The Search Intelligence Process

Christopher S. Young
Contra Costa County Sheriff's Search & Rescue Team
Chairman Bay Area Search and Rescue Council (BASARC)
USA
Email csy1492@comcast.net

Abstract

The Search Intelligence Process of gathering information regarding the missing subject occurs during every search incident. We recognize intelligence information is used to build a subject profile; gather lists of people with first-hand knowledge of the missing subject that we want to talk to; develop scenarios; and task investigators to research and mine information from various sources, like social media or cell phone data, to determine where to look and what to look for.

However, during the initial stage of an active search for a missing person, intelligence gathering can be very daunting, chaotic, haphazard or worse not initiated thus delaying the compiling of crucial information that could shorten the time it takes to locate the subject. In any other aspect of the search operation like ground searching or technical rope rescue we preplan, train and develop processes to be more efficient.

This presentation will discuss the search intelligence process by: defining the various sources of information available to use developing pre-plans for the gathering of intelligent information, developing decision trees, developing lists of reflex tasks, developing algorithms for transitioning between the initial actions into multiple operational periods and eventually to the termination of search operations, and develop ongoing training curricula with the goal of creating efficiencies and hone the necessary skills to perform the intelligence gathering process.

KEY WORDS: Intelligence Gathering, Missing Person, Interviewing.

Introduction

Sir Author Conan Doyle's Sherlock Holmes is quoted as saying:

> **Data! Data! Data!" he cried impatiently. "I can't make bricks without clay."**
> - *The Adventure of the Copper Beeches*

> **"It is a capital mistake to theorize before one has data. Insensibly one begins to twist facts to suit theories, instead of theories to suit facts."**
>
> -A Scandal in Bohemia

> **"It is of the highest importance in the art of detection to be able to recognize, out of a number of facts, which are incidental and which vital. Otherwise your energy and attention must be dissipated instead of being concentrated."**
>
> -The Reigate Puzzle

Holmes's quotations are perhaps the most famous lines he had ever spoken, and with good reason. For, it points to the tendency that it is all too easy to indulge in: the tendency to do the impossible, to make bricks without their proper material and to create something like a theory, in the absence of anything on which to base it. Further, it speculates what can happen absent any hard facts and/or the misuse of few facts. The intelligent information used to build a profile of a missing person is just as or even more essential than the expected outcome. You need the right data, from the right people, or from the right source before you can expect any type of resolution.

What is intelligence? It is the act of gathering information. But, the other part of intelligence is the analysis of the information. We collect mountains of information about the missing subject both physical and nonphysical like from lost person questionnaires. Who can analyze the intelligence, who is going to go back through it and see if it's complete, is it accurate, is there other information we need to start looking for that was the result of some comments that were made in the interview.

In a missing person incident intelligent information is the bases of where we are going to start searching (Initial Planning Point (IPP)). Law enforcement will get the call of a missing subject, dispatch a deputy to the residents and talk to the family… "Well he drove off two hours ago" … Is there a place to start? Not really. So, there is need to gather more information perhaps from a more in-depth interview or searching through other sources like social media. This information may lead to favorite hiking trails. Later, the car is found at one of those favorite trailheads. Now we have a place to start.

We are going to use this information to develop a subject type, so we can start using some of Robert Koester's Lost Person Behavior statistics. Is this a hiker or is it someone who likes to take panoramic pictures? We are going to build a profile, "paint a picture" of who is this missing person. Various scenarios will be developed.

Investigation, as used in a missing person incident, is the continual process of gathering information about the missing person and the circumstances under which they are missing. This process commences with the first report of the missing person and is completed at the end of the missing

person incident; concluding were feasible with interviewing the missing person after they are found in order to determine what happened.

Besides usefulness in search planning, investigation gathers historical and statistical information, which can be useful in future searches for similar missing persons. Statistical information compiled in Robert Koester's "Lost Person Behavior" has proven extremely useful in searches for missing subjects throughout the world. The investigation report should include post-search information on the effectiveness of the resources utilized in locating the missing person. This leads to lessons learned and additional training and practice. Further, the complete report of the investigation and the management of the search incident can later be incorporated into management training tabletop exercises.

We have relied on interviews of persons having firsthand knowledge of the missing subject. But, as will be discuss here, there are many more sources of intelligence information.

Historic and Literature Review

Historically: Military Intelligence

Much to the disappointment of many a comedian, **Military Intelligence** is NOT a contradiction of terms or an oxymoron. The origin of the expression was that it was not military personnel that were unintelligent, but that often they were given orders or missions that did not seem to make a lot of sense, especially to those in the lower ranks who had to follow those orders no matter what and without question.

Military intelligence exploits the collection and many sources of information, which are used as approaches to provide guidance and direction to commanders in support of their decisions. This is achieved by providing an assessment of available data from a wide range of sources, directed towards the commanders' mission requirements as part of the operational or campaign planning activity. This could range from looking at and determining the best location to repel an advancing force, to advancing an offensive against the enemy, or to just move a division from one end of the valley to the other.
In order to provide an informed analysis, the commander's information requirements are first identified. These information requirements are then incorporated into a process of intelligence collection, analysis and dissemination.

The most efficient way to locate a missing person while law enforcement and/or search and rescue team personnel are out looking to find clues, is to simultaneously place heavy emphasis on the initial investigations and prepare a search plan that focuses on places the person would likely be found.

Information on where to look comes from good investigation; building a profile of the missing person as if he or she is someone you already know. Getting to know who the missing person's family, friends, business associates or schoolmates are builds a valuable and more detailed picture. This can better predict what the missing person will do in a particular situation. For example, you may find that an initial 911 call about a possible child abduction is determined later, through your investigation, to be a runaway or just a case of the child forgetting to call home.

This is not to say that all search activity should wait until a thorough investigation is completed. In most cases, the initial information collected by the 911 operator and/or subsequent first on scene law enforcement agency representative interviews regarding the missing person will be enough to begin assigning reflex tasks to field personnel and sending them to high probability search areas. As new information comes in, resources can be deployed based on the scenarios that unfold.

Levels of Intelligence:

In the broader definition of the intelligence search for missing persons, there are three levels:

- **Strategic intelligence:** is concerned with broad issues such as number and type of resources to apply to the search effort. Additionally, such intelligence may be scientific (e.g. weather forecasts), technical, tactical or diplomatic (e.g. the family, local politics, or another authority having jurisdiction pressures), but these changes are analyzed in combination with known facts about the area in question, such as geography, or demographics which may be related to safety issues as well as statistical lost person behavior. In search management this is **Planning Data**

- **Operational intelligence:** is focused on support or denial of intelligence at operational level. In search management, this would be managing clues and information as it becomes available in applying that information to affirm or refute the various scenarios being developed. This would be the function of the **Clue Unit Leader** (sometimes referred to as the **Clue Meister** or **Clue Frog** (the person to "jump on it")).

- **Tactical intelligence:** is focused on support of the operations at the tactical level and would include field searchers. At the tactical level, briefings are delivered to teams prior to disbursement which include descriptions of the missing subject, items to look for, potential hazards and other information that would aid the field searcher in locating the missing subject. The teams are then debriefed at the end of their assignment to elicit information for analysis and communication through the reporting chain. This is all classified as **Searching Data**

The Role of Intelligence in a Missing Person Incident

A missing person incident is an emergency. This should go without saying but is not necessarily understood. When a subject is reported missing, the circumstances are unknown. The missing person may be in danger due to the environment, pre-existing health conditions, or due to extremes in age being very young or very old. It is therefore imperative that our actions in gathering intelligence starts immediately as it may mean the difference between life or death. Laws have been established to mandate immediate action without delay by law enforcement. [e.g. California Penal Code 14205]

Law-enforcement investigators are the gatherers of incident clues and facts regarding the missing person. Search and rescue teams (SAR) also provide the same skills but from a slightly different perspective. SAR gathers information to know what to look for, (i.e. searcher data such as footwear, equipment carried by the subject, etc.) which, if found, can be used to identify as belonging to the subject. Facts about the subject like personality can determine their mindset and intent as to why they are missing in the first place (i.e. planning data).

To build a profile of the missing subject or paint that picture in our minds of who is this person, we can approach this concept by saying “we don't know your missing father but we need to know them in the next few hours as if he were our next-door neighbor”. If one lives in the same place for a given length of time you may have gotten to know your next-door neighbor. You may have talked to them over the fence, raised your children together, and may have even gone on vacation together. The point is that you know them well enough that if they went missing you would have an idea what they might do in a various situations and scenarios.

What outside conditions will influences the missing subject (e.g. changes in the weather, the sun going down). Will the subject build a shelter or will they try to macho their way out of the wilderness? Does the subject have a pre-existing medical condition? Do we need to have paramedics standing by to administer life-saving medications? This can make a huge difference in planning for field operations and the application of appropriate resources.

The intelligence information is used to Establish Time Lines. This would include what was happening in their life up to the point of their disappearance going back hours, days, weeks, months, and even years. It also includes putting clues together to establish where the subject has gone and potentially heading. Clues are not always found in the order in which they are left and therefore must be sorted to tell the story. This information will be used to develop scenarios to help distinguish between a subject that is just missing, potentially suicidal, whether there is a crime involved, or distinguish between a kidnapping, runaway or walkaway.

And eventually, intelligent information can be used to create historical and statistical information to aid in searching for missing subjects in the future.

Who should be responsible for SAR Intelligence?

When the Incident Command System was first conceived it was out of the aftermath of a devastating wildfire in 1970 in southern California, USA, that lasted 13 days cost 16 persons their lives, destroyed 700 structures and burned 1.5M acres. As a result, the United States Congress instructed the U.S. Forest Service to design a system. The resultant system was called FIRESCOPE (FIrefighting RESources of California Organized for Potential Emergencies). Through subsequent iterations, FIRESCOPE has morphed into the National Incident Management System (NIMS) the Incident Command System (ICS) has been fine tuned to what we used today to manage the command and control system delineating job responsibilities or functions through an organizational structure for the purpose of dealing with all types of emergency incidents.

In FEMA publications, "ICS allows for organizational flexibility, so the Intelligence/Investigations Function can be embedded in several different places within the organizational structure." [page 15 of ICS Forms Booklet FEMA 502-2, 8/28/2009 file: FEMA-2009-0013-0002 (1)]

And graphically looks like:

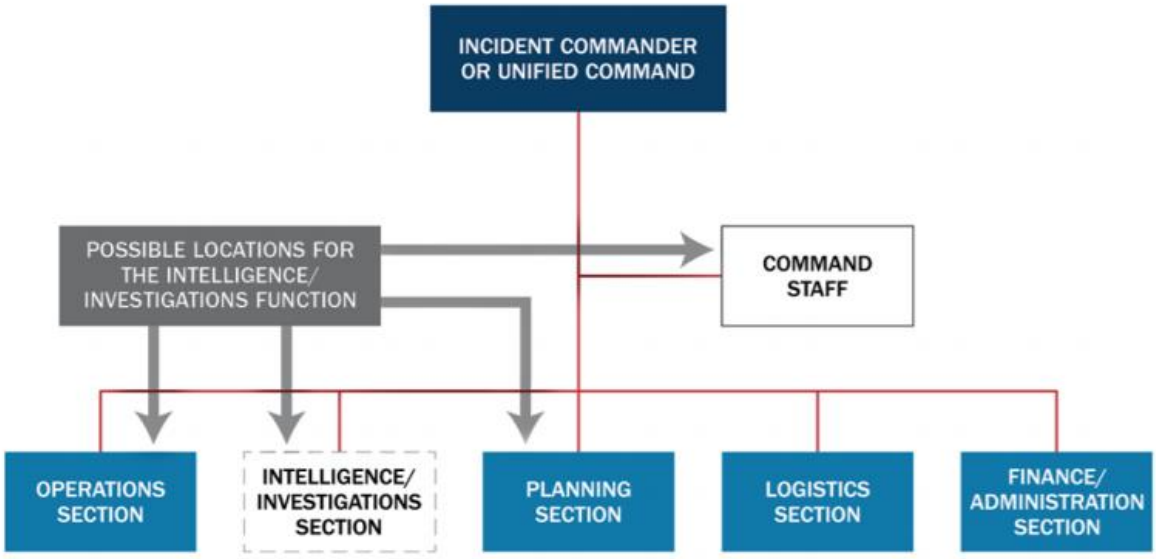

Figure 1 Options for the Placement of the Intelligence/Investigation Function
[National Incident Management System – 3rd Edition October 2017 FEMA]

And under Homeland Security's NATIONAL INCIDENT MANAGEMENT SYSTEM (NIMS) Intelligence/Investigations Function Guidance and Field Operations Guide:

Intelligence/Investigations Function in the Command Staff position: When the incident has an intelligence/investigations dimension but does not currently have active intelligence/investigations

operations, the Incident Command or Unified Command may assign intelligence/investigations technical specialists personnel to serve as command advisors.

Intelligence/Investigations Function under the Operations Section: The Operations Section typically integrates resources, capabilities, and activities from multiple organizations with multiple missions. Consolidating the intelligence/investigations activities in the Operations Section unifies all the incident operations (e.g., law enforcement, fire, EMS, hazardous materials response, public health, etc.) in one organization. Within the Operations Section, the intelligence/investigations function may be configured as a new branch or group, integrated into an existing branch or group, or placed under the control of a new Deputy Operations Section Chief for Intelligence/Investigations.

Intelligence/Investigations Function under the Planning Section: Traditionally in a missing person incident the integrating the intelligence/investigations function is in the Planning Section—either as part of the Situation Unit or as a separate Intelligence/Investigations Unit—enhances the section's normal information collection and analysis capabilities. It helps ensure that investigative information and intelligence is integrated into the context of the overall incident management mission.

Intelligence/Investigations Function as a Standalone General Staff Section: The Incident Commander or Unified Command may establish the intelligence/investigations function as a General Staff section when there is a need to manage the intelligence/investigations aspects of the incident separately from the other incident management operations and planning. This may occur when the incident involves an actual or potential criminal, or a missing person incident or when significant investigative resources are involved, such as interviewing, cell phone forensics, mining data from social media, etc.

Establishing the intelligence/investigations (I/I) function as a General Staff section has the potential to create overlaps with the responsibilities of the Planning, Operations, and Logistics Sections. The Intelligence/Investigations Section Chief and other General Staff members should clarify expectations with the Incident Commander or Unified Command and coordinate closely to ensure that requirements are not lost or duplicated between sections.

The use of the I/I Function in a SAR missing person incident allows for the integration of intelligence and information collection, analysis, and sharing, as well as investigations that identify the pertinent historical data leading up to the disappearance regardless of source.

The activities and information I/I Function are viewed as the primary responsibilities of "traditional" law enforcement departments and agencies having jurisdiction (AHJ). The I/I Function has aspects that cross disciplines and levels of government. "Non-traditional" forms of intelligence/investigations activities (i.e., non-law enforcement) might include but not limited to:

- Interviewing those having first-hand knowledge of the missing subject
- Searching and mining information from Social Media
- Using current Cell Phone technologies like “find my phone” tracking, geolocation services, phone pinging, etc.
- Door to door neighborhood canvassing
- Crowd sourcing – Security Camera analysis, game camera set up and usage, small unmanned aerial vehicles (sUAV)

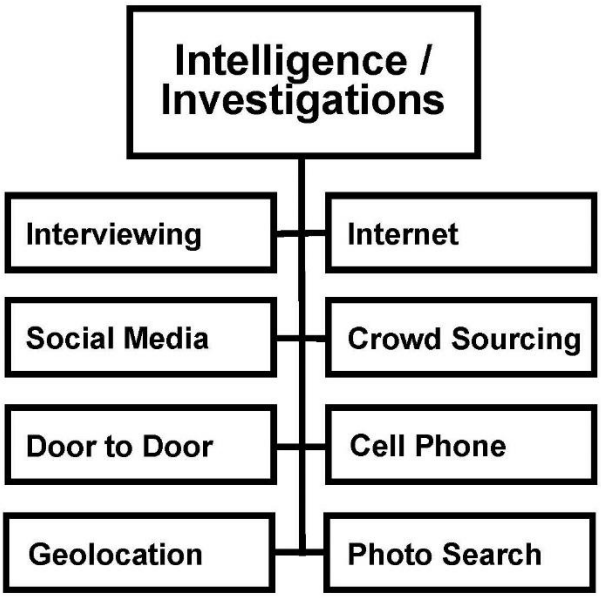

Figure 2 Intelligence/Investigation Function in Missing Person Incident

A word of caution/disclaimer: Controversies have surrounded law enforcement intelligence do to instances where the police departments maintained records of citizens' activities that were viewed as suspicious or subversive though no crimes were being committed. Therefore, intelligence and investigations practitioners must protect constitutional, victim, and privacy rights, civil rights, and civil liberties; restrict the dissemination of sensitive/classified information; and honor legally imposed restrictions on investigative behavior that affect the admissibility of evidence and the credibility of witnesses.

Discussion

As noted in the ***Introduction***, in a missing person incident, Intelligence gathering is the continual process of gathering information about the missing person and the circumstances under which they are missing. Information gathering includes interviewing people who have pertinent knowledge of the person. This process commences with the first report of the missing person and is completed at the end of the missing person case; concluding with interviewing the person after they are found in order to determine what happened.

The information gathered must be verifiable. Take for example one piece of information “he hasn’t been sleeping well for the last couple days”. Does it set off your “Spidey senses”? Maybe despondent? But that’s the only thing you have. In further investigation of their office you find the insurance policy, the will, the car keys and their wedding ring sitting in a row on the desk. Along with disrupted sleep now what can we conclude? Despondent, possibly? We are looking for clusters of information. It may turn out later that asking the wife about the items on the desk. “Oh, he had an appointment tomorrow with the family lawyer to revise his will, as we have grandchildren as well as make sure the insurance policy includes the grandkids. His habit is to lay out the stuff he needs to do for the next day including setting his keys and wedding ring nest to the papers”. This changes the whole dynamics and scenarios.

What are we trying to establish?

To establish what is really going on here, the possible scenarios and determine if a physical search is warranted or further investigation is needed prior to deployment of resources there is a need to collect data. The basic components of intelligence/investigation data are to answer the questions: who, what, when, where, why and how. The questions can be grouped and focused on establishing the missing subject’s:

- Description
- Intent
- Survivability
- Ability to travel
- Ability respond and to what

Description

The basic attributes of who we are looking for to be able to spot them from a distance whether searching in the wilderness or in an urban setting would include but not limited to examples:

Searching data:

- The full name of the missing subject including nicknames and aliases
- Date of birth (age)
- Race and Gender
- Physical characteristics (height, weight, hair and eye color, and other physical attributes):
- Clothing description missing person is believed to be wearing (from head to foot and outer to inner garments):
- Notable items that may be carrying or using such as purse, cane, walker, or backpack

- Recent photograph.

Additional descriptive attributes may include:

Planning data:

- Mental, emotional and physical condition
- Any medications, alcohol or drugs involved

Intent

Probably one of the most important set of questions relates to the subject's mind set and/or their intent. What are they trying to accomplish? What are they trying to get to or away from? Answering any of these simple questions can move the search effort in the right direction and eliminate wasted efforts.

For example, is the missing person suffering from dementia? Knowing that the urge to wander can be strong and is usually based on

- Fear: fear of their new surroundings at a care home, where nothing is familiar and thus they wish to find that which is normal and familiar.
- Frustration: they are frustrated that they can't do what they want to do and therefore will seek to do so
- Food: the basic drive to seek sustenance wherever it may be
- Obligation: obligation or the strong need to perform a duty like go to work though they've been retired for years.

How does this look in practice? If a vehicle is found at trailhead and you find camera equipment in the back seat and you know that the missing subject likes to take panoramic pictures, then where would you send the search teams? Obviously, where there are scenic overlooks at the edge of a cliff (or at the bottom of the cliff).

Survivability

Survival in any environment is challenging whether urban or wilderness. However, some missing persons may be unable to recognize or utilize the facilities, services or resources that are required for basic survival, (e.g., food or shelter). They may be unwilling, afraid or too independent to ask for help. These attitudes could affect their chances of survival and increase the urgency of the search effort.

Another line of questioning is the subject's **ability to communicate**. Do they have access to a Personnel Locator Beacon (PLB), SPOT™, cell phone or sat phone? Do they know how to call home

or dial 911 for help? Is there an answering machine back home or access to voicemail? Are they familiar with the international emergency sign for distress which is three of any signal: three shots, three blasts on a whistle, three flashes with a mirror, or three fires evenly spaced?

Ability to Travel

Depending on the environment the missing person could meander or, in the case of an urban environment, move in a straight line. If there are no impediments or restraints on pathways, the subject could travel great distances eventually ending up out of the local area. This will expand the search area quickly. This could lead to a complete rethinking of where and how to search for the missing person.

How mobile is the subject? Are they:

- Walking?
- Riding in a vehicle, on a horse, on a mountain bike?
- Are they on the water in a boat or other flotation device?
- In the air in a commercial or private aircraft or glider, “flying squirrel suit”?
- Are they familiar with public transportation, such as bus, train, taxi or rideshare services

Ability to respond and to what

The tendency of the person to respond to attraction techniques, such as calling the missing persons name, may be very normal when they are in a normal situation or state of mind. However, circumstances in their environment or life may preclude them from doing so. For example, someone who does not want to be found (e.g., runaway, throwaway or despondent) may avoid searchers or not respond to any attraction techniques.

The missing person may have a fondness for a specific activity, a place to “hang out”, a special pet or animal that they enjoy being around. The converse should also be asked: What would cause them to turn away, shun or hide if they were exposed to an unpleasant activity, crowded environment or specific type of person or thing? What would cause them to have a catastrophic reaction to become violent or potentially hurt themselves or other like load noises, flashing lights, or searchers running toward them.

Sources of Intelligence

Frequently, after collecting intelligence/information from one source, a list of additional sources of information is developed, including names of all the people who know and have firsthand knowledge the missing person including friends, family, teachers, relatives and clergy. The information could

include lists places and attractions. More information may be available from outside agencies and jurisdictions frequented by the missing person. Searches for information may be looking at institutions such as hospitals, domestic violence shelters, homeless shelters and jails should be contacted. The remainder of the discussion will follow the example list from Figure 2,

The Interview

In a missing person incident, whether involving law enforcement and/or search and rescue personnel, there is a specific definition of "interview": A Search Interview is

- A structured, yet informal questioning process to obtain useful information from someone who has firsthand and/or relevant knowledge of the missing person.
- The tone of the interview is such that there are no accusations and there is no condoning or condemning of the actions of the missing person, the interviewee or the circumstances surrounding the person's disappearance.
- Questions are structured to aid the interviewee in recalling specific details and events leading up to the disappearance of the missing person.
- The information gathered is used to develop a missing person profile, to collect lists of other persons to interview and to aid in planning where to look for the missing person.

To expand further, the structured but informal interview means that you have a prepared list of questions (Missing Person (MP) Questionnaire/Interview Form/Guideline) but the environment of the interview is intended to be more relaxing in order to reduce stress. We are speaking to those who can really tell us who this person is because they have known the missing subject and can best describe them as well as help predict their reactions in various scenarios.

In this type of missing person interview, the questions are nearly the same for all types of searches and missing persons. In an interrogation type interview, it can take many hours to build rapport. However, in the Search Interview a rapport is developed almost instantaneously because of the common goal between the interviewer and interviewee that is to find the missing person and bring them home safely. This is sometimes referred to as **"compressed intimacy"** (Lois, 2003). This compressed intimacy is something to be cherished as it is quite fragile and can be destroyed at any time by the words that are used or even body language perceived. It is important to understand what the differences are between non-condoning, non-condemning and non-accusatory questioning and the need to remain neutral. We therefore must be cautious and conscious of our statements to prevent negative reactions from our interviewee.

Who should we interview? The most informed people we can find who have first-hand knowledge of the missing subject. Usually we are talking about family and/or friends. But, interacting with those that have firsthand knowledge of the missing subject brings on many responsibilities and problems for the

interviewer. For example, the interviewer will need to deal with stress and emotional ties to the missing subject which can be distracting and difficult to stay focused.

The person (or persons) who first reported the subject missing (the Reporting Party or RP), the last person to see the missing subject and/or the missing subject's family are usually the best place to start. These could all be one in the same. But, anyone with recent firsthand knowledge or potentially important knowledge of the missing person can provide the investigator the best information to help develop the missing person profile.

The Internet

The following example best illustrates the use of the Internet as a source of intelligence:

During Yosemite National Park's annual maintenance, a trail crew came upon an empty campsite that looked perfectly normal. Sleeping bag stuffed loosely in the tent, camp stove sitting out and the like. The backpack was missing. Nothing unusual for someone who set up a base camp and went out for a day hike. It wasn't until several days later when the same trail crew came back though the campsite when they noticed that nothing had changed or been disturbed. This created suspicions that the owner of the campsite might be in trouble. Yosemite Search and Rescue (YOSAR) was notified and a search was initiated.

A search through the campsite belongings revealed a backcountry permit taken out by a British citizen. YOSAR management decided to do a Google search of the subject's name and came up with information that he was a Professor at a university in the UK. Investigators then went to the university website, located the missing subject's department, found his picture and a contact number for the department. A phone call was made and investigators we able to talk to a colleague. The colleague stated that the missing subject was on sabbatical in the United States visiting several national parks including Yosemite. The colleague last had contact with the subject only a few weeks before via email noting that he was very excited to spend some time in Yosemite. There did not appear to be any physical or mental problems.

YOSAR investigations decided on a long shot and sent an email out to the missing subject stating they were concerned for his welfare and wanted to know his location. They were surprised to receive a return email from the missing subject that stated, he had lost track of time and didn't realize till it was almost too late that he had a meeting with a professor at a university just outside the park. He decided to just leave his camp, pack out as quickly as he could hike to his vehicle and make his meeting. He felt that no one would disturb his camp that he intended on returning to finish his visit to Yosemite.

Social media

In incident in an urban city in California, a teenage girl was believed to have headed out to high school on a normal day using public transportation, but she never arrived. Investigations interviewing the family indicated that the teenager was very depressed the last several months to the point that she had to change high schools. Interviews with new and old classmates indicated the same. Classmates also pointed out that her postings on Facebook were disturbing as well. Through the help of friends, investigators could gain access to the Facebook account. Postings indicated she was depressed and that she liked to take solitude at a special place in an open space regional park that backed up to her home. Search efforts up until then were focused in the urban areas from her home to access the public transportation. However, with this new information from Facebook teams were dispatched to the subject's favorite spot where she was found alive after jumping off a 30-foot cliff.

Crowdsourcing

We have often heard the term crowdsourcing with relationship to business and the acquisition of funding for a particular project, cause or start up. The actual usage of the word crowdsourcing is a portmanteau of "crowd" and "outsourcing" coined by Prof. of Journalism at Northeastern University Jeff Howe (2006) in a June 2006 Wired Magazine article "The Rise of Crowdsourcing". In that article Howe defines crowdsourcing as "… The act of taking a job traditionally performed by a designated agent (usually an employee) and outsourcing it to an unidentified, generally large group of people in the form of an open call." To put it simply, it is taking a large and daunting task, breaking it up into smaller elements, then distributing those elements to several individuals, a direct reflection of the saying "many hands make light work". It is the further defined as the coordinated use of human intelligence to perform tasks that computers are currently unable to do.

One of the earliest forms of crowdsourcing was in the late 19th century when Prof. James Murray led a project to draw on the knowledge and expertise of tens of thousands of volunteers to create the Oxford English Dictionary. Prof. Murray received hundreds of thousands of slips of paper over the course of 70 years each of which contain the definition of English words. The modern-day equivalent is Wikipedia, which draws on the knowledge and experience of hundreds of thousands of volunteers to create the largest body of knowledge on almost every subject conceivable.

Crowdsourcing can further be defined as explicit or implicit. **Explicit** focuses on individuals consciously working to resolve a problem. An example of explicit crowdsourcing would be taking a large geographic area and segmenting it into smaller pieces of real estate and asking small groups of individuals to walk through those smaller pieces of real estate looking for evidence that a single individual may reside there. We call this search and rescue. **Implicit** focuses on individuals performing a task that indirectly solves a problem. For example, when using software to scan and digitize an old book, words and phrases that are unrecognizable are tagged (referred to as captcha

validation). This unrecognizable tagged information must rely on a live human to translate. This human is actually helping digitize the old book one word at a time. There is third form of crowdsourcing called Piggybacking, which is seen most frequently by websites such as Google that mine one's search history and websites to discover keywords for ads

Surveillance or Sentinel devices provide a need to crowd source. In another example, a young 15-year-old female, from California went missing while on her way to school. The missing teen had been diagnosed with what was then defined as Asperger's under the autistic spectrum. Her profile showed that she was very focused on specific tasks. Through investigations it was suspected that she was heading to San Francisco with the intent of jumping off the Golden Gate Bridge. Suspicions were confirmed when investigators could obtain video surveillance camera footage from one of the San Francisco Bay Area Rapid Transit (BART) stations. The videos were from more than a dozen different cameras located in and around the station and exit points. In order to expedite the review of the many camera locations, each video was separated and viewed by family members and friends. It was felt that who would be better to spot her in an image, than those who have had first-hand knowledge and therefore would be able to recognize her quickly. A photo was quickly found of the missing teen coming up an escalator with her bicycle. Further review of other surveillance videos confirmed that she had jumped from the bridge.

We can increase our odds by setting up a form of containment. In Wisconsin a search was conducted for a Mexican native visiting the area. Authorities received a phone call from a nearby resident who stated that while reviewing photos from one of his game cameras, the caller found several pictures of the missing subject. Based on the time stamp on the photo and the location the camera, search efforts were shifted. Sheriff's officials urged all sportsmen, hunters and landowners in the area to check their game cameras for any other possible sightings of the missing subject.

Figure 3 Typical Game Camera

Using airborne platforms like fixed or roto-wing aircraft to record video images is not new. However, with the proliferation of small Unmanned Aerial Vehicles (sUAV) both commercially available to law enforcement and those privately owned it is possible to create video images on the fly (pun intended). There are recorded cases where ground search efforts have been futile which were followed by the launch of a UAV and the subject was located within minutes. Some of this is pure luck but in most cases, it still requires analysis of several minutes to hours of recorded video. It should be noted that those analyzing UAV video need to be experienced viewers to be able to identify what does a human form look like either standing, sitting, or lying down from different camera angles and various environments (i.e. urban versus wilderness).

Neighborhood Door-to-Door Canvassing and Interviewing

An often-used technique in the search for missing subjects in the urban environment it can be just as productive in a trailer or tent campground. Discussed in greater detail in the book “Urban Search – Managing Missing Person Searches in the Urban Environment” co-authored by Christopher Young and John Wehbring, teams are tasked to collect information from the public and the “unknown witnesses”.

The “unknown witness” is someone who might have seen or heard something but may not have recognized the importance of the occurrence until it is brought to their intention that there is an effort to find a missing subject in the area. So, it is equally important to consider what is NOT out of the ordinary, or what is normal for the neighborhood. This would include interviewing such persons as:

- Mail carriers
- FedEx™ and UPS™ drivers
- Newspaper delivery persons
- Utility workers, trash collectors, city workers
- Familiar walkers, joggers, neighbors in the area
- Neighborhood Watch Program participants
- Bus drivers, taxi drivers, ridesharing drivers

In management of a missing person search in the urban environment, it is important to saturate the area around the point last seen (PLS) or last known point (LKP) out to a radius of ¼ mile (300 m) with field teams. The technique of door-to-door canvassing and interviewing in residential neighborhoods generates many clues. Door-to-door interviews may help answer the question “Did the missing subject pass by this way?”

Cell phones mapping

Cell phones or mobile technology has been around for decades. Initially called car phones they were bulky cumbersome and expensive. Today they are slim, contain a massive amount of computing power, and affordable enough for everyone to carry in their pocket. While we accept this technology for granted it is only been in recent years that the technology has been exploited for the use of locating missing persons. The most famous of which was the search for the James Kim family in 2006

On Saturday, November 25, 2006 the San Francisco high-tech executive James Kim and his family were visiting the Portland, Oregon area over the Thanksgiving holiday weekend. The family left heading south with the intent of reaching Gold Beach on the coast of Oregon. The Kim's missed the main route turnoff from Interstate 5 to Oregon Route 42 and instead of backtracking they consulted a highway map and decided on a secondary route that near the Wild Rogue Wilderness and entered a remote area of southwestern Oregon. Unfortunately, the map they consulted, did not indicate the road was closed to through traffic during the winter months. The family drove till they got stuck. The family was reported overdue to authorities when James Kim did not report to work. A massive search was conducted between Portland Oregon and San Francisco California not knowing where the family had disappeared.

Two enterprising Edge Wireless (the Kim's cell phone carrier) engineers, Eric Fuqua and Noah Pugsley, contacted search and rescue authorities offering their help in the search. On Saturday, December 2, the pair began searching through the data logs of cell sites, trying to find records of repeaters to which the Kims' cellphone may have connected. They discovered that on November 26, 2006 at around 1:30 a.m., the Kims' cellphone made a brief automatic connection "ping" with a cell site near Glendale, Oregon, and were able to retrieved two text messages. Through the data logs, the engineers determined that the cell phone was in a specific area west of the cellular tower roughly in a 35 mile arc. They then used a computer program to determine which areas in the mountains were within a line-of-sight to the cellular tower. This narrowed the search area tremendously, and finally focused rescue efforts on Bear Camp Road. At first the search base was reluctant to accept the engineer's findings once they did the family was located. Unfortunately, James Kim perished due to exposure when he set off on his own to try to locate help.

From the after-action review of the Kim family search it became apparent that the data collected by cell phone providers had been underutilized in the search for missing persons. Since then it has become commonplace and more complicated due to privacy laws.

Data can now be mapped showing the overlapping of cell signals and pings form various towers to locate the cell device (see **Figure 4**).

Figure 4 Mapping from Cell Phone Data

International Mobile Subscriber Identity (IMSI) Catchers

An International Mobile Subscriber Identity or IMSI catcher is a device used to act as a "fake" mobile tower to either interrupt the connection between the cell phone and the service provider's real tower or in the absence of a provider's tower provide a cell phone connection. Originally developed as a cell phone ease dropping or listening device to intercept conversations/texting and to track the movements of the device it has proven successful in the location of missing persons in remote or desolate locations where no cell service towers are available. IMSI catchers go under many commercial names like "Stingrays", "Triggerfish", and "Dirtbox".

Figure 5 shows the difference in cell coverage between a fixed tower and an IMSI devise mounted on the underside of a helicopter.

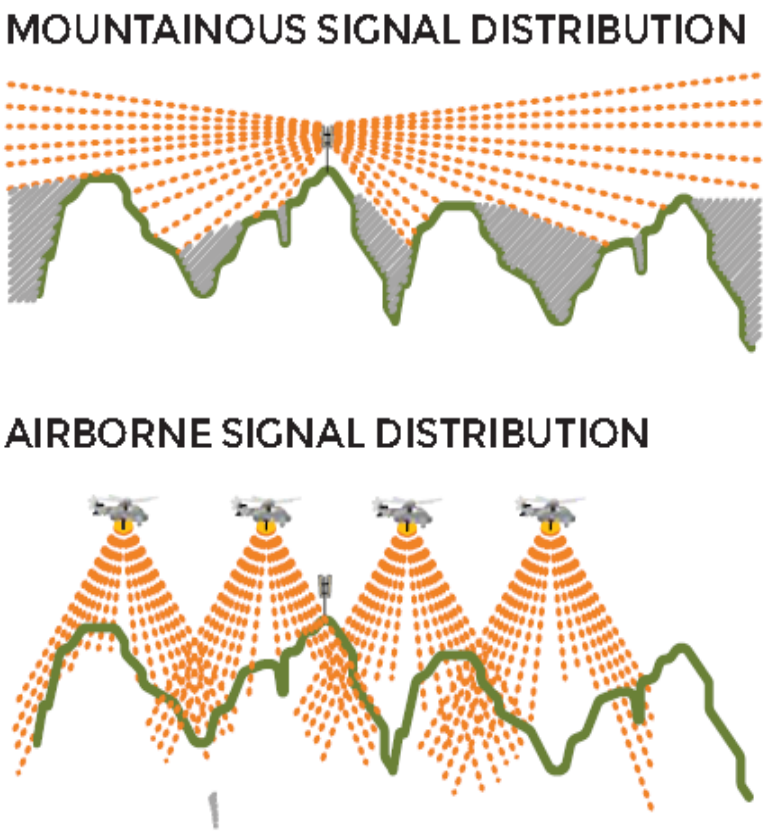

Figure 5 Example How the IMSI Signal Works Mounted an Aircraft Over Mountainous Terrain
[NORRIS Brochure A4 20141204]

Geo Location Services – Web Based Browser Apps

Because of today's technologies, the expectation/assumption of the public is that they can pick up their cell phone and call 911 (or 112) to attain help, especially if they find themselves lost in an urban, rural or wilderness environment. The behavior patterns would be to:

- See if they have any bars (signal strength) indicating a connection to a cell tower
- If they see no bars then they will either move around or climb to higher elevations until they do.
- Make a direct voice call to 911
- Try texting to 911
- Try texting to someone that can relay a message to 911

The problem with all these attempts is that the caller/sender must be able to tell 911 their location somewhere on the earth. The burden is placed on the sender to either provide a street address or a description of their location (i.e. next to the north entrance of the parking lot).

But what happens when the caller has no idea where they are? They may try to send a photograph showing their location, but that will only work if the 911 system will allow them to receive that type of data.

However, there are ways of extracting location information and display it in latitude/longitude if the person in distress knows where to look within their cell phone. (Like opening the Compass app on their iPhone and looking at displayed latitude/longitude)

Browser-based Geolocation Services: There are simple browser based location finding services using Short Message Service (SMS) and Global Positioning System (GPS) technologies that already exist within cell phones

These services are the outcropping of the frustration felt by Search and Rescue practitioners to be able to use current technologies available on cell phones to locate a missing subject. It is believed that the first to experiment with technology to extract location data automatically from cell phones was Russell Hore, then with the Ogwen Valley Mountain Rescue Organization of the North Wales Mountain Rescue Association in 2011. By combining MRMap, a real-time tracking program for managing the location of search and rescue teams in the field via the GPS in the radio handset and SARLOC a geo-location Application Program Interface (API) using the phones own web browser system without having to install any software on the cell phone.

All cell phones today are required by law, in most countries, to include GPS chips that can transmit and display the cell phone's current location. However, most people are unaware that this feature exists or if they do, don't know how to access this information to be able to transmit the information via a short SMS text message. Many times, a lost person doesn't know or realize that SAR personnel are out looking for them. In remote locations, the ability to use a cell phone to call for help is limited by weak signal acquisition by cell towers, cold weather and/or low batteries.

These browser based service applications are meant to solve this problem by automatically acquiring the cell phones GPS location and allowing the subject to email, SMS text, or just read the coordinates out over the phone.

In more detail, the services work using open source HTML5 Geolocation JavaScript API to find a cell phone location via the internal GPS and display it. A message is prepared that should include a URL address and either emailed or text to the target cell phone with a request of the user to click on the URL or respond to the text. Embedded within the response is the extracted GPS coordinates. The return information is then collected via a web based application and plotted on a map.

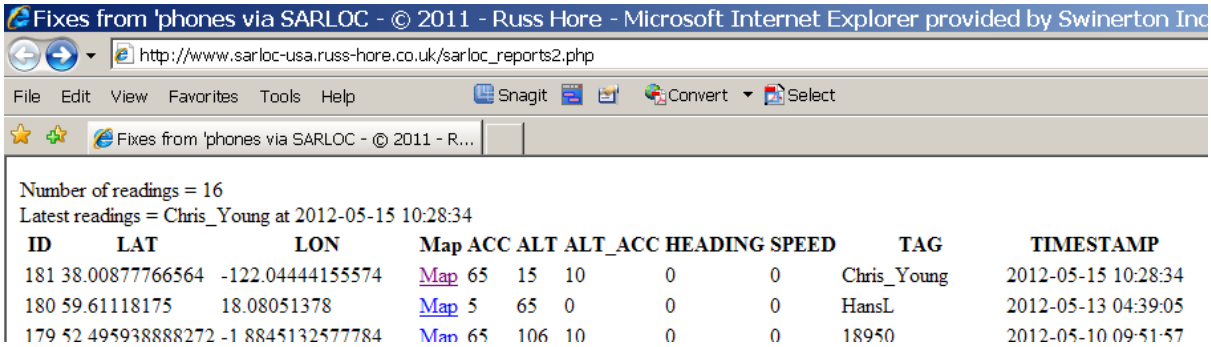

Figure 6 Geolocation Information form Web Base application

[Source: http://www.sarloc-usa.russ-hore.co.uk/sarloc_reports2.php]

Figure 7 Example of Geolocation Source Information Plotted on a Map

Photo Search – Meta Data EXIF

The advent of digital photography and the demise of the photographic film industry, there have been many changes in the way we view the world as well as well as cultural changes in the field of photography. There is no longer the need in traditional photography to have dark rooms or deal with hazardous materials to produce a post-production image. Images can now be processed, enhanced and edited on a computer screen in the home, which allows for more creativity.

Certainly, the camera feature on most cell phones has also helped popularize digital photography, largely due to the strong need for recording every day events, photos of friends and loved ones and the “Selfie” (a self-portrait form of self-expression), and posting of all to the internet and social media.

Mining information from photograph images has always been useful tool in building a profile of a missing subject. This would include such things as the subject’s:

- Favorite places
- List of friends
- Favorite activities
- Emotional status
- Physical status
- Other interests

What has also become useful in the search for missing persons is the mining of hidden data within a digital image. When taking a digital photograph using a cell phone or a GPS enabled digital camera, besides recording the image there is also additional information hidden within the digital file. This hidden digital information referred to as “Metadata” is information regarding the image taken and stored in what is called the **Exchangeable Image File Format (EXIF)**. The EXIF is a standard that specifies formats and “tags” used by digital cameras including smart phones.

So how does this EXIF information help us in locating missing persons? If you can see the metadata contained within photos, you would find information such as, but not limited to:

- the date and time the photograph was taken
- the file source
- the Camera make and model or Cell Phone used
- the size of the file
- the focal length
- the exposure time
- the f-stop

But one of the main key pieces of data is that it also contains the **GPS latitude, longitude, altitude and image direction** (assuming the GPS feature on the phone is turned on).

If we can download a digital image the extraction of the GPS information of course is extremely useful. If we know something about the origin of the image from other investigated sources such as:

- who took it
- the subject matter or scene
- when it was taken
- those depicted in the photograph

This all combines to paint a picture of where the missing subject might be. If we have an image sent directly form the subject in real time, our search work may be close to accomplished. The right image

could also tell us the local terrain and provide information on access to the missing subject and possible extraction routes.

However, there is a caveat that must be noted. Some social media sites such as Facebook, Twitter and Instagram will strip away the metadata when an image is uploaded. This is being done as a privacy security policy and data compression. The only way to determine where a photo was taken is if the user associated the image with a place when they uploaded to the social media site.

So, what is the process to extract this information? The first task is to download the image. Once this is done, there are couple of options.

There is a simple quick option for an iPhone (from an iPhone image sent by the subject). Saving a texted image to “Photos”, opening the image and slide it up:

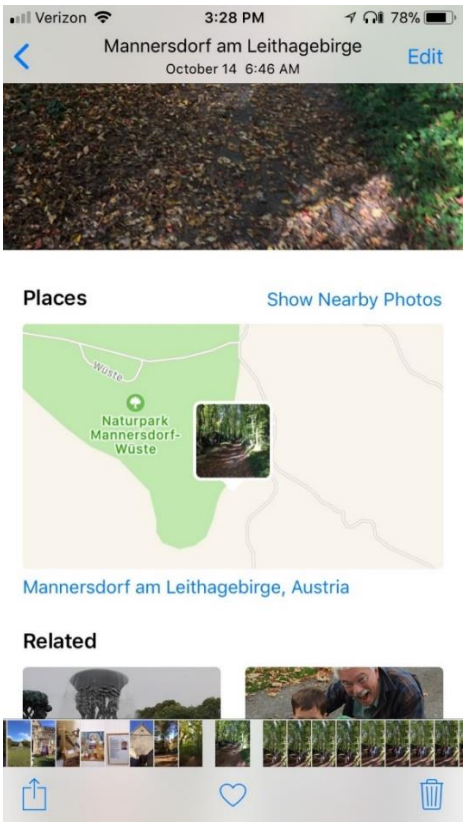

Figure 8 iPhone Photo Image Slid up to Reveal Map

Tap the photo in the center will bring up the Map app which can be viewed as a Map, Hybrid or Satellite.

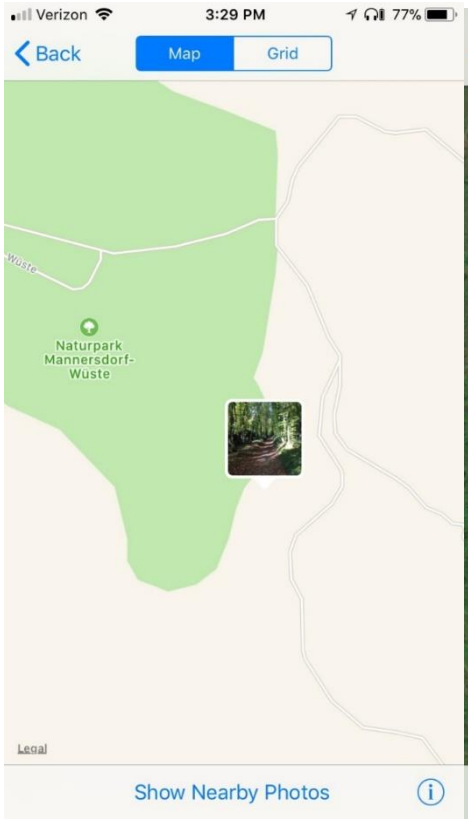

Figure 9 iPhone "Map" Image

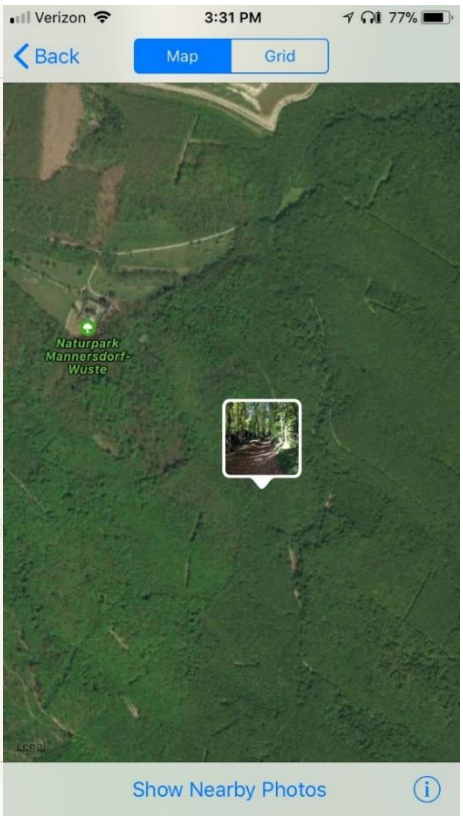

Figure 10 iPhone "Satellite" Image

A Second Option is to save the picture to a computer running Windows. Right "Click" on the image, select "Properties" and click the "Detail" tab. Scroll down to "GPS". On a Mac "Click" on the image, select "Get Info" and look under "More Info" section

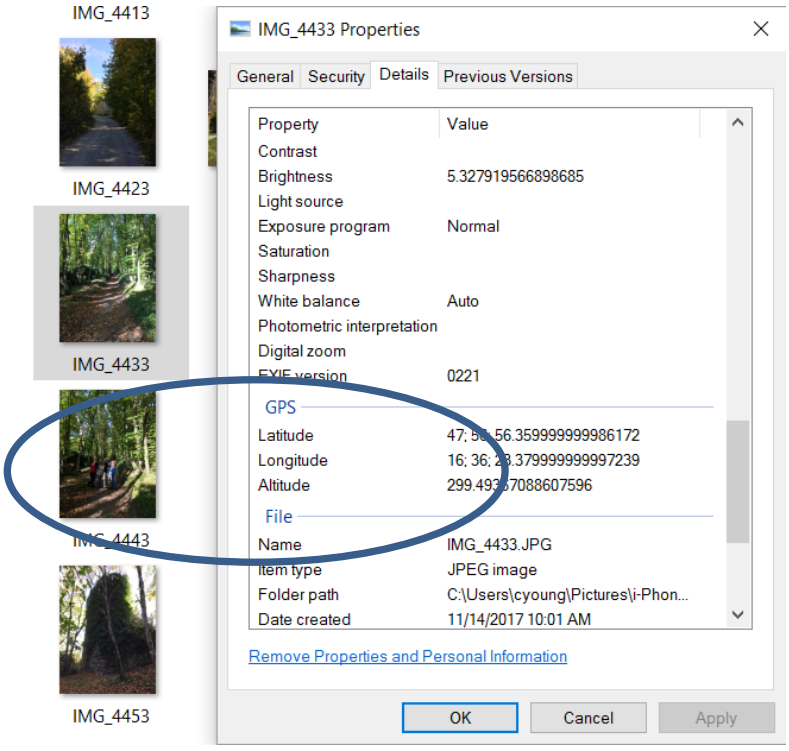

Figure 11 Windows Image of "Properties/Details" Showing GPS Metadata

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Results

Intelligence preplanning:

Looking at all the management functions we need to process prior to missing person incident requires thought and preparation. This is referred to as preplanning. This can be summarized based on the review of intelligence and information process and the many sources of information

For Intelligence/Investigations Sections

- Look at Lessons Learned from various types of missing person incidents and locations. What were the sources of information made these incidents successful or could have been improved with the right information

- Seek out candidates that have search management experience as well as the appropriate aptitude, demeaner and passion to be a good investigator

- Conduct courses on:
  - Intelligence gathering and Interviewing
  - Sensitively in dealing with families
  - Technical skills for internet & social media mining
  - Technical skills in extracting videos & photo data
  - Technical skills in extracting cellphone & ISMI data

- Establish lists of Geolocation Services

- Establish lists of outside services to cover services not available to the authority having jurisdiction (AHJ)

Coordination with Plans/Operations Sections

- Review and be familiar with the output of the Intelligence/Investigations Section.

Coordination with Logistics

- Review and be familiar with the technical support and equipment for the Intelligence/Investigations Section.

In addition, look at the workflow process and intelligence gathering from individual sources and plot out decision trees. Example:

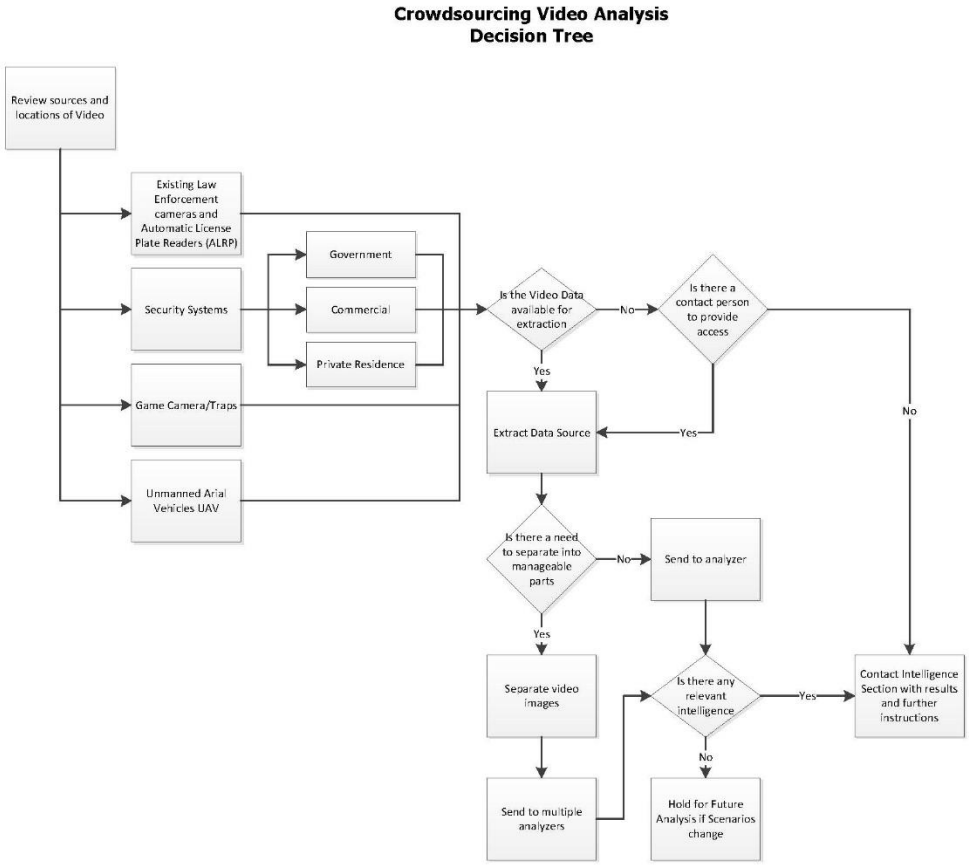

Figure 12 Crowdsourcing Video Analysis Decision Tree

Intelligence Reflex Tasking

Reflex tasks are those initiated as soon as possible from the commencement of a missing person incident. These assignments are assigned as qualified personnel become available. These include:

Incident Commander:

- Assign Intelligence Section Chief

Intelligence Section Chief

- Assign teams to the various disciplines to be investigated

Plans/Operations

- Set up the pre-established procedures to react to output of the Intelligence Section.

Coordination with Logistics

- Set up the technical support and equipment for the Intelligence Section.

Training Curriculum, Practice and Discussions

In incident management courses there is a component that puts all of the tenants learned and applies them to a practical exercise, and often referred to as a map or tabletop problem. For the intelligence/investigations process to be successful, there must be curricula developed as well as practical exercises to hone the skills necessary to be successful in a missing's person incident. A course curriculum has been developed by this author and is available upon request.

As part of the course there is a breakout session where students are broken up into teams of three and given a simple scenario. One of the team members will act as the person reporting the incident (PRI). This scenario is that the PRI has a relative that came to stay with them for the weekend. The PRI leaves in the morning to go shopping and upon their return at noon they find their relative missing. The person acting as the PRI is asked to describe a real life relative. It is up to the two remaining members of the team to act as the investigators to build a profile of the missing subject as well as develop scenarios. They can use whatever investigative sources of information they feel necessary. The exercise can run from 45 minutes to a few hours. It is not expected that the investigation will be completed in this period of time. At the conclusion of the exercise the teams brought back together to review the following:

- Note how much investigation was completed in the time given?
- What did you learn? Describe the facts of the case, the summaries, the scenarios developed?
- How would you do it differently?

Conclusion

So, what does this all mean? During a missing person search the organization and function of the Intelligence/Investigation Section has often been overlooked or not applied at all. The goal of this

paper is to provide a better understanding on the utilization by defining its use in developing subject profiles and scenarios. There are lots of sources of information out there if we know where to look and think out of the box. Experience tells us that this can make or break an incident. The process is very labor-intensive and is up to the individual agencies having jurisdiction to plan ahead to train resources to perform the functions necessary for a successful outcome.

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About the author

Christopher S Young has been active in Search and Rescue since 1981, managed searches since 1986, is the past reserve Captain for the Contra Costa County Sheriff's Search and Rescue Team and serves as chairman of the Bay Area Search and Rescue Council, Inc. (BASARC). Chris is a retired Instructor for the POST "Direction and Control of the Search Function Course" for the State of California Office of Emergency Service for 25 years, is currently an Instructor Trainer for the "Managing the Lost Person Incident" and "Urban Search Management" (developed by Chris) for the National Association for Search and Rescue (NASAR), he is also an Instructor Trainer in Emergency Medical Response and first aid for the American Red Cross since 1972, as well as specialized topics in Search Management, including Search Management in the Urban Environment, and Investigation and Interviewing in SAR. Chris has also written, published and presented search management papers at the National Association for Search and Rescue conferences, the Canadian National Search and Rescue Secretariat SARSCENE conferences, the William Syrotuck Symposiums on Search Theory and Practice, the Canadian Coast Guard College, the Provincial Sûreté Du Québec Police, the Ontario Provincial Police, the New Zealand National SAR Conference, the Icelandic International Search and Rescue Conference, Norwegian Frivillige Organisasjoners Redningsfaglige Forum (FORF) Seminar and several State Search and Rescue conferences. He is also co-author of the book **"Urban Search – Managing Missing Person Searches in the Urban Environment"**, published 2007 by dbS Publications as well as a contributing author on several other books for search and rescue. Additionally, Chris is a Level 1 law enforcement reserve with the Sheriff's Dept and the City of Danville and is an EMT 1 Instructor. Chris holds a Master of Science Degree in Construction Management and works as a Senior Project Manager for a large general contractor based in San Francisco and is responsible for overall management of multi-million dollar ground up commercial, high rise, hospital, educational and hotel projects.

Abbreviations

AHJ	Authorities Having Jurisdiction
API	Application Program Interface
BART	Bay Area Rapid Transit
BASARC	Bay Area Search and Rescue Council
EXIF	Exchangeable Image File Format
FEMA	Federal Emergency Management Agency (US)
GPS	Global Positioning System
I/I	Intelligence/Investigations
ICS	Incident Command System
IMSI	International Mobile Subscriber Identity
IPP	Initial Planning Point
LKP	Last Known Point
MP	Missing Person
NASAR	National Association for Search and Rescue
NIMS	National Incident Management System
PLB	Personal Locator Beacon
PLS	Place Last Seen
PRI	Person Reporting Incident
RP	Reporting Party
SAR	Search and Rescue
SMS	Short Message Service
sUAV	Small Unmanned Aerial Vehicles
YOSAR	Yosemite Search and Rescue

References

Federal Emergency Management Agency (2017). National Incident Management System

Federal Emergency Management Agency (2013). NIMS: Intelligence/Investigations Function Guidance and Field Operations Guide

Howe, Jeff. 2006. “The Rise of Crowdsourcing” - Wired Magazine - Issue 14.06 - June 2006

Koester, Robert J. 2008. *Lost Person Behavior*, Charlottesville, VA: dbS Productions

Lois, Jennifer. 2003. *Heroic Efforts – The Emotional Culture of Search and Rescue Volunteers*, New York, NY, New York University Press

Young, Christopher S and John Wehbring. 2007. *Urban Search – Managing Missing Person Searches in the Urban Environment*, Charlottesville, VA: dbS Productions