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**U.S. Department of Homeland Security
Science and Technology Directorate
First Responders Group
National Urban Security Technology Laboratory**



FIND Lost Person Locator

Operational Field Assessment Report

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Executive Summary

The National Urban Security Technology Laboratory (NUSTL), with the support of the Deschutes County Sheriff's Search and Rescue Office, conducted an operational field assessment (OFA) of the FIND software for the Lost Person Locator Project on June 18, 2016, in Bend, Oregon. To conduct the OFA, NUSTL leveraged an annual Search and Rescue exercise (SAREX) in Deschutes County. Several law enforcement officers from the Bend area participated; numerous civilian volunteers also participated and made up the majority of on-site personnel.

The FIND software was developed under the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) First Responders Group (FRG) First Responder Technologies Division (R-Tech) to provide a computer-based means for search and rescue (SAR) personnel to manage a SAR event, apply search theory, and replace/augment processes that are mostly done by hand with pencil and paper. Currently, SAR processes vary from state to state; although, there are some commonalities, which are briefly described below.

SAR events normally start by gathering as much information as possible on the lost subject. The subject is typically classified to characterize their primary behavior, e.g., someone with dementia vs. an experienced hiker; a person with dementia may remain closer to defined roads and paths, while an experienced hiker may veer closer to the edge of a watershed. With the subject characterized, the search planner can begin to plot onto a map the last known location of the subject and the direction that person was believed to be heading. Then the search planner can identify the initial tasks that should be accomplished by whichever state assets or local volunteers show up first.

Once the search is underway, all units must check in and be assigned into teams. Those teams are assigned radio communications and incident command (IC) keeps track of the varying frequencies being used. Those teams go out and search their assigned areas based on hand-written task assignment forms. When a team completes the search of their assigned area, they inform the IC. The search is then refined based on cleared areas and the clues found in those areas. New tasks are created based on the refined information and assigned to teams, over and over, until the subject is found. Finally, after the search is completed, information about the logistics of the search is compiled and archived for lessons learned and for use in future training.

During the SAREX in Bend, Oregon, the participating SAR units employed their current processes using the standard methodology outlined above. In parallel, OFA participants used the Lost Person Locator Project's FIND software to accomplish the same processes in order to determine whether they found the software to be faster and easier than the standard hand-written method (referred to as the manual method here forward). The SAR volunteers received minimal training on the FIND software prior to the start of the exercise as the FIND software was designed to be user friendly. The volunteers gave their feedback on the aspects of the software that they liked and on the aspects that they felt needed improvement prior to being adopted by the full SAR community. This report captures their comments, and ultimately concludes that the FIND software could provide a huge benefit in time savings and efficiency.

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1 Introduction

Search and rescue (SAR) organizations currently use a manual method to manage SAR events and to create and assign tasks to search teams. When searching for a lost subject, the incident command (IC) prints out several copies of the map being used. Zones are then drawn onto the map for different teams to search. The IC also assigns specific details to each search team such as the radio frequency to use or the direction from which to search (e.g., from west to east, from north to south). All search-specific task details are printed out (along with a copy of the map) on task assignment forms. Once a team returns after completing their task, they inform the IC of what they found. The IC then modifies the search and creates new task assignments. This is repeated until the lost subject is found. At the conclusion of the SAR event, FIND software is used to archive the data for future lessons learned.

The goal of the U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) First Responders Group (FRG) First Responder Technologies Division (R-Tech) FIND Lost Person Locator Project was to address issues and to digitize and automate some of these manual processes.

An operational field assessment (OFA) was conducted to evaluate the Lost Person Locator Project's FIND software during a training exercise, which simulated typical operational conditions for SAR personnel. On June 18, 2016, representatives from the Deschutes County Sheriff's Search and Rescue Office, in Bend, Oregon, conducted an annual SAR exercise (SAREX) for training purposes. The National Urban Security Technology Laboratory (NUSTL) conducted the OFA in conjunction with the SAREX to leverage those assets present.

1.1 Purpose

The purpose of the OFA was to assess the FIND software's suitability, based on user evaluations, to determine its ability to be a marketable and viable solution for the first responder SAR community.

1.2 Objective

The objective of the OFA was to allow as many SAR planners and participants as possible to engage with the FIND software under a scenario-driven environment, in order to obtain feedback on the utility of the software to plan and aid in SAR events, as well as to augment current standard operating procedures (SOPs).

1.3 Prototype Description

The FIND software—developed by dbS Productions LLC—is a software tool designed to aid SAR planners and participants. It does so by providing search planners with search theory and mapping tools to help optimize their search, as well as providing a mechanism for information and task management.

Some of the features of the software include the ability to set pre-defined search areas based on several different input layers of modeled information, such as geographic features, elevation models, watershed models, etc. (see Figure 1); however, the software also allows search planners to create their own search areas.

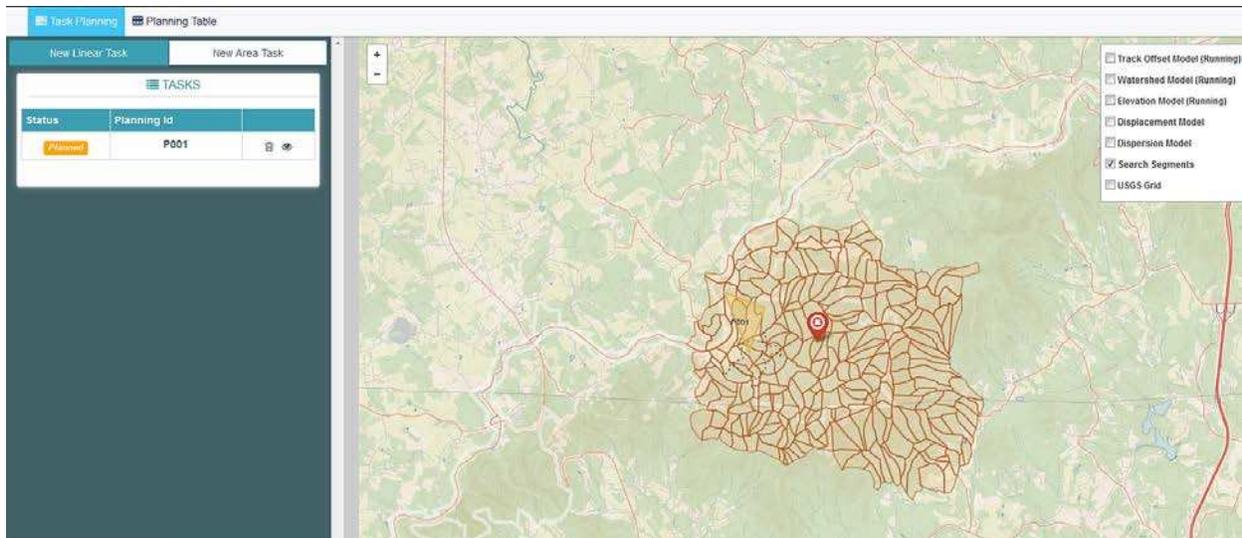


Figure 1 – FIND will pre-populate suggested search zones

The FIND software can be used to plan and manage specific task assignments. In fact, the form used in the software mirrors a paper form often used by SAR teams (see Figure 2).

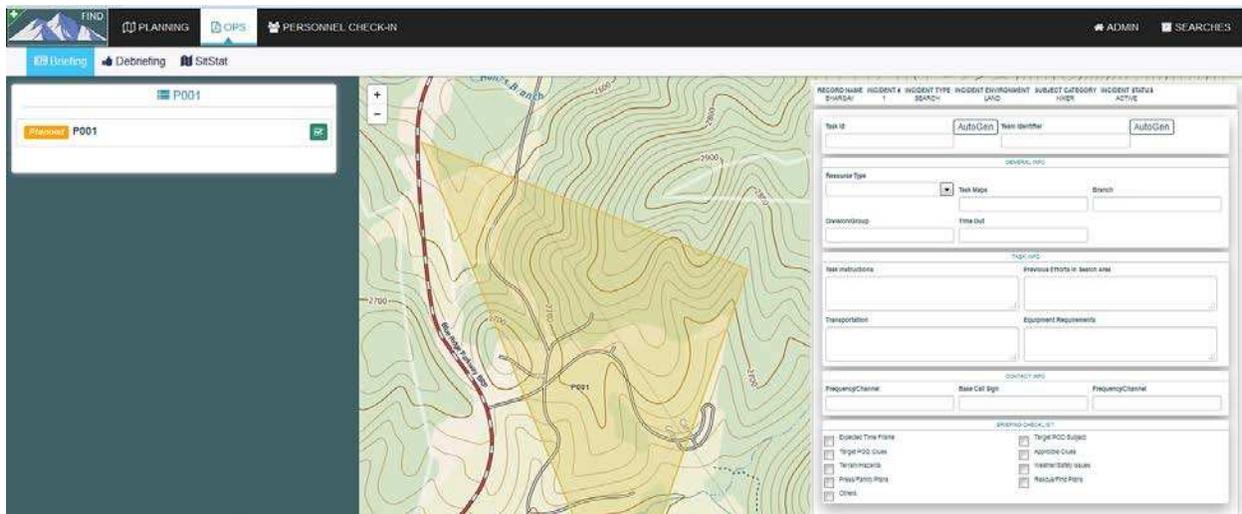


Figure 2 – FIND will allow a search planner to assign tasks for search areas and track task related information

Search planners may also use the FIND software to manage the information that is coming back to them from deployed teams. This is accomplished thru a communication log (see Figure 3).

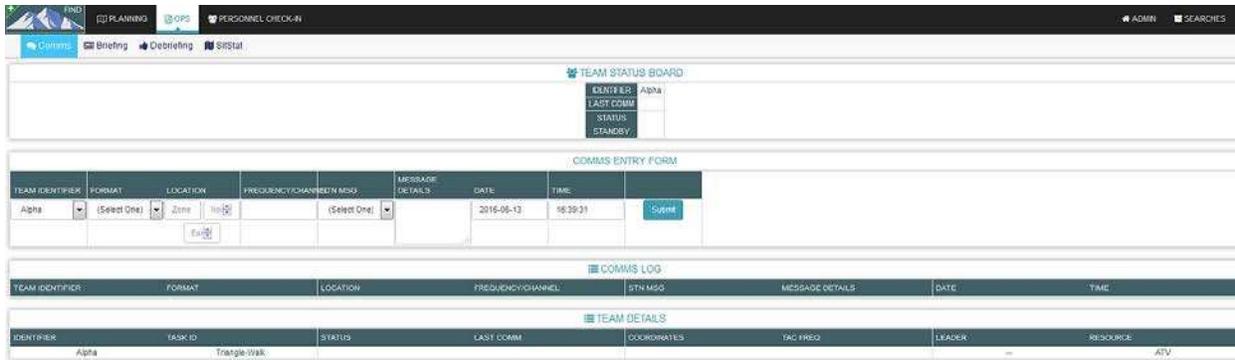


Figure 3 – A communication log allows incident command to manage the flow of information

The full breadth of the software’s features and capabilities were presented during a training session with the developers from dbS Productions LLC the evening prior to the OFA.

2 Operational Field Assessment Design

Three experienced SAR professionals from the Deschutes County area participated in the OFA of the FIND software. They each had different backgrounds, but they each play a role in SAR missions. Two of the participants received hands-on training with the software prior to the start of the OFA and used it extensively throughout the day, while the third participant received a briefing on the software and then provided feedback.

2.1 Scope and Limitations

The focus of the assessment was on operational suitability. The OFA of the FIND software was conducted in tandem with a pre-planned SAREX, and all attempts were made not to detract from the primary learning objectives of the SAREX, and to have a minimal effect on the various entities involved. Since DHS did not want to over burden the SAR participants and volunteers, there were functions and features of the software’s capability that were not assessed, although they could be evaluated in a post-OFA table-top exercise with mock scenarios. DHS S&T believed there was more benefit to assessing the operational suitability of the software within the realistic operational tempo of a SAREX as opposed to a table-top exercise.

2.2 Event Design

The overall concept of the OFA was to be as unobtrusive as possible while leveraging all available resources. The OFA had three main components: vendor training, an operational scenario and a post-OFA questionnaire. Participants were given the opportunity to provide constant verbal feedback during each portion of the assessment; that feedback was captured by either the vendor or the assessment team, and it is presented in this report where indicated.

The evening before the SAREX, dbS Productions LLC conducted a vendor-training session for more than a dozen SAREX participants. During this session, participants provided verbal feedback in real time to the developers from dbS Productions LLC. This feedback, which is not included in this report, was captured by the developers and will be used, as appropriate, to further refine the software design.

Of three scenarios proposed by the assessment team in the OFA Plan, the SAREX coordinator determined that Scenario C—the serial method—was best suited to the operational conditions and

available manpower during the SAREX. The serial method entailed the IC conducting normal planning/SOP operations first, creating and assigning initial tasks based on the manual method. Once the first set of teams were deployed, the IC moved to a new location closer to the scene of the simulated scenario that was the basis of the SAREX. At this new location, the IC set up a mobile command center and shifted from the manual method to using the FIND software. During the scenario, the assessment team captured participants' comments in real time, as they related to the use of the FIND software. Their comments are discussed in Section 3.

After the SAREX was completed, participants who were able to use the FIND software during the scenario were given written questionnaires to fill out. A questionnaire was also provided to a participant who received a brief overview of the software, but did not have the opportunity to use the software during the OFA. Their feedback is discussed in Section 3.

2.3 Summary of the OFA

The exercise began with a phone call to the Deschutes County Sheriff's Search and Rescue Office relaying that a simulated plane had crashed and that there were possible missing persons. The Civil Air Patrol was the first to arrive on scene and established an IC staging area. At the same time, the Deschutes County Sheriff put out a notification to volunteer SAR organizations that people and resources were needed to conduct a SAR operation. While the Civil Air Patrol flew over the area surrounding the last known location of the plane, looking for the plane's transponder, volunteers started showing up at the Sheriff's Office. These volunteers checked in and were assigned to teams. All initial tasks were assigned using the manual method. Those teams departed the Sheriff's Office and joined the Civil Air Patrol at the IC staging area. At this time, the two OFA participants were assigned to use the FIND software rather than the manual method for the duration of the exercise.

Search teams that had previously been assigned using the manual method were then entered into the FIND software along with their initial task assignments. As those teams found various clues that had been planted in the field, they communicated that information back to the IC, and new tasks were created and assigned using the FIND software. When search teams completed a task, they returned to the IC to inform the SAR planner of what was accomplished during the task execution. There is a tab to capture this information from the debriefing process within the FIND software. The teams were then assigned their next task. This process was repeated until all missing persons were found, emergency care was administered, and an end-of-exercise was declared.

3 Results – Evaluator Feedback

Evaluators provided feedback by filling out a survey questionnaire at the conclusion of the SAREX/OFA based on their knowledge of and/or experience with the FIND software. Most of the participants' solicited feedback compared the FIND software to how they typically accomplish their tasks using the manual method. The assessment team was also concerned with gathering feedback related to what was missing from, or needed to be changed, to better match the manual process to ensure no data or part of the process is lost when using the software. The assessment team also took notes based on users' verbal feedback while the assessment was ongoing.

3.1 Comments on FIND

Three personnel gave feedback on the FIND software. The first two users operated the FIND software during the SAREX. The third user received a brief overview of the FIND software and completed a

questionnaire; however, this individual worked with the Civil Air Patrol during the SAREX and used their standard manual processes exclusively.

The questionnaire was intended to follow the process flow of a SAR operation.

The first question was:

In the initial creation of the search mission, were you able to perform all necessary functions?

- User 1: No, there were some things that I do manually (paper method) that were not available to me.
- User 2: No, the software tool is completely different from how I typically accomplish this task.
- User 3: No, there were some things that I do manually (paper method) that were not available to me.

In following up with the first question, the users responded:

- User 1: The paper forms we use were developed by us and were customized to how we work. Our forms are less about Probability of Detection/Probability of Success Rate and more about documentation of our efforts.
- User 2: It was easy to create tasks and assign teams. I didn't use Probability of Detection or modeling in doing so. Changing teams/tasks was hard and cumbersome.
- User 3: Needs to be able to create bearing lines and range rings.

The second question was:

In the task planning, how hard was it to draw tasks on the map (regions to search)?

- User 1: Somewhat hard. I needed a little additional training.
- User 2: Somewhat easy. It took some practice, but I figured it out.
- User 3: Somewhat easy. It took some practice, but I figured it out.

In following up with the second question, the users responded:

- User 1: In this exercise we used free form drawing of segments.
- User 2: I want the ability to input Universal Transverse Mercator (UTM) coordinates into the map and have it draw the region based on those coordinates.
- User 3: N/A

The third question was:

For the additional layers on the map (dispersion model, elevation model, watershed model, etc.) are there any additional attributes that would be beneficial to creating search zones?

- User 1: I want different colors for each model layer.
- User 2: N/A
- User 3: N/A

The fourth question was:

In the task assignment form, how did the task package compare to the manual method?

- User 1: It was about the same as the manual method.
- User 2: It was better than the manual method because it had information that I had not thought about including but is valuable.
- User 3: It was better than the manual method because it was faster and more efficient.

In following up with the fourth question, the users responded:

- User 1: Mostly what we use, but different.
- User 2: Would like secondary assignments to be editable.
- User 3: N/A

The fifth question was:

For the communications log, how did the level of information compare to the manual method?

- User 1: The manual method was better because FIND missed some elements.
- User 2: The manual method was better because it was faster than FIND.
- User 3: The manual method was better because FIND missed some elements.

In following up with the fifth question, the users responded:

- User 1: N/A
- User 2: Need UTM as a drop down selection. Allow for “team summary page” to review communications at a glance. Allow for “To” and “From” in the communications log.
- User 3: Need to be able to list backup channels/frequencies/cell phone numbers.

The sixth question was:

For the debriefing form, how did the level of information compare to the manual method?

- User 1: It was about the same as the manual method.
- User 2: It was better than the manual method because it had information that I had not thought about including but is valuable.
- User 3: It was better than the manual method because it was faster and more efficient.

User 1 noted the following features/functions that should be added/modified to make the FIND software more convenient for them:

- Would like to move the “Submit” button on the task assignment form so it doesn’t cover any of the team names when the list of teams gets very lengthy.
- Would like to be able to sort participant names vs. showing them in the order that they checked in.
- Would like the ability to revise/divide the prepopulated segments into smaller segments.

User 2 noted the following features/functions that should be added/modified to make it more convenient for them:

- Would like a field where they can add the missing subject's information into the initial tasks that get put into the task assignment forms.

User 3 noted the following features/functions that should be added/modified to make it more convenient for them:

- Would like to be able to download actual data fields so as to be able to create dashboards for data visualization.

While the questionnaire was administered after the SAREX/OFA was concluded, the two primary users provided abundant feedback while the SAREX/OFA was ongoing. This information is captured below:

- Would like to add "Degrees True" for initial direction of travel.
- Need a way of separating mission number for a search that lasts over 12 hours or 24 hours, depending on how the state conducts its SAR missions.
- Would like to see the Probability Success Rate number added to a custom linear task that is drawn using the FIND software (this number is currently available if a prepopulated search area is selected).
- Would be nice to have a sliding contrast ratio so the user can vary the opacity of the different layers using the various models.
- Would be nice if each team's task assignment form had some information on the teams whose tasks are physically adjacent to theirs, in order to ease communication between teams if necessary.
- Would be nice to import .csv file information that an agency already has when team members first check in. That information is contained in a database of responders' certifications that already exists in many states.
- Would be nice if required fields were marked with an asterisk (*).
- It is necessary to add a way to document the operational period, which is a Federal Emergency Management Agency (FEMA) reporting requirement.
- It is necessary to make each selectable layer on the map a different color in order to prevent confusion when multiple layers/models are being used at the same time.
- It would be nice if the different models updated the Probability of Success Ratio for each prepopulated area on the map.
- It would be nice to have new tabs specific to teams (existing tabs are briefing, debriefing, and situational status), which show tasks planned, tasks ongoing, and tasks completed.
- It would be nice to be able to pre-plan for personnel that you expect, but that haven't arrived or checked in yet.
- It is necessary to add a field in the debriefing form in the case that a death has occurred. For this case it is common that each agency has a code that is used when a search team finds a deceased person, so that it isn't announced over radio communications for sensitivity purposes.

- It would be nice to color code the teams based on the Resource Type they are. For example, if a team is using All Terrain Vehicles (ATVs) or has tracking dogs.
- It would be helpful to have environmental factors available, such as weather.
- Add a time feature to update the period of time that the individual has been missing and to update the search parameters.
- Add a time feature to track individuals as to whether they need to be rotated out of the search.
- The task assignment form should print in a larger format and font.

3.2 Additional Discussion and Suggestions

While most comments that were made by the SAR personnel were things that dbS Productions LLC has heard before, it should be noted that the final product will be heavily customizable. The FIND software is being marketed to each state because the manner in which SAR operations are conducted varies greatly between states. Additionally, changes that could be made based on how Oregon does things might not be changes that are valuable to other states. Once a state purchases the software, dbS Productions LLC will work with them on their specific requirements to modify the software, corresponding to that state's SAR processes. While the software will come with search regions prepopulated for a particular state, it will have a buffer of about 15 to 25 miles into neighboring states to aid in searches that cross state lines.

The training for the FIND software was accomplished in just a couple hours the evening before the SAREX. Users commented on how easy it was to navigate the software and noted that proficiency could be expected after using the software during only a few training exercises or real-life events. One user specifically noted that using the FIND software at least once a month would be sufficient to maintain the skills necessary to fully rely on the software.

Users noted that keeping track of the communication log requires one dedicated individual; therefore, it was recommended that FIND software be used by two personal at all times. One person to focus on task briefing/assignments and task debriefings, and the other person to focus on the communication log.

Users also noted that adding an additional tab to the menu for specific teams was quite necessary. The software tool is primarily task-focused and is laid out in that manner, but for ideal management you have to be able to search for personnel, see what team they are on, reassign them to different teams, etc.

3.3 Conclusions

The general consensus among the participants was that the FIND software could successfully augment the manual method currently employed during SAR operations. While individual users have ideas for system enhancements that would be specific for their applications and operations, the system is adequately functional as is.