plans Chief or personnel with knowledge of the area.
Probability of Area (POA)

- Chance (percent) that the subject is in a given segment.
- Group consensus to prioritize segments.
- Once created, Plans and Ops can assign resources to the search segments.
The reality is that natural difficulties in terrain make it nearly impossible to achieve a very high “probability of detection.”

PROBABILITY OF DETECTION- Measurement of search effort effectiveness.
SWEEP SEARCH

Searchers employ “purposeful wandering.”
SEARCH OPERATIONS

GRID SEARCH

Search Team Makes Additional Passes To Cover Entire Segment

Spacing Is Determined By Terrain, Targeted POD & Search Subject
Incident Action Plan (IAP)

- Contains incident information including organizational chart, search team assignments
- GISS should ensure it also includes a map (or map book)
- Ensure that it states what format the incident is using: USNG? Lat/Long in Degrees Decimal Minutes (common for aviation involved incidents)?
Geographic Information Systems (GIS)

Initial Lost Person Information Plotted
Geographic Information Systems (GIS)

2 Search Area Boundary Established
Global Positioning System

GPS track log of ground search efforts displayed on incident map.
Incident maps reflect the search area segmentation and incident elements such as helispots or staging areas.
How Can GIS Help SAR?

- Application of modern tools for SAR planning and operations
  - Access up-to-date information for enhanced situational awareness
  - Decision making and addressing uncertainty (Critical Thinking)
  - Automating operational, analytical and administrative processes.
  - Communicating information to others.
- Provide a better understanding of the role of geospatial information for SAR
  - How does geography influence the missing subject?
  - How does geography influence the way we search and conduct rescues?
  - How does geography influence the assumptions we make about the missing subject and searching?
GIS SAR Products

- SAR Personnel are not always used to working with GISS and may not know what to ask for.
- Without being a nuisance, listen and talk to team members to make suggestions as to what they might need.
- Preferably, talk to the team in advance.
- Map Product Gallery
  - Repeat/cyclic products
  - Intermittently updated
  - Ad hoc products
HOW??

Plan Ahead!!

- Know who would respond in your area (resources) and what areas you could be sent to
- Get your Minimum Essential Datasets (MEDs) in order now!
  - DRGs (Topos)
  - DOQs (Aerial Imagery)
  - Hillshade
  - Slope
  - Rectified Brochure
  - Maps
  - Boundaries
  - Watersheds
  - Hydrography
  - Place Names
  - Buildings
  - Communications
  - Roads & Trails (social/winter)
  - Buildings
  - Ground & Air Hazards
  - Aviation (Helispots/LZs)
  - Historic SAR incidents

- Pre-segment (ground and air)
- Order inks/cartridges/paper for your plotters and tabloid-size printers and GPS cords/batteries
- Know your technology.....practice!!
- Comfort with ICS & acronyms
- What format/datum/projection will you use in your area? (IAP)
Prep the Products

- Communicate with your SITL/Plans Chief!
  - Be aware with the current status of the incident.
  - Are you using GIS/map request forms? Or direct orders?
  - Ask questions if something doesn’t seem logical, but don’t be a nudge.
  - Get Clues/Info back and into GIS/on the maps
  - Figure out how maps will get to teams/briefing – request runners if necessary.
- Tools for Segmenting if Necessary
  - mxds as templates
  - Topos for drawing on (or old-school, acetate)
  - Web Tools
    - AGOL/Portal
    - Geocortex Web Viewer
- GeoPDFs
- Avenza – Check current licensing. Create spatial PDFs for products.
- Mobile Apps
- Carry Map, Collecto
Think Outside of the Box

- Once your core products are out, then....
  - Eat/Sleep if needed
  - Attend briefing
  - Help the Consensus Team? (rank segments)
  - Are there any analyses that you can do?
    - Radio Coverage
    - Cell Phone
    - Travel-Cost Model
    - Potential Landing Zones
    - Sound Analyses
  - Be prepared for next thing coming
The ability to use a compass is a vital skill for all SAR personnel.
Incident Conclusion

Hot Debrief

The “hot debrief” is an informal after-action review to discuss the operation candidly with involved personnel focused on improving future operations.
Initial Actions--- Identify Command & Determine Incident Objectives

- Investigation
  - Develop Thumbnail Sketch – Maintain Contact With Reporting Party
  - Determine Point Last Seen or Last Known Point—Crime Scene Considerations
  - Calculate Search Urgency—Determine Strategy—Passive vs. Active
  - Disseminate initial information (e.g. flyer, radio, telephone & neighbors)
  - Conduct Interviews(s) -- Lost Person Questionnaire, NCIC Checks. Obtain Photo.
  - Assign dedicated investigator—anticipate additional investigative staffing.

- Confinement
  - Review Lost Person Behavior.
  - Limit the subject’s movement.
  - Consider transportation options, domiciles and voice mail.

- Hasty Search
  - Personnel accountability (check-in) in place—check-in personnel.
  - Deploy competent and efficient search teams following a briefing.
  - Personal preparedness for field assignment (e.g. 24-hour pack in backcountry)
  - Focus on high probability areas (e.g. travel aids, prior searches & hazard areas)
  - Use appropriate tactics for subject (e.g. responsive, unresponsive or evasive)

Concurrent Actions--- Assign Plans Function & Identify ICP

- Establish Search Area
  - Use detailed maps (e.g. 1:24,000 scale)
  - Mark Point Last Seen (PLS) or Last Known Point (LKP)
  - Apply the four common methods of establishing a search area; 1.) Theoretical, 2.) Statistical, 3.) Subjective & 4.) Deductive Reasoning

- Segmentation
  - Segments sized to allow effective searching in an operational period.
  - Segment boundaries should be identifiable in the field.
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  - Consider vegetation, terrain, and obstacles in segment selection.
  - Travel aids delineated as separate search segments.

- Calculate Initial Probability of Area (POA)
  - Small team with local knowledge & expertise (e.g. investigator, PSC, OSC, etc)
  - Use Modified Mattson Consensus method following extensive team briefing
  - Calculate initial POA- Employ software and dedicated computer operator

**Successive Actions--- Project incident overhead & resource needs**

- **Conduct Planning Meeting** (Pre-meeting consensus by OPS & Plans)
  - Situation Update (OPS & Investigations) -- Analyze Updated POA values
  - Review Incident Objectives
  - Weather
  - Complete Operational Planning Worksheet (ICS-215)
    - Plan for contingencies— Operational setbacks; Rescue & recovery
    - Determine resource needs-
    - Safety-- Hazard Analysis (LCES-ICS 215A) – Develop mitigation procedures
    - Approval of Plan & functional comments

- **Prepare Incident Action Plan (IAP)** -- Detailed division assignments (ICS-204)

- **Briefing**
  - Manageable number of participants and limit distractions
  - Organized format and succinct

- **Deployment**
  - Plan for efficient effective deployment of resources – Anticipate problems
  - Mentally project and sufficiently plan to avoid the “hurry up & wait” syndrome.

- **Debriefing**
  - Plans Section personnel-- utilize interviewing skills—Debrief team leaders.
  - Obtain Probability of Detection (POD) -- **Evaluate accuracy**!
  - Document coverage— Plot on map or GPS download.
  - Identify gaps in coverage and operational deficiencies.
  - Update POA values—Prepare for next planning meeting.
Thank You

National Park Service
U.S. Department of the Interior