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Colorado SAR offers a 40 hour and a 20 hour class on MISF. Interspersed between lectures are real world exercises to plan and execute searches. The scenarios are mostly taken from National Park Service searches since they do an excellent job of documenting their searches. NPS rangers are paid professionals. Class attendees serve in different leadership roles with several teams working the same mission. Depending on how each team deploys the exact same resources available during the real search they will be given the same clues discovered during the real search. Great fun to see who finds the search subject first. A chance to learn from your mistakes and the best practices of others in a classroom environment.

This presentation will briefly discuss some of the topics from the class along with our local team mission process.

I copy of this presentation, including speaker's notes, may be downloaded in PDF format from the members section of the website.

Current IC (Incident Command) Team

Two people are on duty 24-7, one week at a time, beginning Monday at 7 AM – Look in IAR scheduling menu to find who is on duty

Primary IC – Must be available to contact sheriff's dispatch immediately if their pager goes off – will be IC for the mission unless they hand it off to some-one else

Secondary IC – Has pager with them and ready to call dispatch in case primary does not hear their pager; go-to person for primary to contact if they need to run an errand, get out for some exercise or other reason

IC will use IAR (I Am Responding) phone/email application to call out and to update the team during a mission

Current IC Team Members:

- Danny Andres, Evan Brady, Don Dubin, Dick Eustis, Tracey Lehman, Jinan Martini, Bill Sample

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Please do not call IC right after you get an IAR call out to ask what's up – they are very busy, send a text if you must and don't get impatient on when they respond

IC team members will collaborate on planning and executing missions. No single person comes near having the combined knowledge, skills, and experience of the team.

Occasionally a member of the sheriffs department may assume command of the team.

So Many Abbreviations

IC – Incident Command or IC – Person directing the operation

SO – Sheriffs Office – Who we work under

RP – Reporting Party or RP – The person who called sheriffs dispatch

LKP – Last Known Point – Where evidence says they were last

PLS – Place Last Seen

IPP – Initial Planning Point – Center of the search, often LKP, stays the same place even if better clues come along later

IAR – I Am Responding or IAR – The phone/email application we use to call out and to update the team

Any process worth following deserves some abbreviations

Here are some of the more common abbreviations; none are acronyms as they cannot be pronounced like SAR is

All are abbreviated in writing

Some are abbreviated in speech but some are not

Search Urgency Worksheet (1 of 3)

Eleven questions answered with 1 through 4 rating

- The lower the number the more urgent the response
- If any of the eleven is answered with a 1 the search may require an immediate response
- A total of 10 – 15 Urgent Response
- A total of 16 – 27 Measured Response
- A total of 28 – 41 Evaluate and Investigate

Some example responses

- Routine IAR call-out with brief description of mission
- IAR call-out describing need for more than the usual turn-out
- In addition to IAR, request for aerial assets, specialty teams (dogs, technical ropes, tracking) from other SAR teams, etc.
- Request deputy to go to trailhead(s) to confirm subjects vehicle is present – IAR team but hold at bay until vehicle located
- Send IAR message to expect a call-out at 0530 next morning
- Direct subject to trailhead using cell phone

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Call out the full team and begin a mission now? Wait until daylight? Send out a small number of resources? Do more investigation and then decide?

IC can often do urgency decision in their head without completing the form

The form can show others, such as the RP or relative, how we are following nation wide search urgency criteria – due the paper work to document rational if delaying the mission, not needed if not delaying, could also document the rational for limited (measured) immediate response

Search Urgency Worksheet (3 of 3)

G. PHYSICAL CONDITION

Unfit ----- 1
 Fit ----- 2
 Very fit ----- 3

H. CLOTHING PROFILE

Inadequate or insufficient- 1
 Adequate----- 2
 Very good ----- 3

I. WEATHER PROFILE

Existing hazardous weather ----- 1
 Hazardous forecast (8 hours or less) ----- 2
 Hazardous forecast (more than 8 hours) ----- 3
 No hazardous weather forecast ----- 4

J. TERRAIN & HAZARDOUS PROFILE

Known hazards ----- 1
 Difficult terrain ----- 2
 Few hazards ----- 3
 Easy terrain, no known hazards ----- 4

K. EQUIPMENT PROFILE

Inadequate for activity/environment ----- 1
 Questionable ----- 2
 Adequate ----- 3
 Very well equipped ----- 4

If any of the eleven categories are rated as (1), regardless of the total, the search may require an immediate response.

10-15	16-27	28-41	TOTAL _____
URGENT RESPONSE	MEASURED RESPONSE	EVALUATE AND INVESTIGATE	

**** The total should range between 11 and 41 with 11 indicating the greatest urgency.****

Describe planned response from completion of worksheet

Missing and Lost Person Behavior

Use local data from previous searches if it is available

Use International Search and Rescue Incident Database

- Select appropriate categories
 - Mental status of the subject
 - Subjects age
 - Subjects primary activity – hunter, hiker, climber, dementia, ...
 - Eco-region
- Probability rings of found distance from IPP (Initial Planning Point)

Use Lost Person Behavior Book

- Much information from interviews of found subjects
- 41 different subject types
- Overall traits of subject type
- Helpful descriptive information
- Available as book or phone app

Are either of these in the bay's library?

Phone app is apple, google, and amazon - \$10

Subject Profile

Physical and mental description

Name(s)

Physical resources carried by the subject

Known activity at the time of the loss

PLS (Point Last Seen) or LKP (Last Known Point)

Personality Traits

Interest and activities – outdoor pursuits, hobbies, vocation, etc.

Experience – novice vs. seasoned veteran

Subject lost before?

Predetermined emergency strategies or options discussed with other party members

Personal tragedies – possible influences to behavior

Contact known friends, family, associates for advice on profile

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Personality Traits – aggressive, despondent, confident, low self esteem, happy-go-lucky, stable, etc.
Early in a mission may not know many of these but a good investigation will discover more

Reflex Tasking

Very little planning or thought process before assigning and carrying out these tasks

Coordinating and executing a search in a way that worked well in the past

Initial rapid deployment of resources on-scene to likely spots

Resource to begin investigation steps

Establish IPP (Initial Planning Point)

Resources to begin containment

Begin search of immediate area around IPP

Resources to travel corridors – trails, ridges, drainages

Resources to other high probability tasks

For 95+% of the time this is all that is executed on a mission

While reflex tasking is taking place be working plans for tasks and resources beyond reflex tasks in case they are needed

Why Math

Origin is Operations Research to find WWII German submarines

- Highest probability of success with limited resources

Don't try to be exact – use to compare one option to another

Use to distribute or redistribute resources

- As the search progresses the numbers change

Increase or decrease the size of the search area

Decide when to end the search

- Difficult decision – do it with data and minimize emotion

Rationalize actions to family, media, or higher authority

Use as potential justification in litigation

First five slides are tools for managing a large multi operational period search with large number of resources

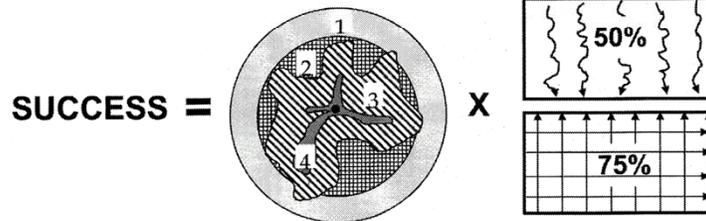
Last five slides are things that can be used on all searches

Search Planning Formula

Conventional Search Planning Formula

$$\text{POS} = \text{POA} \times \text{POD}$$

Search Success is Based on Two Factors = Looking in the Right Place, X .. and Being Able to Detect What is Being Looked For



Probability of Success = Probability of Area X Probability of Detection

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Story of searching for keys on dark street

This formula does not include time but it is often imperative to find the subject before weather, injury, etc. does the subject harm

Also must consider safety, difficulty, time to search an area, and need for special resources before deciding order of which areas to search

Searchers often overestimate their ability for probability of detection so don't be surprised if the IC uses a lower value than you gave them

Cumulative Probability of Detection

After First Pass with
60% POD



After Second Pass with
another 60% POD



Searching the area a second time only has a 24% probability of finding the subject

- 40% chance still there after first search
- 60% chance of finding them in the 40% remaining
- $0.24 = 0.40 \times 0.60$

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Search an area a second time?

Less chance they are there if not found the first time

Formula for cumulative POD when area searched multiple times

Think of a pie that is being eaten – the pie remaining in the pan is odds the subject is still in the search area

Each pass takes out their POD percentage of the remaining pie

First pass with 60% POD results in 40% chance still in area

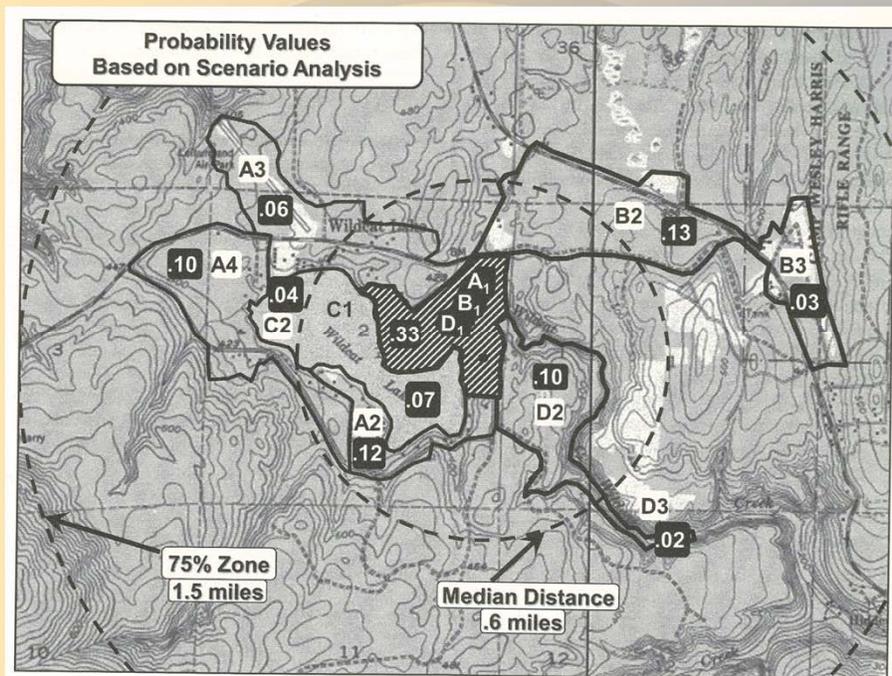
Second pass with another 60% POD is applied to the remaining 40% resulting in

40% 1st pass remaining minus 60% 2nd POD x 40% 1st pass remaining

40% - 24% = 16% remaining after second pass, or $1 - 16\% = 84\%$ POD after 2nd pass

For the mathematically inclined use reciprocal of the sum of the reciprocals on the POD numbers

Probability of Area Values



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Areas are sized so that each can be searched by a single team in a single operational period
Probabilities are updated at least at the end of each operational period as the probability of the subject being in an area is reduced once it is searched

Rings show statistics for similar missions

- Median is 50% found within this ring

- 75% found within the 75% ring

Probabilities of marked areas on the map should add up to less than 100%

Rest of the World concept is that the subject is out of the mapped area

- Faked disappearance

- Not lost but left the area

- Other possibilities

Consensus Worksheet - Never Plan Alone

	Scenario A	Scenario B	Scenario C	Scenario D	
Evan	100	30	25	50	
Don	10	50	100	75	Ref
Tracey	25	75	100	25	Value
Dick	10	50	100	12	100
Jinan	30	100	75	25	
					Sub Across
Sub Down	175	305	400	187	1067
Consensus	0.16	0.29	0.37	0.18	
Date:	1/20/2019	Mission:	2	Op Period: 2nd	Time: 06:55

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Scenarios (what the subject may have done and where they may have gone) can contain multiple search areas

A search area may be incorporated into multiple scenarios

Worksheet can be used for scenarios and then applied to areas or applied directly to areas if only a single scenario is assumed

Reference value is given to each persons pick for the most probably area or scenario

Often use 100 or 10

Smaller numbers are then applied relative to the reference for each scenario

Team members don't enter percentages just relative values

A members total of assigned numbers does not have to equal anything

After the math, percentages are found on the bottom line

Danny finds his first mission as IC to be an "interesting" one

Great turn out of resources including other IC's

At least four scenarios brought forward by fellow IC's

Evan is sure of scenario A

Don, Tracey, and Dick all lean to C

Jinan favors B but also sees merit in C

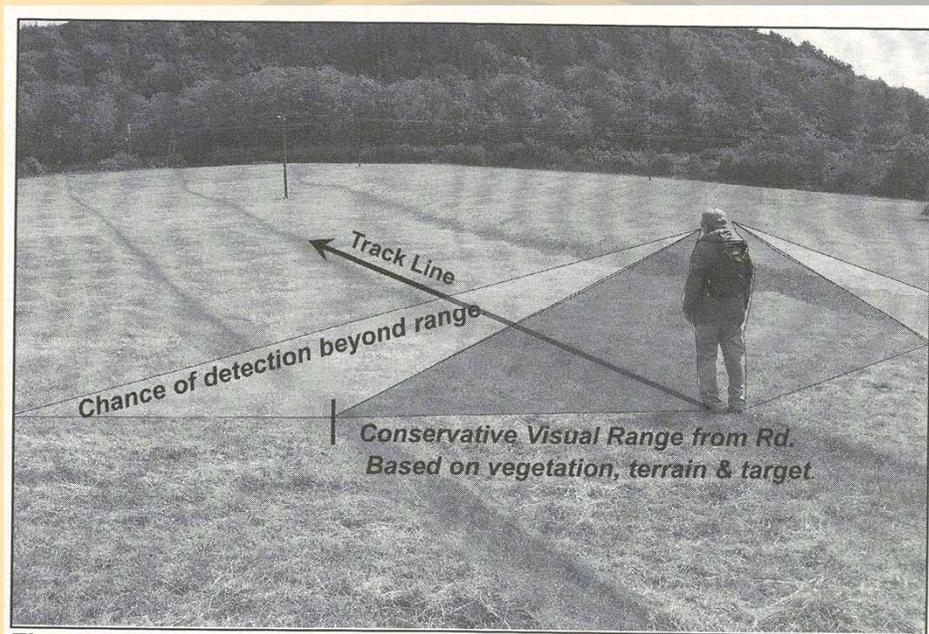
Danny hands them the worksheet and says work it out and come back to me

Ten minutes later with worksheet in hand Danny quickly assigns resources to C and then B

Evan pleads his case for the remaining resources – Danny says 0.16 is close enough to 0.18 and gives Evan a small team of the remaining resources

Teams hit the field all feeling like good decisions were made

Effective Sweep



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Let's leave the command station and enter the field of search

The sweep width and travel speed are adjusted based on environment

Field tests have been conducted to determine sweep width for objects of various sizes, shapes and colors on flat ground

Can do a quick test in the field by placing a similar object on the ground and walking towards it from several directions to get a sweep width value

Rolling terrain can hide things unless you occasionally move laterally to observe into the dips

Might do a wide sweep width on initial search and come back later with more resources for a narrow sweep width

If searching an area additional times do the search differently to observe new perspectives

- If a grid search do the second search lines 90 deg to the first search lines

- If a linear search such as along a trail, drainage or ridge, or around a lake – do the second search in the opposite direction

Searchers Effectiveness

Tools

- Binoculars, bright head lamps, spot lights, GPS, maps, flagging, etc.

Speed

- Slow enough to be effective – stop to look behind and to sides

Track

- Go to the edges and end of your segment – don't assume the adjacent team will check the edges

Visual Expectations

- You only see what you expect to see – expand your expectations
- Have description of subject – especially clothing color
- Does subject have lights, whistle, signal mirror, fire starting capability

Use radio to coordinate sound and light sweeps

- Every few minutes all blow whistles at same time and then listen
- Every few minutes all go dark to better see lights from subject
- Helicopter may request all lights out to look for light from subject

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Use flagging tape to mark points, routes and areas and collect it on the way out if no longer needed
When travelling off trail flagging will help other teams follow your route and may help you on your return

Flagging may mark the boundaries of an area that has been searched – write things like SAR, date, and other descriptive words on the tape when appropriate like on a multi-day search

Agree on whistle blast patterns to distinguish subjects whistle blasts from searchers whistle blast

Patterns of three are international distress standard – reserve these for the search subject

Some teams never blow their whistle unless they need assistance

Medical and military helicopter has night vision goggles that are thousand times more sensitive to light than your eyes

See the light from a lighter at two miles

Optimize your night vision on a night search

It takes 15 to 25 minutes for the eyes to adapt to darkness

Use a minimum of light to keep you eyes adapted

Using red light preserves night vision

DO NOT shine your light into the eyes of another team member

This ruins there night vision and is easy to do with your headlamp

Older eyes take longer to adapt and do not see the faint lights that may be seen by the more youthful members of the team

Will the subject hide from you?

Will the subject be in a sheltered location?

Will the subject be laying down or up and moving?

Clues

Novice searchers may look only for the subject and not for clues

Clues are found not only in the field but outside of it

- Example is team member calling family, friends, co-workers, etc. to interview them to gain clues

Priming is having a mental list of what clues are possible

- Brief team before deploying them
- Discuss with fellow team members what they are looking for

Document clues and report them

- Photograph or sketch – put an object of known size in the photo for scale – your radio, a coin, etc.
- Record map coordinates
- Call in on the radio, repeat what was found at debrief

Don't jump to conclusions based on a single clue

- Other teams may have other clues that combined with yours give a more probable conclusion

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Person remaining with vehicle at trailhead may be able to do investigation from there if they have cell coverage

Please coordinate investigative phone calls with IC so this is not duplicated

When relatives get same questions from multiple team members we appear disorganized and they lose confidence in us

Also coordinate information given to family – conflicting information really makes us look disorganized

Types of Clues

Physical or Events

- Footprints, sign, disturbance, discarded items, lights, shouts, smoke, phone or radio calls, whistle, mirror flash, flare, noise or loud sound

Recorded or Documented

- Summit log, receipts, notes, letters, trail registers, permits, maps, guide books

People or Testimony

- Witnesses, relatives, friends, vendors, bystanders, companions, sales persons

Analytical

- Previous behavior, previous searches, deductive reasoning
- Distances from local or international data

Many groups out in the winter carry BCA and other brands of radios that operate in the UHF FRS/GMRS bands

If you own one bring it on the search and monitor the channel informally designated for our area or one that the subject is known to use – occasionally call to see if the subject is listening
Many radios can be programmed to scan channels to allow listening to many channels at a time

Obtain from Clues

Location and Elevation

- Map coordinates, for tracks - subjects direction of travel

Time

- How long ago
- When was the last rain or snow as this can help date tracks

Direction and Speed

- Direction of travel and how fast

Corroboration and Ownership

- Conclusively human, belong to subject

Intent

- Activity, intentions or purpose

Character

- What is it

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Report clues to IC before moving on

They may have questions about the clue that you can investigate

Document clues with photos, coordinates, flag if cannot or should not be moved, ask if should collect and bring back

Be safe out there and good hunting