# Scanner
# Familiarization and Preparatory Training
# Course Part-1

# Introduction

## *Purpose*

Welcome to the Scanner Familiarization and Preparatory Training course! You are now beginning your training to become one of the most valuable resources in Civil Air Patrol Emergency Services. The mission base is established for one reason; so that people like YOU can be sent out into the field to scan for search objects. The scanner's primary responsibility is to maintain constant visual contact with the ground while over the search area. This responsibility makes each scanner a key member of the search aircrew.

Although we are unpaid volunteers, it is our obligation at all times to uphold the highest standards of professionalism. We must demonstrate our KNOWLEDGE, our DEDICATION TO DUTY, our COMPASSION FOR OTHERS and our CONCERN FOR SAFETY in a way that will inspire the confidence of those with whom we work and of those whose needs we serve. If we LOOK like professionals, ACT like professionals, and SPEAK like professionals, we will be REGARDED AS PROFESSIONALS by all with whom we come in contact.

This course sets forth the academic preparation required for the pursuit of the Civil Air Patrol (CAP) Mission Scanner operational specialty rating as set forth in CAPR 60-3.

**Have you ever flown in the back seat of a light aircraft? If not, it is highly recommended that you do so at the earliest opportunity to insure you will feel comfortable in participating in the Scanner specialty.**

## *Prerequisites*

? **Be GES Qualified**

? **Be at least 18 years of age**

? **Have a Unit Commander or authorized designee's signature to attesting that all prerequisites have been completed.**

## *Instructions*

In this course, the subject matter is developed in a series of sections. Each section includes questions to help you review it. The question answers are found at the end of Parts 1 and 2. You will be asked to demonstrate your knowledge of the subjects when you finish the course with a multiple choice closed book test on both parts.

It is recommended that you have a pencil and paper to take notes while you are doing the course. You are encouraged to print out sections and attachments of the course for your personal use. You will need a sectional chart of your local area. It will have to be gridded before you start Advanced Training.

Do not hesitate to ask qualified scanners, observers or mission pilots for help on any area you may not understand. The object is to be knowledgeable about the subjects and not just pass a test!

## *Questions*

1. What are the prerequisites to start Scanner Training?

# Scanning Techniques and Sighting Characteristics

## *Scanning*

Scanning is the process of investigating, examining, or checking by systematic search. In search and rescue operations, the scanner visually searches the search area for distress signals or accident indications by using a systematic eye movement pattern. The observer or pilot manages all scanning aboard the search aircraft by assigning an area of responsibility to each individual scanner when there is more then one scanner aboard. When the search aircraft nears the designated search area, the observer or pilot must ensure that all crewmembers are aware of their respective areas of responsibility. However, if the search object is an aircraft, the visual search begins when the search aircraft leaves its parking space and ends when it is parked.

The scanners job is to concentrate on scanning for the objective within the search area. Anyone can "look," but scanning is more than just looking. Scanning is the skill of seeing by looking in a methodical way, and there are certain techniques that can help you develop this skill. In this section, we will present these techniques. But, more than knowing scanning techniques is required. You need practice at using the techniques so that your ability to scan becomes second nature.

## *Vision*

**Span of Vision**

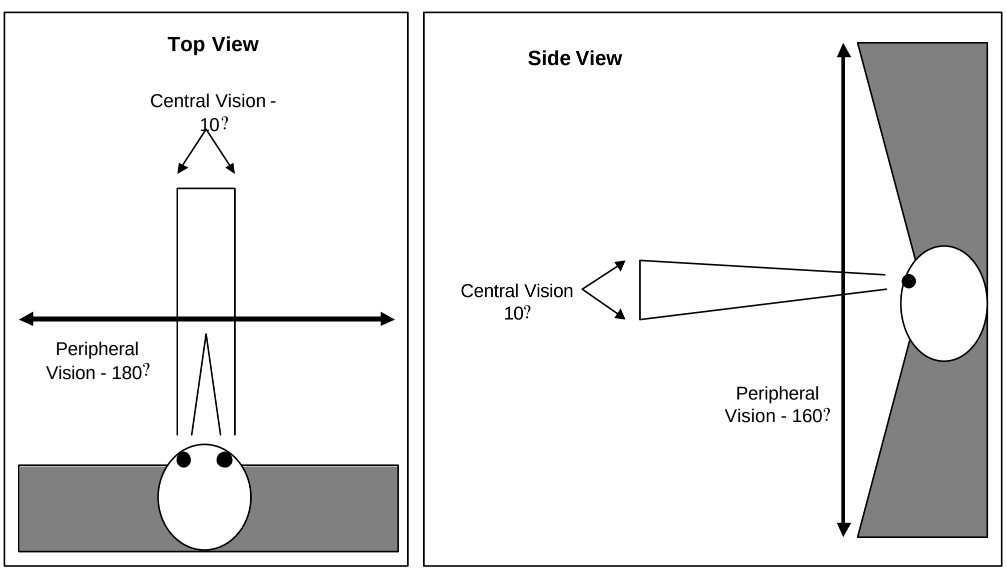



**Figure 1**

The primary tool of the scanner is the eye. Although an eye is a marvelous device, it has some limitation even if it is in perfect physical condition. There also is the problem of interpreting correctly what the eyes convey to the brain.

When a person with normal eyes looks straight ahead at a fixed point, much more than just the point is seen. The brain actively senses and is aware of everything from the point outward to form a circle of about 10 degrees. This is *central vision*, and it is produced by special cells in the fovea portion of the eye's retina. Whatever is outside the central vision circle also is "picked up" by the eyes and conveyed to the brain, but it is not perceived as clearly. This larger area is called *peripheral vision* and cells less sensitive than those in the fovea produce it. An example of this would be a flash of reflected sun light off a shiny surface or a light shining somewhere on a dark night. However, objects within the peripheral vision area can be recognized if mental attention is directed to them. Figure 1 shows the span of human vision.

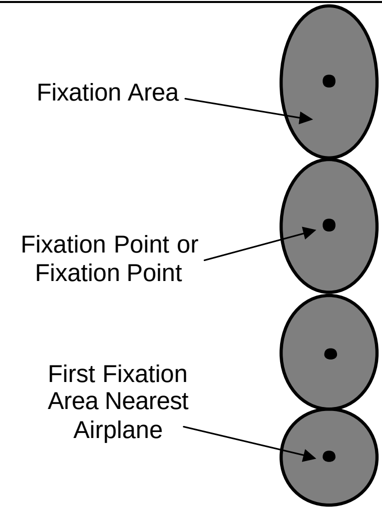


**Figure 2**

Also shown in Figure 1 is the 10-degree central vision circle, what we well call the *fixation area.* Remember, this is the area in which "concentrated looking" takes place. If the search objective happens to come within this fixation area, you probably will recognize it. We say probably because there are other factors which influences whether the objective will be recognized. These factors will be discussed later.

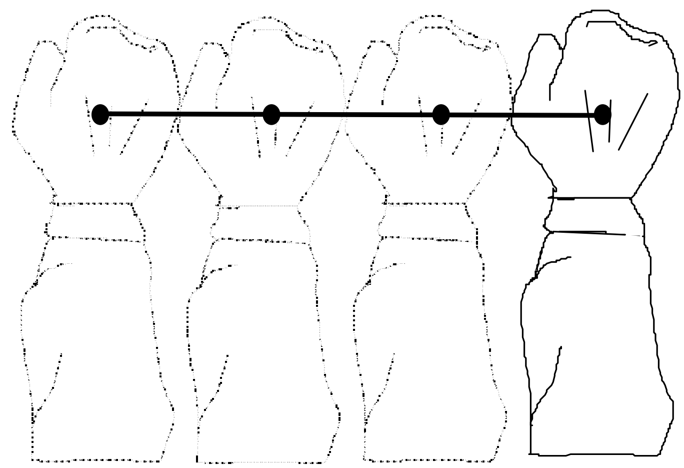


**Figure 3**

"The moving eye does not see". By that statement, we mean that in order to perceive, to be cognizant of, that which the eye is focused on, the eye must remain fixed or unmoved for a short period of time. If this is not allowed to happen, the brain will fill in the gaps in what was seen with, not what was there to be seen, but what was expected to be seen. This is called *apperception*. Read, "I pledge allegiance to the flag of the United State of America, and to the…" . You probably didn't notice that States was misspelled; the final "s" was omitted. If you happened to fixate on that word you would probably have noticed the misspelling but if your eyes just moved over the word, your peripheral vision did not allow you to see the misspelling, your brain merely filled in what you expected to see. .

For central vision to be effective, the eye must be focused properly. This focusing process takes place each time the eyes, or head and eyes, are moved. Let's introduce a reason for scanners to move their heads while scanning. Good central vision requires that the eyes be directed straight to the front. Side looking, in other words, can reduce the effectiveness of central vision. Why? Very simply, the nose gets in the way. Take a moment and focus on an object well to your right, but keep your head straight. Then close your right eye. Notice that your central vision was reduced by one-half, although you did not realize it.

## *Fixation Points and Line of Scan*

When you wish to scan a large area, your eyes must move from one point to another, stopping at each point long enough to focus clearly. Each of these points is a fixation point. When the fixation points are close enough, the central vision areas will touch or overlap slightly. Spacing of fixation points should be 3 or 4 degrees apart to ensure the coverage will be complete (Figure 2). Consciously moving the fixation points along an imaginary straight line produces a band of effective "seeing."

The fist held at arm's length approximates the area of central vision, and you can use this fact to help you practice your scanning technique. Extend your arm at eye level and picture that you are looking through the back of your fist. Look "through" your fist and focus your eyes on the center of the area that would be covered if you were looking at it instead your fist. Now move your fist to the right to a position next to and touching the previous area (refer to Figure 3). Again, look "through" your fist and focus on the center of the fist-sized area on the other side of your fist. If you continue to move your fist along a line, stopping and focusing your eyes on the center of each adjacent fist-sized area, you will have seen effectively all of the objects along and near that line. You will have "scanned" the line.

Repeat this process, but this time establish a starting and stopping points for the line of scan. Pick out an object on the left as the starting point and an object on the right as the stopping point. Start with the object on the left. Extend your arm and look through your fist at that object. As practiced before, continue moving your fist to the next position along an imaginary line between the objects. Remember to stop briefly and focus your eyes. When your eyes reach the object on the right, you will have scanned the distance between the objects.

Follow the same procedure but scan between the two objects without using your fist as a guide. Move your head and eyes to each fixation point as before. Pause just long enough to focus clearly (about 1/3 to ½ second depending on whether your age is under 30 or over 30). When you reach the object on the right you will have *scanned* the line or area between the two objects in a professional manner.

## *Fixation area*

The goal of scanning techniques is to thoroughly cover an assigned search area. Reaching this goal on a single over flight is not possible for a number of reasons. First, the eye's fixation area is a circle and the search area surface (ground) is flat. Coverage of a flat surface with circles requires much overlapping of the circles. More importantly, the movement of the aircraft creates significant areas of uncovered ground. See Figure 4. We will come back to this idea later.

Angular displacement is the angle formed from a point almost directly beneath the airplane outward to the scanning range, or beyond. By this definition, the horizon would be at 90 degrees displacement. Although the fixation area may be a constant 10-degree diameter circle, the effectiveness of sighting the objective decrease with an increase in this angular displacement. Said another way, your ability to see detail will be excellent at a point near the aircraft, but will decrease as the angular displacement increases. At the scanning range, at which the angular displacement may be as much as 45 degrees, the resolution of detail area probably will have shrunk to a 4-degree diameter circle. Said another way, your ability to perceive an object at an angular displacement of 45 degrees has decreased to 40% of what it was directly beneath the aircraft!

### Field of scan

The area, which you will search with your eyes in lines of scan, is called the field of scan. The outer limit of this field is the line that forms the scanning range. See Figure 5 and 6. The inner limit is the lower edge of the aircraft itself. The reason that we always scan from left to right is cultural. By the time you become a scanner, you have practiced the actual scanning procedure, probably, tens of millions of time. Each time you read a line in the morning paper, you are scanning from left to right. It might be interesting to see how scanning is done in a culture were reading was not done horizontally, from left to right.

## *Scanning Range*

We are using the term "scanning range" to describe the distance from an aircraft to an imaginary line parallel to the aircraft's ground track (track over the ground.) This line is the maximum range at which a scanner is considered to have a good chance at sighting the search objective. Scanning range some times may be confused with search visibility range. Search visibility range is that distance at which an object the size of an automobile can be seen and recognized. Aircraft debris, a missing child or an injured hiker may not be as large as an automobile, and they may not be immediately recognizable from the air. Therefore, scanning range is usually shorter than search visibility range, sometimes much shorter.

If your pilot states that the search altitude will be 500 feet above the ground level (AGL), you can expect your scanning range to be 500 to 1,000 feet (Although at a scanning range of 1,000 FT, your ability to perceive the search object could easily have diminished to less that 20% of what is was directly beneath the aircraft). If the search altitude is 1,000 feet AGL, you can expect a scanning range of between 1,000 FT and 1/4 mile. (Again, at ¼ mile you will have suffered a significant degradation of you ability to perceive the search object). There are many variables that affect

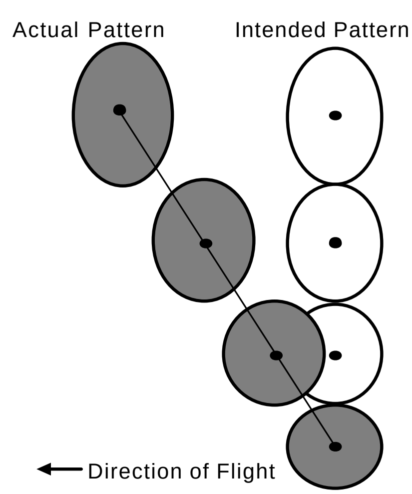


**Figure 4**

both the effective scanning range and your probability of detecting the search objective. These issues are discussed elsewhere in this section.

## Scanning patterns

To cover the field of scan adequately requires that a set pattern of scan lines be used. Research into scanning techniques has shown that there are two basic patterns that provide the best coverage. These are called the *diagonal pattern* and the *vertical pattern.* The diagonal pattern is recommended for the scanner with limited experience; less than 100 hour actual scanning time.

Figure 5 illustrates the way the diagonal pattern is used when sitting in the right rear seat of a small airplane. The first fixation point is slightly forward of the aircraft's position. Subsequent fixation points generally follow the line as indicated in the figure.

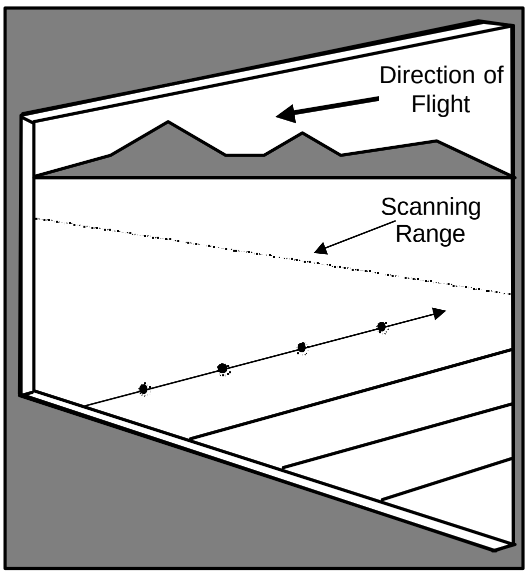



**Figure 5**

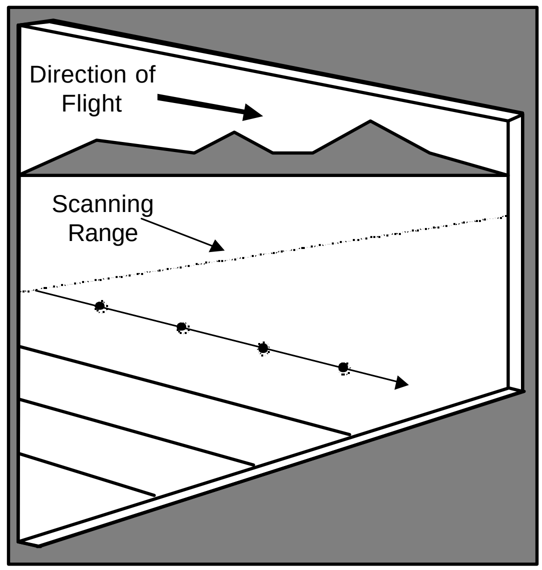



**Figure 6**

When the diagonal scanning pattern is used from the *left* rear window (Figure 6), the direction of scan lines still is from left to right, but each line starts at the scanning range and proceeds toward the airplane. Each scan line on this side terminates at the window's lower edge.

The next scan line should be parallel to the first, and so on. Each succeeding scan line is started as quickly as possible after completing the previous one. Remember, the duration of each fixation point along a scan line is about 1/2 second. How long it takes to complete one scan line depends on the distance at which the scanning range has been established but about 4.5 seconds is the norm. Also, the time required to begin a new scan line has a significant influence on how well the area nearest the airplane is scanned. In other words, more time between starting scan lines means more space between fixation points near the airplane.

In Figure 7 you can see the actual effect of using the diagonal pattern from the right seat of an aircraft at a search altitude of 1,000 Ft and maintaining a search speed of 80 Kts, which is on the slow end of the search speed spectrum. The search range in this example is 1,000 Ft, which means that the angle of displacement is 45 degrees. Note that while the field of scan is about ¾ million square feet, the portion covered by the central vision scan is only about ¼ million square feet or about 1/3 of the area covered! For this example, the single sweep took 4.5 second, which is average for this scanning range.

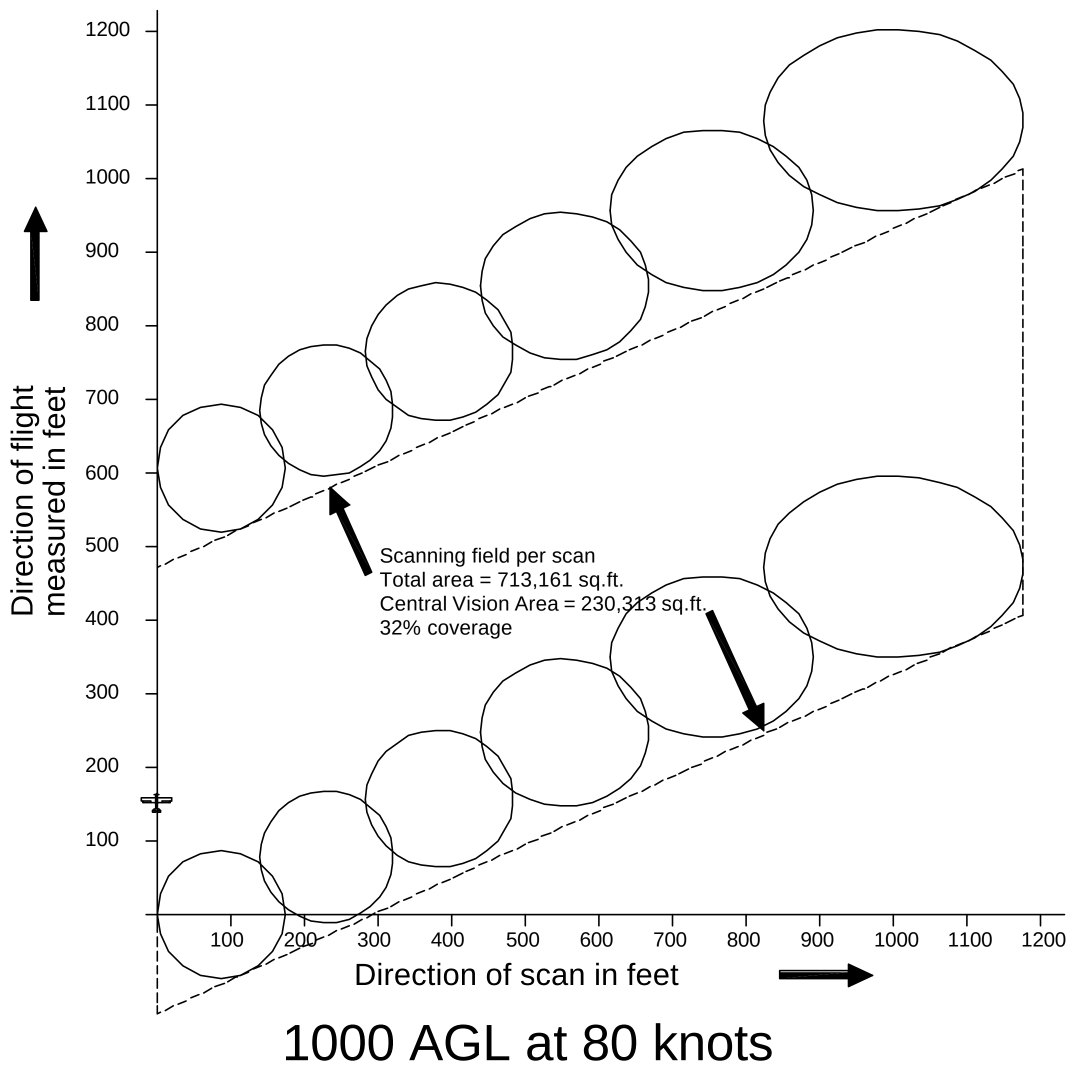



**Figure 7**

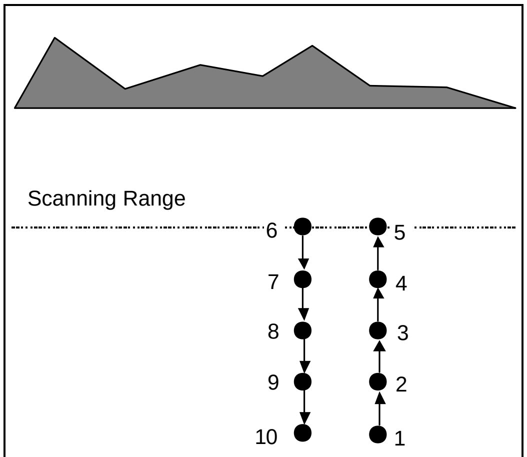



**Figure 8**

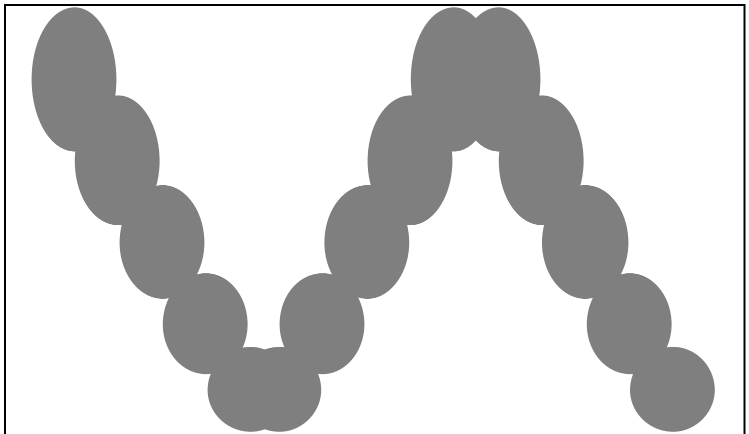


**Figure 9**

The second, and somewhat less effective scanning pattern is illustrated in Figures 8 and 9. The scanner starts the scan at the aircraft and scans to the scanning range and then moves the scan forward and starts the scan back to the aircraft. The real problem with this scanning technique is the fact that there is a lot of area near the aircraft and out near the scanning range that is not covered by the scanners central vision and the scanner's peripheral vision is stretched to the point of being almost totally ineffectual because of its distance from the focal point. When two scanners are on the same side of the aircraft this pattern, used by one scanner and the diagonal pattern by the other scanner, produces good coverage.

Scanners, especially those with considerable experience, may use a system or pattern that is different from the diagonal and vertical patterns discussed above. Many search objectives were found and many lives were saved long before there was an effort to analyze the scanning process and develop recommendations for its improvement. On the other hand, it is possible that Civil Air Patrol's outstanding search and rescue record would have been better had the scanners of times past used a set pattern and used it consistently.

## *Atmospheric and lighting conditions*

During darkness, scanners make fewer fixations in their search patterns than during daylight because victims in distress are likely to use lights, fires, or flares to signal rescuers. Contrast between signal light and surrounding darkness eliminates the need for scanners to concentrate on making numerous eye fixations. Search aircraft interior lighting should be kept to the lowest possible level that still allows normal chart reading. This will help the eyes adjust to the darkness and reduce glare on windshield and window surfaces. Red lights are used when flying at night because that color has little or no affect on the low-light adaptation of the human eye. Remember that red lines on charts will not show up under red light. Regardless of light conditions, a scanner should always maintain a systematic scanning pattern with fixations every few seconds. Darkness merely lengthens the interval between fixations.

### Atmospheric conditions

All aircrews hope for perfect visibility during a SAR mission. Seldom does this atmospheric condition exist. Most of the time the atmosphere (especially the lower atmosphere) contains significant amounts of water vapor, dust, pollen, and other particles. These items block vision according to their density. Of course, the farther we try to see the more particles there are and the more difficult it is to sight the objective.

The urgency of finding a downed aircraft may require flight under marginal conditions of visibility. An example here is flight through very light rain or drizzle. Another example is flight during the summertime when the air is not moving appreciably. It may become virtually saturated with pollutants.

### Position of the sun

Flying "into the sun," soon after it rises in the morning or before it sets in the afternoon, poses visibility problems. No doubt you have had this experience while driving or riding as a passenger in an automobile. Recall how difficult it is to distinguish colors and to detect smaller objects. Also, the contract between the objects in the sunshine and those in the long shadows create a problem of accommodation for your eyes.

Research in search and rescue techniques has determined that the best time to fly search sorties is between mid-morning and mid-afternoon. This is when the sun is about 30 degrees or more above the horizon. When the sun is below this angle, it intensifies visibility problems.

As the sun climbs higher in the sky it helps to relieve visibility problems caused by the presence of particles in the atmosphere. The sun's rays heat the ground and the atmosphere. This heat causes the lower atmosphere to expand. As the atmosphere expands the particles it contains are spread farther apart, decreasing their density within a given volume. Therefore, there are fewer particles between the surface and the scanner's eyes and the effective scanning range is increased slightly.

## Clouds and shadows

Shadows produced by clouds can reduce the effective scanning range. This is due to the high contrast between sunlit area and shadows. Our eyes have difficulty adjusting to such contrasts. The same effect occurs in mountainous areas where bright sunlight causes the hills and mountains to cast dark shadows.

## Terrain and ground cover

If flat, open, dry areas were the only areas to be searched, the scanner's job would be easy. Most aircraft crashes do not happen in such areas; when one does happen, it usually is found quickly without an intensive search effort.

The more intensive search efforts occur over terrain that is either mountainous or covered with dense vegetation, or both. Mountainous area searches demand frequent variation in the scanning range. This you can visualize fairly easily; at one moment the mountain or hill places the surface within, say 200 feet of the aircraft. Upon flying past the mountain or hill the surface suddenly may be a half-mile away.

Forested areas can reduce the effective scanning range dramatically. This is especially true during spring, summer, and fall when foliage is most pronounced. The situation doesn't change for the better in the winter where trees are of the evergreen types-pine, spruce, etc.-because the height of the trees plus their foliage masks the search objective very effectively. Frequently the only way for a scanner to actually spot an objective under such circumstance is to be looking down almost vertically. There are other signs to look for in such areas, but we will discuss them later.

## Surface conditions

Here we are thinking of snow and water, primarily. Even a thin covering of new snow will change the contour, or shape, of a search objective. Also, the light-reflective quality of snow and water affects visual effectiveness. The net result is a need to bring the scanning range nearer to the aircraft.

## Cleanliness of window

This might seem to be a very minor factor. On the other hand, it is estimated that the scanner's visibility can be reduced up to 50 percent if the aircraft window isn't clean. If you discover this to be the case in your aircraft, ask the pilot to please clean the windows. Do not attempt to clean then yourself without the pilot's permission, aircraft windows are made of plastic and they are easily scratched.

## Use of binoculars

Binoculars rapidly bring on eye fatigue when used in an aircraft. They should only be used to check sightings or for short, detailed viewing of an assessment area or search object. Continuous use of binoculars will cause you to become airsick very quickly.

## Condition of the scanner

Your general physical welfare will influence how well you do your job. For example, if you have a cold, sinus trouble or motion sickness, etc, you may feel so bad you cannot concentrate on scanning. In effect, this reduces your personal effective scanning range to "zero." Only you can determine your fitness to fly and do the job expected of you. You will be more highly regarded if you know your own limits.

# Visual clues

## Sighting Characteristics

If you have not had much experience at "looking down" while flying, there are some surprises in store for you. Objects appear quite different when they are seen from above and at a greater distance than usual. Even if you are very familiar with the territory as seen from the surface, scanning it from the air will reveal features and objects you had no idea were there.

Experience is the best teacher, and you will soon be able to evaluate what you see from the air. To help with your development of this ability, we will present some visual clues, what you might expect in aircraft wreckage patterns, signals which survivors might be expected to use, and some false clues that are common to selected areas. **However, anything that appears to be out of the ordinary should be investigated thoroughly.**

## Typical Visual Clues

Anything that appears to be out of the ordinary should be considered a clue to the location of the search objective. In addition to this piece of advice, the following are specific clues for which scanners should be looking:

*Light colored or shiny objects* - Virtually all aircraft have white or other light colors as part of their paint schemes. Some aircraft have polished aluminum surfaces that provide contrast with the usual ground surface features. Also, bright sunlight will "flash" from aluminum surfaces. Aircraft windshields and windows, like aluminum, have a reflective quality about them. Water (creeks, small ponds, etc.) and polished rocks can also cause a “flash”. If the angle of the sun is just right, you will pick up momentary flashes with either your central or peripheral vision. A flash from any angle deserves further investigation.

*Smoke and fire* - Sometimes aircraft catch fire when they crash. If conditions are right, the burning airplane may cause forest or grass fires. Survivors of a crash may build a fire to warm themselves or to signal search aircraft. Campers, hunters, and fishermen build fires for their purposes, but no matter what the origin or purpose of smoke and fire, each case should be investigated.

*Blackened areas* - Fire causes blackened areas. You may have to check many such areas, but finding the search objective will make the effort worthwhile.

*Broken tree branches* - If an airplane goes down in a heavily wooded area, it will break tree branches and perhaps trees. The extent of this breakage will depend on the angle at which the trees were struck. The primary clue for the scanner, however, will be color. As you no doubt realize, the interior of a tree trunk or branch and the undersides of many types of leaves are light in color. This contrast between the light color and the darker foliage serves as a good clue.

*Local discoloration of foliage* - Here we are talking about dead or dying leaves and needles of evergreen trees. A crash that is several days old may have discolored a small area in the forest canopy. This discoloration could be the result of either a small fire or broken tree branches.

*Fresh bare earth* - An aircraft striking the ground at any angle will disturb or "plow" the earth to some degree. An over flight within a day or so of the event should provide a clue for scanners. Because of its moisture content, fresh bare earth has a different color and texture than the surrounding, undisturbed earth.

*Breaks in cultivated field patterns* - Crop farmlands always display a pattern of some type, especially during the growing season. Any disruption of such a pattern should be investigated. A crop such as corn could mask the presence of small aircraft wreckage. Yet the pattern made by the crashing airplane will stand out as a break in uniformity.

*Water and snow* - Water and snow are not visual clues, but they often contain such clues. For example, when an aircraft goes down in water its fuel and probably some oil will rise to the water's surface making an "oil slick" discoloration. Other material in the aircraft may also discolor the water or float as debris. If the aircraft hasn't been under the water very long, air bubbles will disturb the surface. Snow readily shows clues. Any discoloration caused by fire, fuel or debris will be very evident. On the other hand, do not expect easy-to-see clues if snow has fallen since the aircraft was reported missing.

*Tracks and signals* - Any line of apparent human tracks through snow, grass, or sand should be regarded as possibly those of survivors. Such tracks may belong to hunters, but it pays to follow them until the individual is found or you are satisfied with their termination-at a road, for example. If you do find the originator of such tracks and the person is a survivor, no doubt he will try to signal. More than likely this signal will be a frantic waving of arms.

*Birds and animals* - Scavenger birds (such as vultures and crows), wolves, and bears may gather at or near a crash site. Vultures (or Buzzards) sense the critical condition of an injured person and gather nearby to await the person's death. If you see these birds or animals in a group, search the area thoroughly.

*False clues* - In addition to the false clues of campfires and other purposely set fires, there are others of which you should be aware; oil slicks may have been caused by spillage from ships. All aircraft parts may not have been removed from other crash sites. Some of the aircraft parts may have been marked (with a yellow "X"), but you may not be able to see the mark until near the site because the paint has faded or worn off with age. In certain parts of the country, you will encounter many false clues where you would not ordinarily expect to see them. These false clues are discarded refrigerators, stoves, vehicles and pieces of other metal, such as tin roofing. What makes these false clues unique is that they are in areas far from towns and cities.

*Survivors and Signals* - If there are survivors and if they are capable of doing so, they will attempt to signal you. The type of signal the survivors use will depend on how much they know about the process and what type signaling devices are available to them. Some signaling techniques that survivors might use will be covered in Part 2.

*Nighttime signals* - For various reasons, nighttime searches are very infrequent. If you are requested to scan for a nighttime sortie, your job will be easy. Flights will be at 3,000 AGL, or higher, and you will not need to use the scanning patterns discussed earlier. Light signals of some type will be the only clue to the search objective location.

? A fire or perhaps a flashlight will be the survivor's means of signaling. On the other hand, a light signal need not be very bright; one survivor used the flint spark of his cigarette lighter as a signal. His signal was seen and he was rescued.

## *Wreckage patterns*

Frequently, there are signs near a crash sight that the aircrew can use to locate the actual wreckage. The environment plays a major role in sighting the signs from the search aircraft. In crashes at sea, searchers may be unable to locate the crash site as rough seas can scatter wreckage or signs quickly. On land, the wreckage may be in dense foliage, which can obscure it in a matter of days. By knowing signs to look for, the scanner can improve the effectiveness of each sortie. In general, don't expect to find anything that resembles an aircraft; most wrecks look like hastily discarded trash. However, certain patterns do result from the manner in which the accident occurred. These patterns are described as:

### Hole in the ground

This pattern is caused from steep dives into the ground or from flying straight into steep hillsides or canyon walls. Wreckage is confined to a small circular area around a deep, high-walled, narrow crater. The structure may be completely demolished with parts of the wings and empennage near the edge of the crater. Vertical dives into heavily wooded terrain will sometimes cause very little damage to the surrounding foliage, and sometimes only a day or two is needed for the foliage to repair itself. Some wreckage from flying into a canyon wall may have slid down to the base of the wall.

### Cork screw or auger

This pattern is caused from uncontrolled spins. Wreckage is considerably broken in a small area. There are curved ground scars around a shallow crater. One wing is more heavily damaged and the fuselage is broken in several places with the tail forward in the direction of the spin. In wooded areas, damage to branches and foliage is considerable, but is confined to a small area.

### Creaming or smear

This pattern is caused from low-level "buzzing", or "flat hatting" from instrument flight, or attempted crash landing. The wreckage distribution is long and narrow with heavier components farthest away from the initial point of impact. The tail and wings remain fairly intact and sheared off close to the point of impact. With power on or a windmilling propeller, there is a short series of prop bites in the ground. Ground looping sometimes terminates the wreckage pattern with a sharp hook and may reverse the position of some wreckage components. Skipping is also quite common in open, flat terrain. In wooded areas, damage to the trees is considerable at the point of impact, but the wreckage travels among the trees beneath the foliage for a greater distance and may not be visible from the air.

### Four Winds

This pattern is caused from mid-air collisions, explosion, or in-flight break up, like flying into a thunderstorm. Wreckage components are broken up and scattered over a wide area along the flight path. The impact areas are small but chances of sighting them are increased by the large number of them. Extensive ground search is required to locate all components.

### Hedge-trimming

An aircraft striking a high mountain ridge or obstruction but continuing on for a considerable distance before crashing causes this pattern. Trees on the ridge or the obstruction are slightly damaged, or the ground on the crest is lightly scarred. Some wreckage components may be dislodged: usually landing gear, external fuel tanks, cockpit canopy, or control surfaces. The direction of flight from the "hedge-trimming" will aid in further search for the main scene.

### Splash

Most aircraft sink very rapidly, even after a controlled ditching. Where an aircraft has gone down into water; oil slicks, foam, and small bits of floating debris are apparent for a few hours after the impact. With time, the foam dissipates, the oil slicks spread and streak, and the debris become widely separated due to action of wind and currents. Sometimes emergency life rafts are ejected but, unless manned by survivors, will drift very rapidly with the wind.

## *Directing the Pilot*

The "clock position" system is used to describe the relative positions of everything outside the airplane. The system considers the clock positions to be on a horizontal plane that is centered within the cockpit. Any object above or below this plane is either "high" or "low." Straight ahead is 12 o'clock, behind is 6 o'clock (Figure 10).

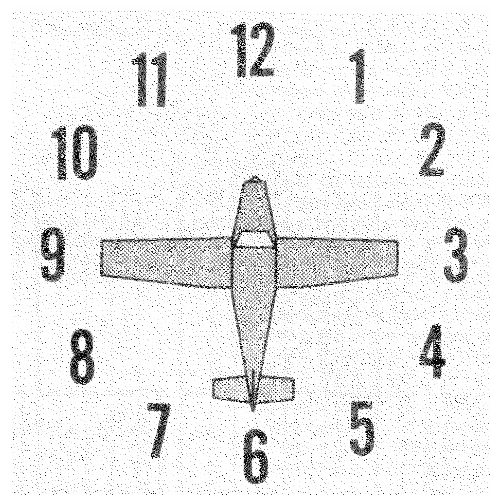


**Figure 10**

If you were sitting in the right rear seat of the airplane you probably would be able to see ahead to the one o'clock position and to the rear to the 5 o'clock position. From the left rear seat, of course, these would be 11 o'clock to 7 o'clock.

The clock positions are especially helpful in designating the location of other aircraft within your area of the airspace. Your pilot needs to see all other airplanes in the area to can keep clear of them. If you see another airplane, notify the pilot immediately. The high and low designations are also appropriate if the other airplane is considerably higher or lower than your altitude. For example, an airplane that is directly ahead but above your altitude should be called out as, "aircraft twelve o'clock high."

Let's say you see a flash of light from the right rear, somewhere near the four o'clock position. You call out "possible search object at four o'clock." Keep your eyes on the search object area. The pilot starts an immediate medium-bank turn to the right or left as terrain permits. The pilot knows the four o'clock position but his concept and your concept of this position may not be exactly the same. It looks as if the pilot might swing past your four o'clock. Don't let it happen! Say something like "straight ahead and level." Or "stop turn." Or "wings level." The pilot will get the idea.

Start describing the search object area while the pilot is turning. Pick out a large easily identifiable point and talk the pilot down to the search object using smaller identifiable points. For example; see the dirt road bridge over the creek, go up the creek to the first bend to the right, above the bend is a group of trees, the search object is at the base of the trees.

The pilot will descend to a lower altitude. At this lower altitude identification may be possible. If the clue turns out to be the search objective, mission base will be notified by radio. Your search aircrew will try to remain in the area to direct ground teams to the site. If the clue is not the search objective, your pilot will return to the search track.

## *Recording the Search Object Location*

When your aircrew team bcates a search objective, the scanner's duties change. Locate the search object on your chart using ground features, GPS coordinates or other electronic information. Now you need to make a quick sketch of the search object area. The sketch will be needed for debriefing and may be what a ground team uses to find the search object if you land before it leaves the base. Start your sketch, using true north as the reference, at a point easily found on the ground; e.g. an intersection of the dirt road with the nearest paved road intersection. This portion of the sketch does not have to be too detailed as long as it is clear where the ground team should be going. Indicate identifiable points that should be found on their route. Draw in the road bridge you used to direct the pilot. From this point, draw a sketch showing the creek and trees in proper position with one another. Use your chart/map to help with this so your sketch will look like a chart the ground team can use. Estimate the distance, using your chart/map, from a town or major intersection to the paved road, to the bridge and then to the search object. Indicate on the sketch the estimated distances, normally in statute miles and tenths of miles. Include distances between the identifiable points along the route. You can see that the sketch can be very easy if the search object is located near a point easily found from the ground but may require a lot of thinking and work if it is out in the boonies.


**Figure 11**


**Figure 12**

The above chart (Figure 11) and map (Figure 12) sections show the search object location as a red dot. The LA Sectional chart on the left does not show much detail on what you are seeing on the ground. It is good for emphasizing the terrain and would be the easiest to plot, or extract, latitude and longitude coordinates from. The AAA County map on the right not only gives better detail, but ground team members may have the same map. It also shows mileage between points for your estimates and has highway numbers or names for identification. You would only need a sketch of the immediate search object area from the creek when you have the AAA or similar map to mark the search object on. You can see that a map of the search object area similar to the AAA map should be carried by you. It will simplify and ease your work.

You cannot bury your head while doing the sketch because the scanner now needs to keep a sharp lookout for other aircraft. The pilot will be very busy flying the airplane at low level and the pilot or the observer will be communicating with other mission units. The preoccupation of the pilot and observer, plus the tendency of other aircraft to congregate at a crash site, often leaves the responsibility for keeping clear of other aircraft to the scanner.

The scanner's job of looking and seeking is not over until the aircraft is parked at mission base even if the search objective is found. There could be another unknown crash to be found.

## *Questions*

1. Name the six aircraft wreckage patterns.
2. What is the fixation point and how long is the usual duration of it for SAR purposes?
3. When the sun is shining, it is important to investigate every flash of sunlight because a survivor may be using what type of signaling device?
4. Even at a very low search speed, how much of the field of scan is covered by the scanners central vision?
5. Any object off of the left wing of the aircraft is at the __________ o'clock position.
6. The distance an object the size of an automobile can be seen and recognized is called _____________.
7. List, in any order, the ten visual clues that help find a search objective.
8. In degrees of arc, what is the diameter of the circle formed by central vision?
9. Position of the sun, and clouds and shadows are examples of variables affecting _______________.
10. What should you be doing while the pilot is turning towards the search object you spotted?
11. What is the effect of aircraft motion on the surface coverage pattern?
12. Where ______________vision enable us to recognize objects immediately, _____________vision requires mental concentration to recognize even large objects.
13. Is a sectional chart the only chart/map of the search area you need to carry?
14. The maximum range at which a scanner is considered to have a good chance at seeing the search object is called the __________________.
15. What is the scanner's main duty after the search object has been located?
16. What does the scanner do from start taxi to parking?

# Search Coverage

This section will cover search factors that are unique to SAR/DR mission planning. All crewmembers are expected to understand the planning concepts and the "language" of search and rescue.

*Maximum Area of Possibility* - This normally circular area is centered at the missing airplane or search objective's last known position, corrected for the effect of wind. The circle's radius represents the maximum distance a missing aircraft might have flown based on estimated fuel endurance time and corrected for the effects of the wind over that same amount of time. The radius may also represent the maximum distance survivors might have traveled on foot, corrected for environmental or topographical conditions, such as snow, wind, mountains, and rivers.

*Probability Area* - This is a smaller area within the maximum possibility area, where there is an increased likelihood of locating the objective aircraft or survivor. Distress signals, sightings, radar track data, and the flight plan are typical factors that help define the probability area's boundaries.

*Search Altitude* - This is the altitude that the search aircraft flies above the ground (AGL). [Remember, routine flight planning and execution deals in MSL, the altitude above mean sea level.

*Search visibility* – This is the distance at which an object the size of an automobile can be seen and *recognized.*

*Probability of Detection* - The likelihood, expressed in a percent, that a search airplane might locate the objective. Probability of detection (POD) can be affected by weather, terrain, vegetation, skill of the search crew, and numerous other factors.

## *Search Priorities*

When faced with a lack of vital information concerning the missing aircraft, the planner can either give the entire probability area search priority or select a portion of the probability area for a concentrated search. Some of the factors used in estimating the location of the missing aircraft within a portion of the probability area are:

- Areas of thunderstorm activity, severe turbulence, icing and frontal conditions that might have been encountered.
- Areas where low clouds or poor visibility may have been encountered.
- Deviations in wind velocities from those forecast by the weather bureau.
- Areas of high ground.
- Any part of the aircraft's track that is not covered by radar.

## Search Area Determination

The first task in planning a search and rescue mission is to establish the most probable position of the crash site or survivors. If witnesses or other sources provide reliable information concerning an accident, the location may be established without difficulty. If there is little or no information, the planner faces a more difficult task.

## Probability areas

Plotting the probability area is the next factor in search planning. The probability area is determined by:

- The aircraft disappearance point on radar.
- The bearing or fix provided by other ground stations.
- Dead reckoning position based on the time.
- Emergency locator transmitter (ELT) reports.

There are instances where the above information is not available. To establish a probable position in these instances, the planner must rely on less specific secondary sources of information including:

- The aircrafts flight plan.
- Weather information along the intended route or track.
- Proximity of airfields along route.
- Aircraft performance.
- Pilot's previous flying record.
- Radar coverage along the intended track.
- Nature of terrain along the intended track.
- Position and ground reports.

Based on experience and simulation provided by these factors, the planner is able to define an area of highest priority to initiate the search.

Organization is an important element in search planning. The time it takes to locate downed aircraft or survivors could depend on the definition and charting of the search area. As a crewmember, you should become familiar with each designated search area before the mission is launched.

# *Probability of detection*

You can easily determine a probability of detection (POD) by gathering the data affecting the search and by using a POD chart to calculate the detection probability. The type of terrain, ground foliage, altitude of the search aircraft, track spacing, and search visibility are vital factors in determining a POD. Once each of these factors is given a description or numerical value, the POD can be determined by comparing the search data with the POD chart data. The following discussion is based on this example search situation:

> A Cessna 182, white with red striping along the fuselage and tail, was reported missing in an area northeast of Bishop. The last known position (LKP) of the airplane was 40 miles northeast of Bishop. Geological survey maps indicate that the probability area is very mountainous and has dense or heavy tree cover. Current visibility in the area is greater then 10 miles. A search for the airplane and its three occupants is launched using 1000 feet AGL for the search altitude and a track spacing of .5 miles and the estimated search visibility is 3 miles.

By referring to the POD chart, Figure 13, you will note that there is approximately a 30% chance of locating the missing aircraft during a single search. Locate the numbers in the column describing heavy tree cover and very hilly terrain that coincide with the search data mentioned above.

**SINGLE SEARCH PROBABILLTY OF DETECTION (POD) CHART**

| OPEN FLAT TERRAIN | | | | | MODERATE TREE COVER AND/OR HILLY | | | | | HEAVY TREE COVER AND/OR VERY HILLY | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SEARCH ALTTITUDE (AGL) | SEARCH VISIBILITY | | | | SEARCH ALTTITUDE (AGL) | SEARCH VISIBILITY | | | | SEARCH ALTTITUDE (AGL) | SEARCH VISIBILITY | | | |
| Track Spacing | 1 mi | 2 mi | 3 mi | 4 mi | Track Spacing | 1 mi | 2 mi | 3 mi | 4 mi | Track Spacing | 1 mi | 2 mi | 3 mi | 4 mi |
| 500 FT | | | | | 500 FT | | | | | 500 FT | | | | |
| .5 mi | 35% | 60% | 75% | 75% | .5 mi | 20% | 35% | 50% | 50% | .5 mi | 10% | 20% | 30% | 30% |
| 1.0 | 20 | 35 | 50 | 50 | 1.0 | 10 | 20 | 30 | 30 | 1.0 | 5 | 10 | 15 | 15 |
| 1.5 | 15 | 25 | 35 | 40 | 1.5 | 1 | 15 | 20 | 20 | 1.5 | 5 | 5 | 10 | 10 |
| 2.0 | 10 | 20 | 30 | 30 | 2.0 | 5 | 10 | 15 | 15 | 2.0 | 5 | 5 | 10 | 10 |
| 700 FT. | | | | | 700 FT. | | | | | 700 FT. | | | | |
| .5 mi | 40% | 60% | 75% | 80% | .5 mi | 20% | 35% | 50% | 55% | .5 mi | 10% | 20% | 30% | 35% |
| 1.0 | 20 | 35 | 50 | 55 | 1.0 | 10 | 20 | 30 | 35 | 1.0 | 5 | 10 | 15 | 20 |
| 1.5 | 15 | 25 | 40 | 40 | 1.5 | 10 | 15 | 20 | 25 | 1.5 | 5 | 5 | 10 | 15 |
| 2.0 | 10 | 20 | 30 | 35 | 2.0 | 5 | 10 | 15 | 20 | 2.0 | 5 | 5 | 10 | 10 |
| 1000 FT. | | | | | 1000 FT. | | | | | 1000 FT. | | | | |
| .5 mi | 40% | 65% | 80% | 85% | .5 mi | 25% | 40% | 55% | 60% | .5 mi | 15% | 20% | 30% | 35% |
| 1.0 | 25 | 40 | 55 | 60 | 1.0 | 15 | 20 | 30 | 35 | 1.0 | 5 | 10 | 15 | 20 |
| 1.5 | 15 | 30 | 40 | 45 | 1.5 | 10 | 15 | 20 | 25 | 1.5 | 5 | 10 | 10 | 15 |
| 2.0 | 15 | 20 | 30 | 35 | 2.0 | 5 | 10 | 15 | 20 | 2.0 | 5 | 5 | 10 | 10 |

**Figure 13**

## *Questions*

1. The distance at which an object can be seen and recognized at the height the search aircraft is flying is______________.
2. The__________________ is the geographic area where there is an increased likelihood of locating the missing aircraft.
3. You are to search for an aircraft while flying over open, flat terrain. At an altitude of 500 feet, your track spacing will be two miles with a search visibility of three miles. What is the POD for a single search?
4. A POD of 50% is desired for a single search. The search area has moderate tree cover with a search visibility of four miles. The search altitude will be 300 feet. What should the track spacing be?
5. ___________________ is the distance the scanner is expected to see the search object. It is usually less then the search visibility.

# Visual Search Patterns and Procedures

Almost all search and rescue missions are concluded by visual searches of the most probable areas once good information has been received from electronic searches, SARSATs, or other sources. To help you become familiar with the names of the various visual search patterns, the following are presented with a brief description of those commonly used by CAP. The “S” in the patterns refers to track spacing.

## *Track crawl (route) search*

The track line (route) search pattern, in Figure 14, is used when an aircraft has disappeared without a trace. This search pattern is based on the assumption that the missing aircraft has crashed or made a forced landing on or near its intended track (route). It is assumed that detection may be aided by survivor signals or by electronic means. The track line pattern is also used for night searches (in suitable weather).

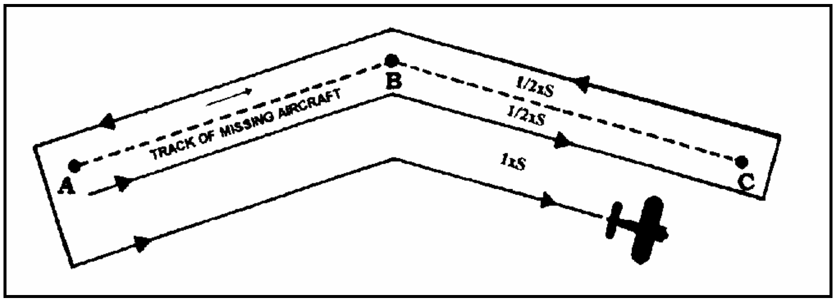



**Figure 14**

## *Parallel track or parallel sweep*

This pattern, Figure 15, is normally used when one or more of the following conditions exist: the search area is large and fairly flat, only the approximate location of the target is known, and uniform coverage is desired. The aircraft proceeds to a corner of the search area and flies at the assigned altitude, sweeping the area maintaining parallel tracks.

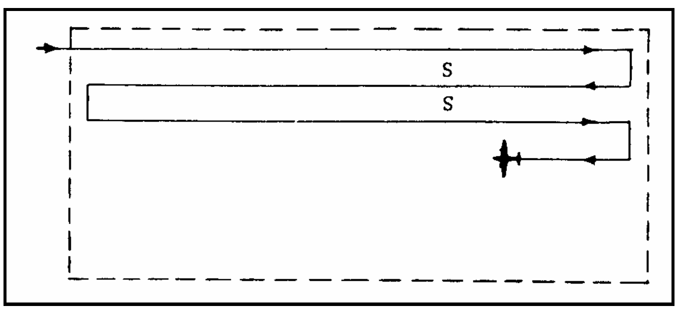



**Figure 15**

## *Creeping line search*

This search pattern, Figure 16, is similar to the parallel patterns search area. It is used in valleys when other search patterns would be less effective.

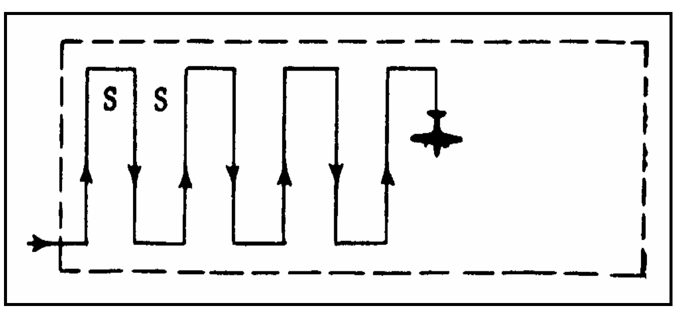



**Figure 16**

## *Expanding square search*

The expanding square search pattern, Figure 17, is used when the search area is small (normally, areas less than 20 miles square), and the position of the survivors is known within close limits. This pattern begins at an initially reported position and expands outward in concentric squares.

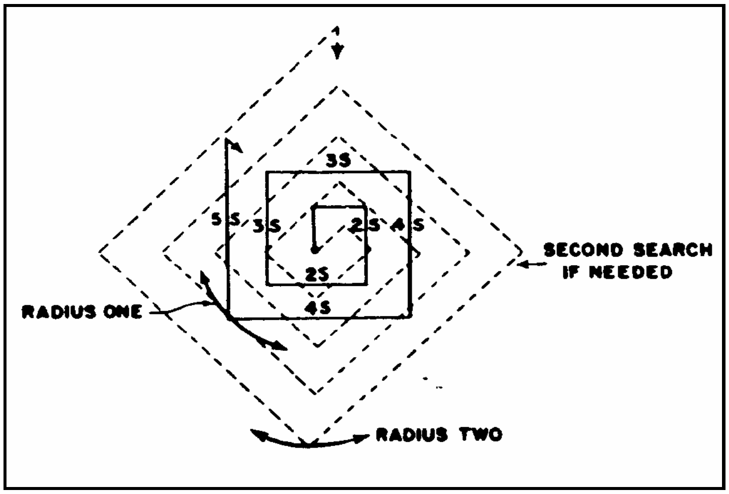



**Figure 17**

## *Sector search*

The sector search, Figure 18, is another visual search pattern that can be used after the approximate location of the target is known. The aircraft will fly over the suspected location and out far enough to make a turn, fly a leg that is equal to the maximum track spacing, then turn back to fly over the point again.

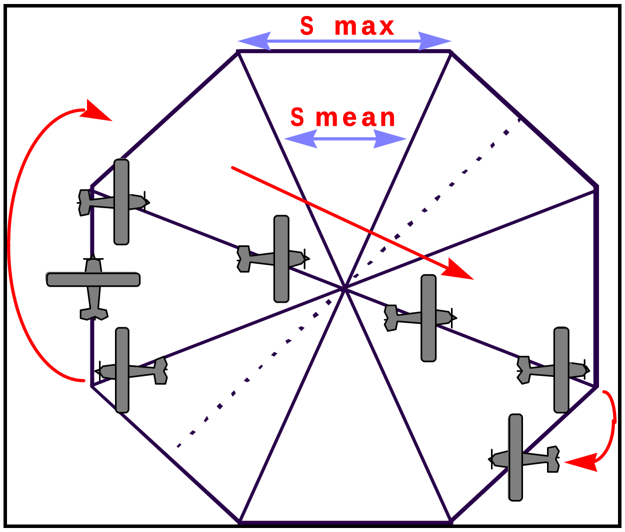



**Figure 18**

## *Contour search*

The contour search pattern, Figure 19, is best adapted to searches over mountainous or hilly terrain. When using this pattern, the aircraft pilot initiates the search at the highest peak over the terrain. The pilot flies the aircraft around the highest peak "tucked in" closely to the mountainside. As each contour circuit is completed, the pilot lowers the search altitude, usually by 300 to 500 feet.

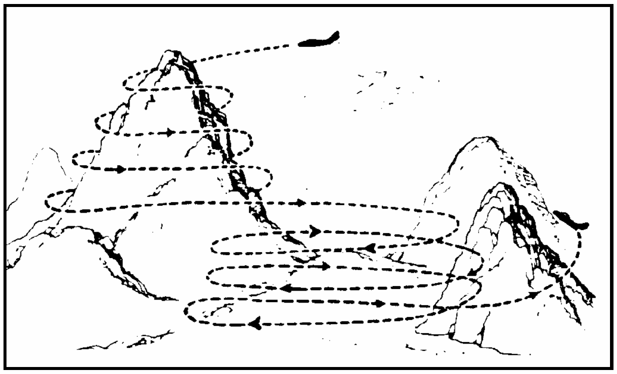


**Figure 19**

## *Questions*

1. What are the conditions that determine when the creeping line search will be used?
2. What search pattern is most frequently used when an aircraft has disappeared without a trace?
3. An expanding square search is planned when what two conditions are met?

# Aircrew Responsibilities

## *Aircrew Responsibilities*

The scanner's primary responsibility is to maintain constant visual contact with the ground while going to and from, and over the search area.

The observer, on the other hand, has expanded duties and usually sits in the right front seat. In addition to the primary duty of scanning, the observer helps with navigation, communication, and documentation

The pilot, first and foremost, is responsible for the safety of the crew and the aircraft. Acting as the Pilot-in-Command or aircraft command he/she must also navigate precisely in order to execute mission procedures and flight patterns so that the scanners have the best possible chance to achieve mission objectives.

## *Scanner Responsibilities*

### Before Leaving Home

Are you experiencing any of the "**IM SAFE**" criteria (CAPR 60-1, Attachment 12)? You should consider not reporting for duty if you are. Your effectiveness may be degraded and a search target missed! "**IM SAFE**" is an acronym for:

- ***Illness.*** Even a minor illness suffered in day-to-day living can seriously degrade performance of many tasks vital to safe effective flight. The safest rule is not to fly while suffering from any illness. If this rule is considered too stringent for a particular illness, the pilot should contact an Aviation Medical Examiner for advice.
- ***Medication.*** Aircrew performance can be seriously degraded by both prescribed and over-the-counter medications, as well as by the medical conditions for which they are taken. Federal regulations prohibit pilots from performing crewmember duties while using any medication that affects the faculties in any way contrary to safety.
- ***Stress.*** Stress from everyday living can impair performance, often in very subtle ways. Stress and fatigue (lack of adequate rest) can be an extremely hazardous combination.
- ***Alcohol.*** Extensive research has provided a number of facts about hazards of alcohol consumption and flying. As little as one ounce of liquor, one bottle of beer or four ounces of wine can impair flying skills.

- ***Fatigue.*** Fatigue and lack of adequate sleep continue to be some of the most treacherous hazards to flight safety, as it may not be apparent to a crewmember until serious errors are made.
- ***Emotion.*** The emotions of anger, depression, and anxiety may lead to taking risks that border on self-destruction.

### Clothing

You must have suitable clothing for the flight and the terrain you will be flying over. The approved CAP flight uniform for aircrews on SAR/DR missions is per CAPR 39-1. Appropriate civilian clothes may be required on counter drug missions. Clothes and uniforms must be clean and neat at all times. Remember that we represent the Air Force and that the public will judge our professionalism according to the appearance we present.

- A Nomex flight suit shall be worn unless directed otherwise.
- Boots must be worn with the flight suit. The boots must be black leather, laced, above the ankle, with low heels and round toes. It is recommended that boots be worn on all flights.
- For SAFETY, caps should NOT be worn on or near the flight line. They could be blown off and you could run into a spinning propeller trying to catch them.
- Gloves are another optional item that may be worn for comfort and safety. Nomex or leather gloves are approved for fire protection.

Whatever the clothing specified for the mission, it must meet the needs of the worst climate and terrain conditions you may encounter if the plane had an emergency off field landing. The temperature may be 90 degrees at the base and 20 degrees on the ground in the grid area. Wearing layered clothing is also handy when the aircraft's heater is not working well or at all.

For maximum fire protection, there should be no exposed skin or other clothing when the Nomex flight suit is worn. The Nomex sleeves should be fully rolled downs with the gloves pulled up and over the wrists. The suit should fit over the boots.

### Equipment

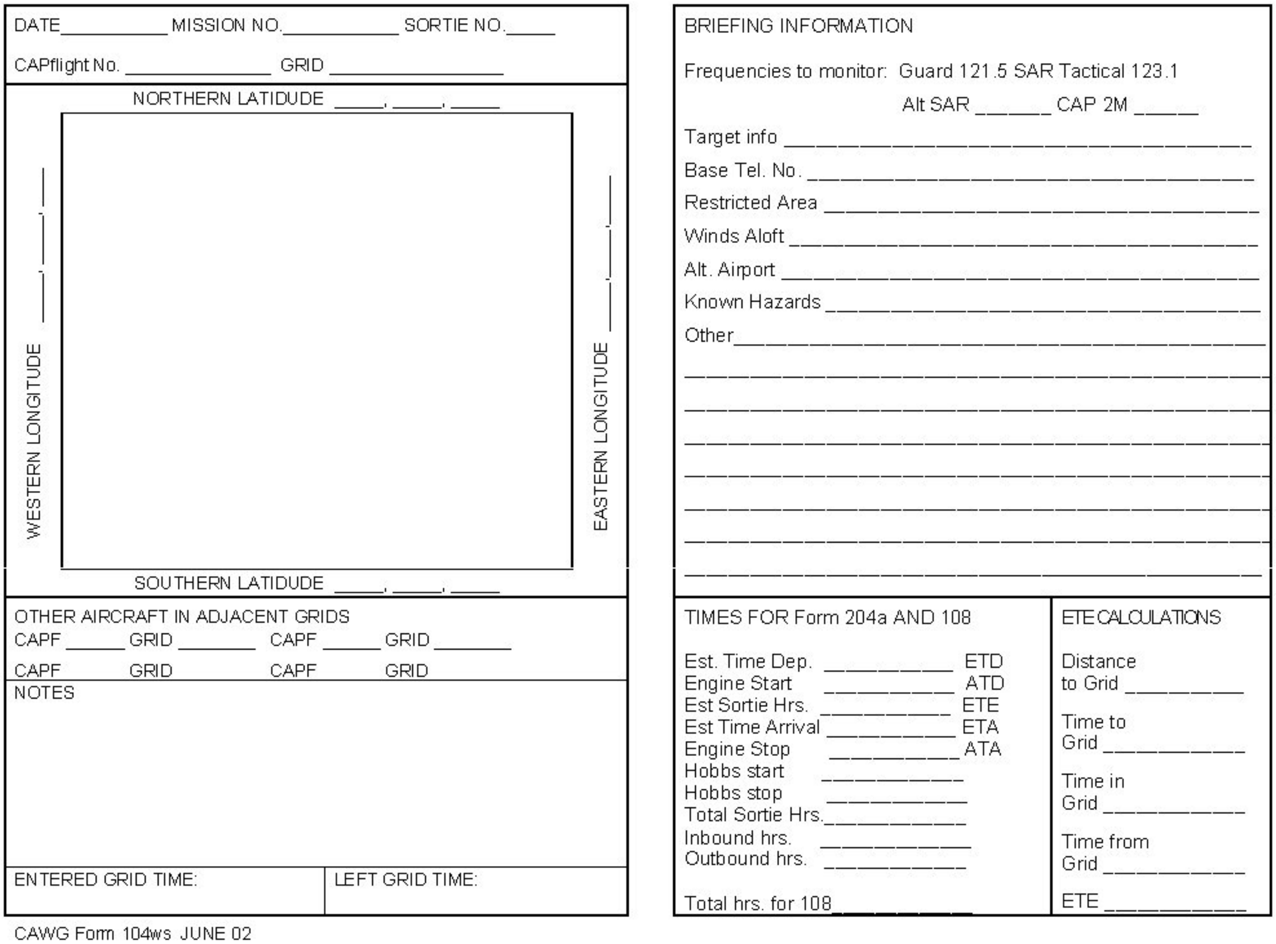
The following equipment is suggested.

- Personal items such as regular glasses and sunglasses, medication, money including change for vending machines, credit card, snacks, water, airsickness bag(s), extra clothes and a kit for remaining over night (RON).
- Documentation such as your current CAP membership card and CAPF 101 or CAPFT101 Specialty Qualification card. It is a good idea to carry all CAP cards you posses.
- Specialty items such as charts and maps of the mission area, pen/pencil(s), note pad/paper, survival kit (Refer to Section 3), headset (?), binoculars (?) and a flashlight with extra batteries for night missions.

## At the Mission Base

### Arrival

Once you arrive at the base make sure you are ready to fly a sortie the minute you walk through the base door. Sign in yourself and vehicle, if applicable. Then help the mission pilot (if you came with one) to fill out the CAWG ICS 104a and get it turned into the operations area. If you need a crew to fly with, inform the Air Operations Officer and then start looking yourself for a crew to fly with. While you are awaiting to be assigned a task or to a crew start filling out your CAWG 104ws (Aircrew Worksheet, Figure 20)



DATE__________ MISSION NO.___________ SORTIE NO._____

CAPflight No. ______________ GRID ________________

NORTHERN LATIDUDE _____, _____, _____

WESTERN LONGITUDE ____, ____, ____

EASTERN LONGITUDE ____, ____, ____

SOUTHERN LATIDUDE _____, _____, _____

OTHER AIRCRAFT IN ADJACENT GRIDS

CAPF ______ GRID ________ CAPF ______ GRID ________

CAPF ______ GRID ________ CAPF ______ GRID ________

NOTES

ENTERED GRID TIME: LEFT GRID TIME:

BRIEFING INFORMATION

Frequencies to monitor: Guard 121.5 SAR Tactical 123.1

Alt SAR ______ CAP 2M _____

Target info ____________________________________

Base Tel. No. ____________________________________

Restricted Area ____________________________________

Winds Aloft ____________________________________

Alt. Airport ____________________________________

Known Hazards ____________________________________

Other____________________________________

TIMES FOR Form 204a AND 108

Est. Time Dep. ___________ ETD

Engine Start ___________ ATD

Est Sortie Hrs. ___________ ETE

Est Time Arrival ___________ ETA

Engine Stop ___________ ATA

Hobbs start ___________

Hobbs stop ___________

Total Sortie Hrs.___________

Inbound hrs. ___________

Outbound hrs. ___________

Total hrs. for 108 ___________

ETE CALCULATIONS

Distance to Grid __________

Time to Grid ___________

Time in Grid ___________

Time from Grid ___________

ETE ___________

CAWG Form 104ws JUNE 02

**Figure 20**

**Media and Family**

You will frequently encounter radio, television and newspaper reporters on a search base. Many times family members and friends of the missing people will also be present on search base. Remember that these people, as well as personnel from other agencies assisting in the search, will be watching you. Therefore, it is ESSENTIAL that you maintain the highest standards of PROFESSIONALISM in your APPEARANCE, your ACTIONS, and your SPEECH. You must NOT converse with or give any information to reporters, family members or friends, or other non-CAP bystanders. **ONLY** the Incident Commander and Public Affairs Officer are authorized to release information about the search. Tactfully refer all questions to them.

## Mission Sortie Briefing

This briefing will include areas to be covered, type of mission, latest weather, altitudes, search patterns, communications frequencies and procedures, actions to be taken, hazards to operations, length of flight, and other information considered pertinent. Copy this information for your reference.

## Aircrew Briefing

Prior to each flight, the pilot-in-command will conduct an aircrew briefing. This briefing will include specific information concerning how to use the seat belts and shoulder harnesses, the no smoking policy, emergency exits, the order of emergency egress, and taxi and in-flight emergency procedures. Duties for each crewmember during the start up, taxi, takeoff, and transit phases of the flight will be assigned. The pilot should inform you when the **"sterile cockpit"** rule will be in effect. A “sterile cockpit” refers to crewmembers keeping talk in the cockpit to a minimum for safety.

Especially around the airport, the pilot is talking or listening continuously to radio transmissions from different ground controllers. A missed radio transmission, because you were talking on the intercom at the same time, could lead to an accident. Similarly, unnecessary talking while on the low level search could lead to missing the search objective. Whenever you are about to talk on the intercom, keep it short and relevant. **Think of what you are going to say and how to say it before opening your mouth, listen before you talk!** The "sterile cockpit" concept helps remove distractions and keep everyone focused on the important things.

Ideally, the crew will receive their search area assignment prior to the Sortie Briefing. They then can complete their Aircrew Briefing before they go to the Sortie Briefing. At the conclusion of the Sortie Briefing, the aircrew can then proceed directly to the aircraft after a quick stop at a restroom.

## During the Sortie

At engine start, the pilot and observer share duties in setting up the communications and navigation equipment. ***The sterile cockpit rules begin at this time; all unnecessary talk is suspended and collision avoidance becomes the priority of each crewmember.***

Once the aircraft has taxied to the departure point, the pre-takeoff checks are completed and the pilot reviews the takeoff and departure assignments with the crew. If the search object is a missing aircraft, the scanner should be checking the ramp for the aircraft. ***The sterile cockpit rules are still in force; all unnecessary talk is suspended and looking for traffic and obstacles becomes the priority of each crewmember.***

Once clear of the airport/controlled airspace the crew settles into the transit phase. Depending on circumstances, the sterile cockpit rules are normally suspended at this time. The scanner should be looking for the search object from takeoff to touchdown.

When the aircraft enters its search area, the observer primary duty becomes scanning. The observer also makes the necessary reports to mission base or the communication relay aircraft (high bird).

During the actual search or assessment, the aircrew must be completely honest with each other concerning their own condition and other factors affecting search effectiveness. If you missed something, or think you saw something, say so. If you have a question, ask.

You should monitor yourself for fatigue and take breaks as necessary. You should drink water, whether it is a hot day or not. Flying will dehydrate you. During turbulence, relax your body and let it move with the aircraft. Keeping cool and having a flow of fresh air will lessen the probability of airsickness. During maneuvers, keep your head still and your eyes looking in the direction of the maneuver. The worse thing you can do is moving your head in the opposite direction of the maneuver. This is because your inner ear is inducing the motion sickness. If you must throw up, do it into an airsick bag or other personal item. If you continuously get sick in an aircraft, you may want to consider another Emergency Service specialty.

On return, at an appropriate distance from the mission base, ***the sterile cockpit rules begin; all unnecessary talk is suspended and looking for traffic and obstacles becomes the priority of each crewmember.***

Upon landing, each crewmember resumes taxi duties at this time and continues until the aircraft is parked and the engine is shut down. ***The sterile cockpit rules are still in force; all unnecessary talk is suspended and collision avoidance becomes the priority of each crewmember.***

Once the aircraft is properly secured, the aircrew should remove any trash from the aircraft and get the aircraft ready for the next sortie. The pilot will arrange for refueling. These should be done in a minimum of time.

All crewmembers shall ***proceed together directly*** to the Debriefing Officer. The debriefing is the reason you flew the search mission. Your information is of no value until it is entered into the overall data picture for the search object.

## Aircrew Debriefing

During the Aircrew Briefing, everything that is known about the mission was passed along to the aircrew. In the debriefing, the reverse is true. Each aircrew tells how it did its job and what it saw. This type of information is given in detail and is in the form of answers to specific Sortie Debriefing questions, asked by the debriefer. The information is then passed on to the planning section for analysis, and the information may then be passed on, in turn, to departing search crews. Debriefing results are provided to the operations staff and incident commander, periodically or whenever significant items are evident. At the end of each operational period, the Incident

Commander and staff will review the debriefing forms to develop the complete search picture, compute POD, and determine priorities and make plans for the next operational period.

An aircrew cannot search and have "negative results". Even if the objective is not located, important information can be obtained, such as weather, turbulence, ground cover, and false clues.

***Did you make any changes to the planned search procedure?*** The debriefer primary concern is to determine adequate search coverage. If, for example, you diverted frequently to examine clues, there is a good possibility that search coverage was not adequate and that another sorties is justified.

***What types of clues did you investigate?*** Perhaps a clue seemed to be insignificant and you decided not to pursue it. Describe any clues that were investigated and found to be false. This information becomes part of the briefing for other aircrews because it can keep them from pursuing the same false clues.

***Leads?*** What if you saw something and were unable to confirm that it was not the target you were looking for. This is called a Lead and is handled as a priority by the base staff. Ask the Debriefing Officer for a Lead sheet (CAWG 22h) and fill this form out before the debriefing.

Finally, the reverse side of the CAWGF 204a is blank for you to make additional comments or insert drawings, sketches and other supporting information. If you attach your CAWGF 104WS, a drawing or other information to the CAWGF 204a, indicate that fact by writing something like "drawing attached" in this space. Be sure to label the attachment so it can be related to the CAWGF 204a if they accidentally became separated (e.g., mission and sortie number).

When the debriefer is satisfied that pertinent information has been discussed and explained, you will be dismissed. Now what should you do? Obviously, you will need rest. If you are scheduled for another sortie, find someplace to rest. Close your eyes; you may even want to take a nap if there is time and a place to do so. Also, take in some light refreshments to give you sufficient energy for the next sortie but don't eat a heavy meal. A heavy meal may make you sleepy during the next sortie and add to your discomfort in turbulence.

## *Departure from the Mission Base*

Make certain you have all your equipment and a receipt, if applicable, for all borrowed equipment you have returned. Sign out yourself and vehicle, if applicable.

## *Arriving Home*

Keep your personal log current on the mission number, number of flights completed and number of hours flown. Also, keep a detailed log of all deductible tax expenses such as lodging, food, mileage, etc.

Finally, you should brief your squadron on the lessons learned from the mission at the next opportunity. This provides valuable information to your fellow aircrew members and is an excellent opportunity to get in some quality "hanger talk" comparing experiences.

## *Questions*

1. What does a "sterile cockpit" refers to?
2. What is the scanner's primary responsibility?
3. What must you remember to do when departing the mission base?
4. After securing the aircraft and arranging for refueling, the entire aircrew should proceed directly to the _______________?
5. The "IM SAFE" criteria consist of what six items?
6. Arriving at the mission base, you should immediately ___________.
7. You should think of what and how you are going to say something before you use the ___________?
8. What two items of clothing must you have to fly a mission sortie?

**AT THIS POINT DOWN LOAD PART 2.**

# Part 1 Question Answers

## Introduction

1. Be GES qualified, at least 18 years of age, and have a Unit Commander or authorized designee's signature attesting that all prerequisites have been completed.

## Scanning Techniques and Sighting Characteristics

1. Hole in the ground, corkscrew or auger, creaming or smear, four winds, and hedge-trimming.
2. An imaginary point along an imaginary line where movement of the eyes is stopped in order to focus the eyes on a clearly. About 1/3 second to 1/2 second.
3. A mirror.
4. About 1/3.
5. 9 o'clock.
6. Search visibility.
7. Light colored/shiny objects, smoke and fire, blackened areas, broken tree branches, local discoloration of foliage, fresh bare earth, breaks in cultivated field patterns, discolorations in water and snow, tracks and signals, and gatherings of birds and animals.
8. Ten degrees.
9. Scanning range.
10. Describing the search object area to him. Talking him to it from an easily recognizable point.
11. It distorts the pattern causing areas to be missed.
12. Central; peripheral.
13. No. A smaller scale chart/map showing more details of the search area should also be carried.
14. Scanning range.
15. Looking out for other aircraft
16. Look for the search object.

## Search Coverage

1. Search visibility
2. Probability area
3. 30%
4. One-half mile
5. Scanning range

## Visual Search Patterns and Procedures

1. The search area is narrow, long and fairly level, like a valley.
2. The track line (route) search.
3. When the search area is small and position of the target is known within close limit

## Aircrew Responsibilities

1. Keeping talk in the cockpit to a minimum necessary for safety.
2. To maintain constant visual contact with the ground while going to and from, and over the search area looking for the search object..
3. Sign you and your vehicle out.
4. Debriefing Officer.
5. Illness, medication, stress, alcohol, fatigue, and emotion.
6. Sign-in.
7. Intercom.
8. A Nomex flight suit and black leather boots.