Application of Various New Technologies in Wilderness SAR

Appalachian Search and Rescue Conference

Winter Retreat - February 2014

ASRC Technology Team
Outline

- Do we need to improve, do we need innovation?
- What is technology?
- Innovation Applications
  - Administration / Documentation
  - Mapping: Operations, Planning and Logistics
  - Field Teams
  - Off-site support (Remote Support)
- Future
Do we need to improve?

- How do we know if need to or can improve?
  - A well management search could still result in a suspension and a poorly management search could result in a find.
  - What factors contribute to a “good search” / “bad search”?
  - Is just getting people into the field an attribute of a “good search”?
  - SAR exercises are a poor surrogate for the real thing
  - We know from experience that documentation and planning are important.

No thanks... I can just walk.
Why do we need to improve?

- **Safety**
  - Each time someone is sent into the field we are putting them at risk.

- **Efficiency**
  - This is not just about getting teams into the field quickly
  - Putting them in the optimal location
  - Providing them with the up-to-date information
  - Properly documenting the activity
    - Although most searches end quickly, for the ones that don’t we often spend A LOT of time trying to re-create what happened during the initial phase of the search.
Why do we need to improve?

- Increase number of available resources
  - Never enough Incident Staff particularly in the early phase of an operation.
  - Free staff for other activities
  - Alternative scenario analysis
  - Require personnel to understand the various technologies to permit this activity
    - Mapping software
    - Electronic forms
    - E-mail and Dropbox
Why do we need to improve?

- Improve communications
Innovation for SAR  
(Personally you have been doing all this for years)

- Electronic forms
Innovation for SAR (Personally you have been doing all this for years)

- Carbonless paper for forms
- Wireless printers and plotters
Mapping Technologies

- **Terrain Navigator Pro**
  - Can do a lot both on-site and off-site for producing maps and ranking information but it is limited (no database).

- **Geographical Information System (GIS)**
  - Geodatabase records both spatial and non-spatial data
  - Process automation
  - Sophisticated geospatial modeling
Mapping Software - Operations

- Tasking
- Debriefing and POD estimates

GPS tracks collected from field teams
Tracks are buffered to account for team size and spacing

Estimated Search Speeds throughout the search area

Auto-generation of task assignment forms and task tracking
Mapping Software - Logistics

- Communications planning
- Weather

15 m base antenna, 25 W, 155.205 MHz
Why didn’t parents see subject on trail where trail straightens out and terrain flattens?

How far ahead of the parents was the subject when they lost sight?

Did they lose sight because of the switchbacks in the trail?

Foot travel is faster in the section due to terrain?

Why was subject not waiting at the intersection?
Cumulative Probability - ROW

ROW = 21.13%

CC
POA: 12.15

BB
POA: 17.41

AA
POA: 21.13

DD
POA: 28.19

ROW = 25.28%

CC
POA: 14.53

BB
POA: 20.83

AA
POA: 25.28

DD
POA: 14.1

ROW = 29.56%

CC
POA: 16.99

BB
POA: 24.35

AA
POA: 12.64

DD
POA: 16.48

ROW = 34.32%

CC
POA: 19.72

BB
POA: 19.13

AA
POA: 14.67

DD
POA: 21.48

ROW = 38.53%

CC
POA: 9.86

BB
POA: 13.68

AA
POA: 16.47

DD
POA: 21.48
Modeling Lost Person Behavior

Dispersion Angle – Pden (POA/km^2)

Mobility – Pden (POA/km^2)

Watershed – Pden (POA/km^2)

IPP Distance – Pden (POA/km^2)

Track Offset – Pden (POA/km^2)

Find Features – Pden (POA/km^2)
GPS Data Upload...Segment Boundaries

- Using DNRgps (preferred - Frees up PC running TNP)
  - Create Segments as Tracks using TN
  - File – Export – Tracks: Select all the segments
  - Save file as “Segments_(IncidentName).gpx”
- Start DNRGPS
  - Check Projection: File > Set Projection
  - Connect GPS
  - File > Load From > File
  - Select which segment to upload
  - Track > Upload

Searchers can now fill in the boundaries on the GPS.
Off-Site (Remote) Support

- Provide more incident staff
- More opportunities for experience
- Operations
  - Generate tasks and maps
- Logistics
  - Communications planning support
- Planning
  - Lost person behavior modeling
  - Alternative Scenario Analysis
## Alternative Scenario Analysis

<table>
<thead>
<tr>
<th>Evidence</th>
<th>Type</th>
<th>Credibility</th>
<th>Relevance</th>
<th>H1</th>
<th>H2</th>
<th>H3</th>
<th>H4</th>
<th>H5</th>
<th>H6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject’s vehicle located at trailhead</td>
<td>HIGH</td>
<td>HIGH</td>
<td>HIGH</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>LPI’s vehicle located where the deceased’s vehicle was parked</td>
<td>HIGH</td>
<td>HIGH</td>
<td>HIGH</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Subject appeared to be in good health (gut check - runner)</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>C</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Subject had recently visited the area and may feel familiar with the trail</td>
<td>HIGH</td>
<td>HIGH</td>
<td>HIGH</td>
<td>C</td>
<td>I</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>KS/Anter N of Road-Hillside &amp; Trail</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>KS/Anter N of Road-Hillside</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Race-nosed on Shenandoah Mtn Trail, Trail</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Trail 1805 - Backing large, 70</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Trail 1805 - Race-Keeper</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Trail 1802 - Bore, 42</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>C</td>
<td>C</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Court/Police Behavior (LPF)</td>
<td>HIGH</td>
<td>HIGH</td>
<td>HIGH</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>N</td>
<td>I</td>
</tr>
<tr>
<td>Errors and decision points</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>HIGH</td>
<td>I</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>50% of lost subjects are found</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Subjects found in damage - 10%</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>I</td>
<td>I</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>NA</td>
</tr>
<tr>
<td>Subjects found in extreme</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>I</td>
<td>I</td>
</tr>
<tr>
<td>Subjects found in suicide</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Suitable location for suicide</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>MEDIUM</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>C</td>
</tr>
</tbody>
</table>

### Hypothesis
- **H1**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
- **H2**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
- **H3**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
- **H4**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
- **H5**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
- **H6**: Subject had a medical issue and is somewhat along the trail between the trailhead and the intended destination. Subject attempted to short-cut across country to the intended destination and lost the trail. Subject attempted to short-cut across country to the intended destination and became incapacitated. The trail was complicated due to extreme weather and succumbed to hypothermia.
Training Needs

- There is a need for people with specialized skills.
- Do they need to follow the normal “SAR” progression?
Future Trends

- More database usage
  - On-site id (barcode readers for tracking personnel and data entry such as TAF, accountability)
- Better geospatial models
- ArcServer
- Cellphone repeaters
- Cellphone “Sniffer”
- UAV
Questions?

Contact information:

Don Ferguson
Mountaineer Area Rescue Group
dferguso@mix.wvu.edu
(304) 290-9118