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Federal Emergency Management Agency

National
Urban Search and Rescue
Response System

A Component of the National Response Framework
Emergency Support Function 9

Search Strategy and Tactics Handbook

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This document supersedes previous versions and incorporates all other applicable FEMA US&R documents, policies, and procedures.

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FEMA National US&R Response System
Search Strategy and Tactics Handbook

CHAPTER 1: INTRODUCTION

1-1. Purpose

The purpose of this handbook is to provide FEMA and the National US&R Response System with strategies and tactics for planning, managing, and conducing search operations.

Search operations should be implemented as soon as possible to increase the survivability of persons. A fast search is a successful search for survivors. Search and rescue operations in the urban disaster environment require close interaction of all task force elements—management, search, rescue, medical, and technical—for successful survivor detection, location, and extrication. Search operations for detecting and locating survivors are initiated early in a mission. Task force personnel must conform to an accepted system for survivor search strategy and tactics in order to be effective. All task force personnel should have a solid understanding of the general search protocols. Task force supervisory personnel must tailor the general strategy and tactics to be flexible for the specific problems encountered.

It is incumbent on task force supervisory personnel to implement coordinated search tactics and strategy, collect and collate related information, and develop an effective overall task force rescue operation.

1-2. Applicability and Scope

This handbook is applicable to the National US&R Response System.

1-3. Background

The FEMA US&R Branch is responsible for managing the National Urban Search and Rescue (US&R) Response System, referred to as the System, which provides search and rescue capabilities at all levels of government through a unique partnership between FEMA and 28 local and state sponsoring agencies in 19 states local emergency management organizations, known as Sponsoring Agencies. The US&R Branch is also responsible for operational coordination during disasters and throughout the year with other federal agencies that support ESF #9.

1-4. Authorities and Foundational Documents

The following doctrine is relevant to this handbook:

A. FEMA US&R Operations Manual

The FEMA US&R Operations Manual provides a detailed overview of the FEMA National US&R Response System and how FEMA coordinates search and rescue efforts in support of requests for federal assistance from states, local jurisdictions, and tribal territories, under the authority of the National Response Framework (NRF).

B. FEMA US&R Operations Manual, Annex A – Response Concept of Operations

The Response Concept of Operations provides additional information about the requesting and receiving of resources from the FEMA National US&R System and how support is provided at the request of a state or other Federal agency.

C. FEMA National Response Framework

The National Response Framework (NRF) outlines Federal responsibilities and provides the framework for coordinating civil-military requirements. The NRF is designed to ensure that all levels of government across the nation have the capability to work efficiently and effectively together using a national approach to domestic incident management. It serves as the core strategic national-level plan for coordinating Federal incident management activities for terrorist attacks, disasters, and catastrophic incidents. The NRF also contains a specific Annex for Emergency Support Function #9 – Search and Rescue.

1-5. Overview

This handbook is divided into five chapters and provides overall definitions and the different strategies and tactics related to search operations conducted by the FEMA National US&R Response System.

CHAPTER 2: SEARCH DEFINITIONS

Task force personnel should have a clear understanding of the tasking orders in the Incident Action Plan (IAP) provided by the Incident Support Team (IST) and/or the Authority Having Jurisdiction (AHJ). The following search definitions further defined various tasking orders.

2-1. Special Response Teams

The Special Response Team (SRT) is employed when the Incident Commander (IC) has identified specific evacuation requirements necessary to limit loss of life for special needs survivors. Prior to an event such as a hurricane, emergency managers should be able to identify and prioritize facilities that sheltered in place. These facilities will likely have a significant number of survivors who may not be capable of providing for themselves if the event causes a complete disruption of services because of partial or complete collapse or rapid inundation of water. Search resources should be deployed to investigate these pre-identified facilities that are likely to require evacuation assistance. These facilities include but are not limited to:

A. Hospitals

B. Nursing Homes

C. Evacuation Shelters

D. Critical Infrastructure Facilities

E. Areas of last refuge such fire stations and police precincts

2-2. Reconnaissance

Reconnaissance (recon) is the preliminary survey of the affected area and/or assigned area of operation for the purpose of determining the scope and magnitude of the incident and identifying the resources needed to manage the incident. Other considerations for recon include:

A. Initial and fast visual check of the damaged area and/or assigned area of operation.

B. For single structure collapse incidents, the primary purpose of this action is structural assessment and hazardous materials assessment.

C. This can be accomplished by air, waterborne craft, vehicles, or walking.

D. Size and make up of recon teams are incident driven and flexible but should remain as small as possible to keep teams “fast, light, and mobile”.

E. Recon teams should not engage in extrication/rescue operations.

2-3. Hasty (Rapid) Search

Rapid (hasty) search is a fast-paced and methodical search of the assigned area of operation in an attempt to detect/locate survivors in immediate need of evacuation from harm. Other considerations for hasty search include:

A. Can be accomplished by air, waterborne craft, or vehicles.

B. Size and make up of hasty search teams are incident driven and flexible.

C. This may be accomplished simultaneously with recon.

D. If survivors are detected/located and cannot be easily evacuated, their location(s) should be documented and marked using standard US&R marking system unless otherwise required by AHJ/IC or ROG. Additional resources should be called to conduct extrication and/or evacuation.

2-4. Primary Search

Primary search is a quick search of the structures (assigned area) likely to contain survivors. These searches are ground or waterborne operations conducted by walking or navigating watercraft around every structure in the assigned area of operations looking for survivors or deceased victims. Looking into every window/opening, knocking on doors, and hailing for survivors accomplish this. If there are signs of survivors or deceased victims, appropriate action will be taken based on the rules of engagement identified by the local incident commander. Other considerations for primary searches are:

A. A well-established fire ground/incident benchmark and as such, is the stated objective until accomplished.

B. Fast-paced, quick scan of surface debris in and around structures and selected voids.

C. Size and makeup of the search team is incident specific driven and flexible.

D. Detection resources may include physical, canine, and technical.

E. Actions to immediately correct life-threatening injuries may be performed by this team.

2-5. Secondary Search

Secondary search is the systematic search of every room of every structure in the assigned area of operation. Forced entry of structures may need to occur in order to accomplish this objective but will only be done with the authority of the local incident commander. This may involve extensive debris removal of building materials depending on the desired level of coverage and thoroughness. Secondary search can be divided in to two levels of coverage.

A. Low-Coverage Secondary Search

A-1. Systematic search of every room in every structure in the assigned area of operation.

A-2. Systematic search in and around every void space in the assigned area of operation.

A-3. Size and make up of search teams is incident driven and flexible.

A-4. Location/detection resources may include physical, canine, and technical.

B. High-Coverage Secondary Search

B-1. Systematic and thorough search of every room in every structure in the assigned area of operation.

B-2. Systematic and thorough search in and around every void space in the assigned area of operation. This will include complete de-layering and removal of collapsed debris to ensure thoroughness. This may include use of heavy equipment.

B-3. Size and make up of search and extrication teams is incident driven and flexible.

B-4. Location/detection resources may include physical, canine, and technical.

B-5. Upon completion, the search is considered closed.

2-6. Targeted Search

The search of a specific location. A Targeted Search is employed when the IC/AHJ has identified specific sites or conditions that may take priority over others within an assigned region or segment. Subsequent to an event such as a hurricane, emergency managers should be able to identify and prioritize facilities. These locations may be based on critical needs of the jurisdiction (e.g. unanswered 911 requests for help); high occupancy loads (e.g. schools, malls) or due to specific evacuation requirements necessary to limit loss of life for individuals with special needs. These facilities will likely have a significant number of survivors who may not be capable of providing for themselves if the event causes a complete disruption of services. Targeted Searches may be performed to any level of detail (Hasty, Primary, Secondary Low, and Secondary High) per the rules of engagement. Targeted searches can include but are not limited to searches based on:

A. Unanswered 911 calls

B. Health & Wellness Concerns received via third parties

C. Shelter locations

D. High Occupancy locations: Schools, Malls, Office Buildings

E. Critical Infrastructure Facilities

F. Areas of Last Refuge: Fire Stations, Police Stations, etc.

G. Locations of Special Needs Individuals or At Risk Persons: Hospitals, Nursing Homes, Location Lists Maintained by the AHJ

2-7. Detection Team

This team will go into the operational area and use their search resources to DETECT a survivor's location. They will document the location by marking, mapping and proper documentation. They do not have to do redundant checks with another search resource. This team will move rapidly over the assigned operational area. When a detection has been determined the search team manager will then transmit the information to the Task Force Leader (TFL) and have a location team dispatched to the site. The management of this team needs to be flexible.

2-8. Location Team

This team will follow-up the detection team to confirm the location of the survivor. This requires making visual contact or communicating with the survivor. The Rescue Team will then be requested for extrication. Documentation of the survivor needs to be continued. This team will then keep moving forward depending on additional detections. Standard search strategy and tactics will result in the following:

A. Standardized training and increased efficiency of the task force;

B. Reduced potential confusion of responsibilities;

C. Better task force resource use and coordination;

D. Smoother work site engagement and disengagement;

E. Improved confidence in the search operation;

F. Detailed documentation of the incident operations;

G. Increased safety profile for rescue and search personnel; and

H. Fast search = success for survivors.

Table SST-1 and Table SST-2 outline the current tactics available for locating trapped survivors and their corresponding disadvantages and advantages. No single tactic is sufficiently effective on its own to ensure that a complete search has been conducted.

Table SST-1 Disadvantages of Current Search Tactics.	
Tactical Operation	**Disadvantages**
Physical void search	**Limited access to all voids in building. Proximity required is dangerous to search personnel.**
Audible call out/knocking method (rescuer hailing method)	**Unconscious or physically weak person cannot be detected.**
Use of electronic viewing devices	**Extended or inaccessible voids (observation holes) cannot be viewed due to the limited light source. Limited penetration of the equipment.**
Thermal imaging	**Unit cannot detect heat differential through solid mediums. Sources of heat other than persons buried under debris are also indicated which creates confusion.**
Use of electronic listening devices	**Need visual disadvantages – Light illumination is only good out to about 25'.** **Unconscious person cannot be detected. Ambiant site noise is intrusive. Survivor must create a recognizable sound pattern. Range is limited (acoustic - 25 feet, seismic - 75 feet).**
Use of search canine	**Extent of operation is limited; performance may vary according to individual handler and canine capabilities.**

TABLE SST-2: Advantages of Current Search Tactics	
Tactical Operation	**Advantages**
Physical void search	**Does not necessarily require (visual/vocal) specialists, canine, or sophisticated electronic equipment. People could quickly be trained (and supervised by task force personnel) to support the effort. Used for location on survivors.**
Audible call out/knocking method	**Same as above. Personnel can inform survivor of expected response. This procedure can be modified and used in conjunction with listening devices. Can be used during Physical void search. Used for detection of survivors.**
Use of electronic viewing devices	**Provides the general position and condition of the survivor. Can be used to verify other search tactics prior to commencing rescue operations. Can be used to monitor survivor during rescue operations. Used to locate survivors.**
Thermal imaging	**Can be used to survey large, open, dark areas. Used to identify hot spots from fires.**
Use of electronic listening devices	**Able to cover larger search areas and sometimes triangulate on survivor position. Capable of picking up faint noises and vibrations. Used for detection and location.**
Use of search canine	**Can search large areas in short period of time. Can traverse or gain access to voids and other opportunity sources. Used for detection of survivors.**

CHAPTER 3: TACTICAL SEARCH OPERATIONS

The most effective search strategy should blend all viable tactical capabilities into a logical plan of operation. The following general search tactical operations are defined.

3-1. Canine Search

A properly trained search canine can cover large areas in a relatively short period of time. Due to their keen sense of smell, the canine can detect survivors beneath the debris, including persons who are unconscious or incapacitated.

Canine search tactics may involve one or two Canine Search Teams (CST) (handler and canine) and an overhead coordinator who monitors their safety and coordinates the operation. The staffing of the task force search element allows for two separate CSTs. The Search Team Manager may act as the overhead coordinator.

A CST would be deployed at a specific work site or sector area. Each CST would comb the structure or area being searched for any detection of a survivor. The overhead coordinator should sketch the general features of the structure or area being searched. Should a CST have a detection then the overhead coordinator will document and mark the location. This information will then be transmitted to the search manager. Then a location team will be dispatched to the area to confirm the detection and location of the survivor.

3-2. Electronic Search

State-of-the-art electronic listening devices have added a new dimension to the search function. The latest electronic devices can extend the range of the search by detecting acoustical or seismic sounds from the survivors. The task force staffing within the search element provides two technical search specialists. These personnel will usually use the electronic acoustic/seismic listening devices as their primary tool. These positions may also assist with video display devices thermal imaging (if available on site), or other sophisticated equipment as necessary.

Both of the technical search specialists should be deployed early in the mission. Electronic search operations are usually more site-specific and longer in duration than canine search operations. Rescue personnel should assist the technical search specialists and also act in the overhead function to ensure overall safety. In addition, the specialists should sketch the general features of the structure or area being searched noting any significant information.

Application of the acoustic/seismic device involves the deployment of an array of two or more pick-up sensors around the perimeter of a building or void area. Once a survivor detection has been identified, then a location team can set up an array of probes around the area of the original probe giving the strongest indication or where the victim marking is located to more precisely identify the survivor's location.

In the same manner as the redundant canine find determination, a second search resource needs to be used to confirm the initial find. A second Technical Search specialist may be used to provide an indication of a find at the same location, this position should be marked and this information should be passed on to the TFL, or supervisory personnel for action.

3-3. Electronic Viewing Devices

Electronic viewing equipment provides another capability for the search function of the task force. This equipment used in conjunction with concrete coring tools is quite effective at pinpointing the exact location of survivors. Experience has shown success with rescue personnel drilling an array or series of holes and an operator subsequently following along with the search device. This equipment is simple to use once personnel are fully trained in its operation.

Due to its actual visual indication of a survivor, no redundant check is usually required. If the operator is required to move on for subsequent operations, the site should be marked with International Orange spray paint or orange flagging tape to indicate a survivor. The location of the survivor must be mapped, documented, GPS waypoint, and victim marking.

3-4. Physical Search

This includes deploying personnel over and around a collapse site. These personnel can make separate visual assessments in structures, voids, and confined spaces for any indication of survivors. They may also be used in a coordinated fashion as an array of listeners. This operation is less accurate than the others and poses a significant risk to the personnel involved in the operation.

CHAPTER 4: SEARCH STRATEGY

The most effective search strategy should blend all of the identified tactical capabilities into a logical plan of operation. The following is general search strategy.

4-1. Large Scale Search Prioritization

One of the initial determinations that supervisory personnel may have to make at the inception of a mission would be what area should be searched first. There may be many structures damaged that require attention. There are two general strategies that can be used to decide how to deploy task force search resources. An area may be sectored by city block or other easily definable criteria. Available search and rescue resources would be divided and apportioned to each sector for search operations. The sector strategy works well for smaller as well as larger areas. In larger areas one may have to grid out the sector based on Geographical Information Support (GIS).

Another method is to determine the search priorities based on the type of occupancies affected. Those that present the highest likelihood of survivability in terms of type of construction and the number of potential survivors would receive priority. Occupancies such as schools, hospitals, nursing homes, high rise and multi-residential buildings, office buildings, etc., would be searched first. (Refer to the Structure Triage, Assessment, and Marking System Handbook.) This method still will be used in the sectoring method as described above.

4-2. Reconnaissance Team

These actions must be completed in order for the INSARAG teams and the equipment to pass through and be cleared by Customs and Border Protection prior to reporting to the RDC. Liaisons may need to be on-site from CBP, FDA, HHS/ ASPR. Other liaisons may also be need from USDA, DOS and FEMA IAD to facilitate the processing by CBP because these actions cannot be accomplished by RDC personnel.

It may be advantageous for the task force to deploy reconnaissance teams when initiating operations at an assigned location. This team will be made up of 2-4 members. Task force staffing allows for staffing of two recon teams. It may be necessary to deploy a reconnaissance team to a remote location during the course of a mission. They could both be deployed initially when the task force begins operations, if necessary. Initial reconnaissance may have already been done by the AHJ. This does not preclude the task force from doing a secondary hazard assessment.

The recon team will have specific tasks, based on the tasking orders. Search operations should not be delayed until the recon is done. The search detection team should follow right behind the recon team to start the detection of survivors.

A task force reconnaissance team should be staffed as in Table SST-3.

Table SST-3: Reconnaissance Team Staffing	
Search Team Manager (1)	**Functions as recon team supervisor. Ensures that area sketches, and information are documented and communicates details and recommendations back to the TFL.**
Structures Specialist (1)	**Provides analysis and advice regarding building stability, shoring, and stabilization.**
Hazardous Materials Specialist (1)	**Monitors atmospheres in and around voids and confined spaces. Assesses, identifies, and marks hazardous materials dangers.**
Technical Information Specialist	**Provides assistance with documentation for the recon team.**

The TFL may consider adding additional positions, such as a safety officer or rescue team manager, to the reconnaissance team as appropriate.

The reconnaissance teams should perform the following operations:

A. Structural assessment and evaluation

B. Hazard identification and flagging. Any type of personal hazard should be assessed and identified, such as overhanging building components, structural instability, secondary collapse zones, hazardous materials, live utilities, etc. Hazard zones should be conspicuously cordoned off with surveyors tape or Fire Line tape.

C. Assess general atmospheric conditions in/around confined spaces or voids;

D. Sketch the general search area and note all significant issues; and

E. Communicate findings and recommend priorities to the TFL.

4-3. Search Teams

The search team may be divided into two functions. This will facilitate teams to move rapidly through the area in order to triage the operational area for survivors. These teams may be identified as either detection teams or location teams.

4-4. Detection Teams

The staffing of the detection team can be made of up to five positions. The teams staffing is flexible and at any time be made up of any combination of these positions dependent on the incident. Table SST-4 describes detection team staffing.

Table SST-4: Detection Team Staffing	
Search Team Manager (1)	**Functions as search/reconnaissance team supervisor, sketches and records information, and communicates details and recommendations back to the TFL.**
Canine Search Specialists (2)	**Conducts canine search operations for the detection of survivors.**
Technical Search Specialist (1)	**Conducts electronic search operations including acoustic/seismic listening devices and/or electronic viewing equipment.**
Medical Specialist (1)	**Provides medical treatment for located survivors and/or search/reconnaissance team members.**
Rescue Specialists (2)	**Provides assistance for forcible entry, drilling/breaching for electronic viewing equipment and/or deployment of listening arrays. Assists with overhead functions.**

Additional positions can be added dependent on the incident. The detection team should perform the following operations:

A. Detection of survivors using physical, technical or canine resources

B. Documentation of detections

C. Victim markings

D. Site mapping

E. Communicate Detections and make recommendations for the TFL, location and rescue teams

4-5. Location Team

A. The location team staffing will be the same as the detection team (see table SST-4). Additional positions can be added as needed dependent on the incident.

The location team should perform the following:

A-1. Location of survivors using physical, technical, or canine resources

A-2. Continued documentation of survivor(s)

A-3. Victim markings

A-4. Site mapping

A-5. Continued communications and updates with the TFL

A-6. Coordination with rescue teams

B. Specific equipment and materials are necessary to support deployed search teams. This equipment should be segregated and receive priority consideration when a task force cache is being moved to an assigned location. This equipment should be immediately available to deploy one or two Search teams as soon as possible. The following equipment and supplies, as a minimum, are required:

B-1. Coring drills preferably gas operated. Electronic viewing equipment;

B-2. Electronic listening devices;

B-3. Atmospheric monitoring equipment;

B-4. Marking materials (international orange spray paint/surveyors tape, peel and stick placards and fire line tape, etc.);

B-5. Alerting devices (bullhorn for hailing, aerosol horns for emergency signaling);

B-6. Medical gear (physician or paramedic backpack); and

B-7. Personal gear (safety equipment, food, water, etc., for each person).

B-8. Forcible entry tools.

4-6. Site Search Prioritization

The quicker that task forces move into their operational areas the higher the success will be for survivors. In order to accomplish this, recon teams, detection teams, location teams, and rescue teams must work in concert. No longer can we wait for the recon team to complete their operations. We will start with recon and the detection team will be right behind them starting their search operations. Teams must be able to adjust to changing situations that may move them to higher priority buildings as recon may identify. This process is much like mass casualty triage. We must keep moving. As the prioritization of structures in the area becomes clearer then the search operations can then be systematically organized.

In wide area operations (e.g., hurricane, tornadoes, tsunami, etc.) there will be a need to field additional search teams. To accomplish this, rescue teams will be assigned to the search function. Prioritization of resources will be needed in order to put the best resource into the appropriate assignment.

Depending on the incident, search teams may be deployed in several different ways:

A. Deploy a detection team with a location team in staging—single site

B. Deploy two detection teams - this will be used for a blitz attack and for a large operational area.

C. Re-deploy a detection team as a location team - once the detection team has done a primary search and survivors have been detected they would then become a location team. This is done when the other detection Team and/or location team are still engaged.

It may not be necessary to deploy full detection and location teams. Once a specific work area has been determined or assigned, the search tactics should be determined. The canine search can usually provide the most rapid assessment of a work site area. One search canine team

(two canine handlers and one overhead coordinator) can cover a significant area in a short period of time. This capability might be used first to sweep an area for general indications of survivors. A redundant check of a find indication by the other canine team may be used to ensure the greatest degree of credibility of the find. This location should be marked with orange surveyors tape or spray paint, documented and mapped.

The electronic search capability may be used in conjunction with the ongoing canine search or afterward. This may be done in the detection using one but no more than two sensors to detect a survivor. The electronic search will usually be slower and more time consuming. The selection of an electronic search site could result from prior indications of the CSTs or based on the types of construction/occupancies affected, as noted earlier.

Task force rescue personnel present a significant search resource. They should be used to assist the canine and technical search personnel with safety assessments at collapse sites, gaining access to difficult areas, deploying equipment, etc. These personnel could also conduct physical search operations for large areas and or wide area search.

Once a reliable indication of the general location of a survivor is made, the use of the electronic viewing equipment may prove useful in precisely determining the exact location and orientation of the survivor.

CHAPTER 5: GENERAL CONSIDERATIONS

5-1. Search Strategy General Considerations

The combined use of physical, canine, and electronic search tactics will enable the task force supervisors to better establish priorities and focus on the most important rescue activities.

It is essential that every possible search method be employed to enable task force supervisory personnel to locate viable survivors before committing rescue resources to any prolonged operation.

Structural specialists should coordinate with search and rescue personnel during search operations to provide initial assessments of relative building stability and safety.

An important consideration during a mission is the need to reassess previously searched structures. If the profile of a building or structure has been significantly reduced because of debris removal by heavy equipment or secondary collapse, it may be necessary to treat the structure as a new opportunity, and repeat the various search procedures.

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