Digital Mapping for Search and Rescue / Emergency response

Instructor: Don Ferguson, PhD – Appalachian Search and Rescue Conference

Description: This course provides a detailed exploration of the influence of terrain and the environment on wilderness search and rescue operations. In particular, we will examine how geography influences the missing subject and how it influences the way we conduct search operations. Strong emphasis is placed on the utilization of modern computer based mapping software applications, such as ArcGIS and the MapSAR_Ex template. While other mapping applications are discussed and presented, focus is given to the use of the MapSAR_Ex map Template inside of ArcGIS due to its ability to perform a large array of functions that support effective management of SAR operations and growing interest in the search and rescue community. These types of tools can provide analytical tools and utilize readily available geospatial data to improve overall situational awareness during an incident, provide field teams with an accurate view of tasks to be performed and provide a framework for tracking and reporting overall progress of an operation.

Course Objective:

1. Familiarize students with the basics of ArcGIS. Students are required to have completed the free online training course “Getting Started with GIS (for ArcGIS 10.1)” offered by ESRI Training or have equivalent experience with ArcGIS.
2. Familiarize students with the use of GPS devices for not only for use as field navigation but as an effective management tool.
3. Provide an overview of the influence of terrain and the environment on lost person behavior.
4. Discuss how a better understanding of lost person behavior can lead to more effective planning for SAR operations.
5. Provide an overview of how geography influences strategies and tactics and present basic methodologies for tracking overall progress of search and rescue operations.
6. Discuss minimal essential geospatial datasets needed for effective SAR planning and operations and its availability.
7. Provide an overview of suggested content for maps with varying focus (field tasks, mission briefing, planning, etc).

Course topics and Timeline

Day 1 (half day – 4 hours)

1. Course Introduction (0:15)
2. Overview of mapping for SAR response (0:45)
3. Introduction/Overview of ArcGIS and MapSAR_Ex (2:15)
   a. Lecture/Demo (0:10)
   b. Exercise 1: Opening maps, aerial images, setting preferences (0:15)
c. Exercise 2: waypoints, tracks, routes (0:30)
   i. Symbols
   ii. Annotations
   iii. Tracks for segments
   iv. Calculating areas

d. Exercise 3: Range Rings/ Range-Bearing Lines (0:15)

e. Exercise 4: Importing/Exporting data (0:15)

f. Exercise 5: Layers (0:30)

g. Exercise 6: Creating map templates (0:30)

4. GPS utilization (0:30)

5. Mapping Basics Review (1:30)
   a. Coordinate systems and datums (0:30)
   b. Feature Representation (0:30)
   c. Exercise 7 – Reading coordinates (printed maps and electronically), transforming coordinates, route planning (0:30)

   a. How geography influences our decisions
   b. Case studies on geography and SAR
      i. Behavioral Profiles from Koester
   c. Exercise 3 – Making choices based on terrain

7. SAR Planning with MapSAR_Ex (2:45)
   a. Introduction (0:15)
   b. Developing scenarios (consensus) (0:15)
   c. Exercise 11: Tabletop #1 introduction/ Scenario development (0:15)
   d. Creating Regions of Probability (consensus) (0:15)
   e. Exercise 12: Tabletop #1 Probability Regions (0:45)
      i. Develop a detailed strategy for segmenting the regions based on the scenarios
      ii. Use Layers to save details for different scenarios
      iii. Include annotation to track decisions made
   f. Segmenting for searching (0:15)
   g. Exercise 4 – Tabletop #1 Search Segments (0:45)

8. Mapping SAR Operations/Logistics (2:30)
   a. Tracking resources (0:15)
   b. Exercise 8: Plotting locations and tracking resources (0:15)
   c. Influence of terrain on SAR Resources/Tactics (0:30)
      i. Route planning
      ii. Utilizing terrain – containment, weather patterns, etc
   d. Exercise 9: Evaluating the impact of terrain on SAR tactics (0:30)
   e. Viewshed/Line of Sight (0:30)

Day 2 (8 hours)

5. Mapping Basics Review (1:30)
   a. Coordinate systems and datums (0:30)
   b. Feature Representation (0:30)
   c. Exercise 7 – Reading coordinates (printed maps and electronically), transforming coordinates, route planning (0:30)

   a. How geography influences our decisions
   b. Case studies on geography and SAR
      i. Behavioral Profiles from Koester
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   e. Viewshed/Line of Sight (0:30)
Exercise 10: Evaluating communications network for SAR response (0:30)

Day 3 (8 hours)
9. Tabletop Exercise #2 (2:30)
10. Minimum Essential Datasets (0:45)
   a. Availability of data
      i. Basemaps, imagery, elevation
   b. Data mining
      i. Internet, conservation groups, etc
   c. Additional data
      i. Paper maps, pdfs, brochures,
         ii. Georeferencing
   d. Exercise – go get some data!
   e. DNR Garmin
11. ArcGIS Explorer (0:30)
    a. Getting acquainted with AE
    b. Add-ins and tools
    c. Finding places
       i. Waypoints
       ii. Tracks/Trails
    d. Layers
       i. Adding in
       ii. Finding additional data
       iii. Georeferencing
    e. Search management
       i. Range rings
       ii. Segments
       iii. Viewshed
       iv. Adding photos
    f. Saving / Printing
    g. Working Offline
12. Developing Maps for Briefing and After Action Reports (1:00)
    a. Operational and Field map
    b. Planning map
    c. Briefing map
    d. Exercise – Creating a briefing map
13. EXERCISE – Table Top #3 (1:30)
14. Remote Planning and Map Sharing (0:20)
15. Demos and advanced concepts (1:00)
16. Wrap-up (0:20)