

The background of the slide features the official seal of the Civil Air Patrol. It is a circular emblem with a gold border. The outer ring contains the text "UNITED STATES AIR FORCE AUXILIARY" at the top and "CIVIL AIR PATROL" at the bottom, separated by small stars. In the center of the seal is a shield with a blue field and a red and white design. Above the shield is a golden eagle with its wings spread, perched on a globe. The main title "Mountain Flying Qualification Course" is overlaid in large, bold, dark blue letters across the center of the seal.

# **Mountain Flying Qualification Course**

**Civil Air Patrol**

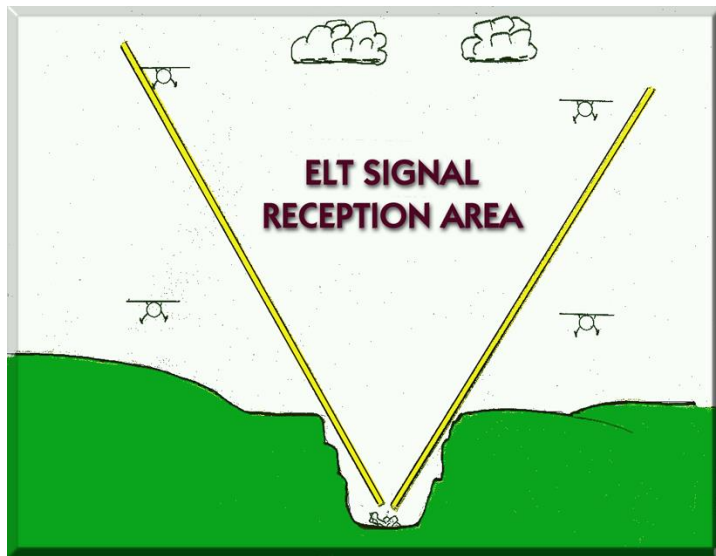
**Auxiliary of the United States Air Force**



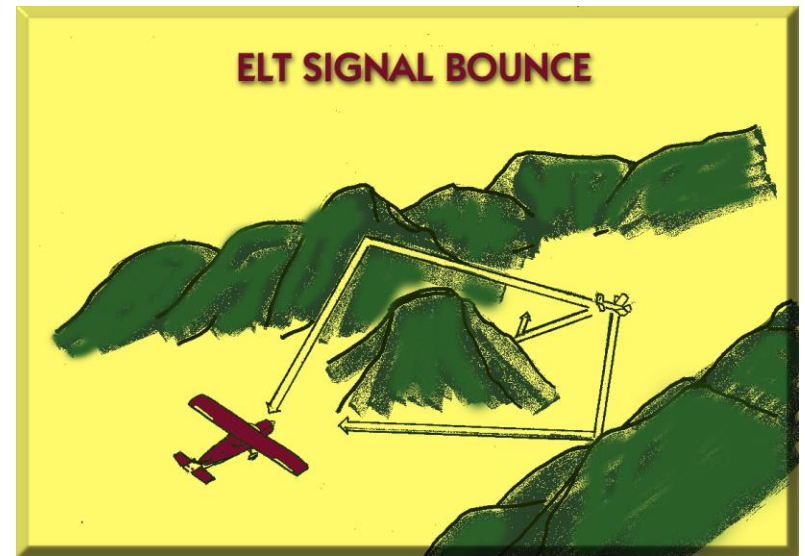
# **Mountain Searching**

# ELT Searches

- Conduct search at highest practical altitude to increase chance of detecting ELT located in valley
- Fly straight line along suspected route. If no detection, fly 7-mile offsets.
- Fly expanding circle over high-probability area.
- If deep canyons in area, fly over each one to prevent missing a vertically propagating signal.
- Signals may only be detectable at certain times. Weak batteries may only transmit when warmed by sun.

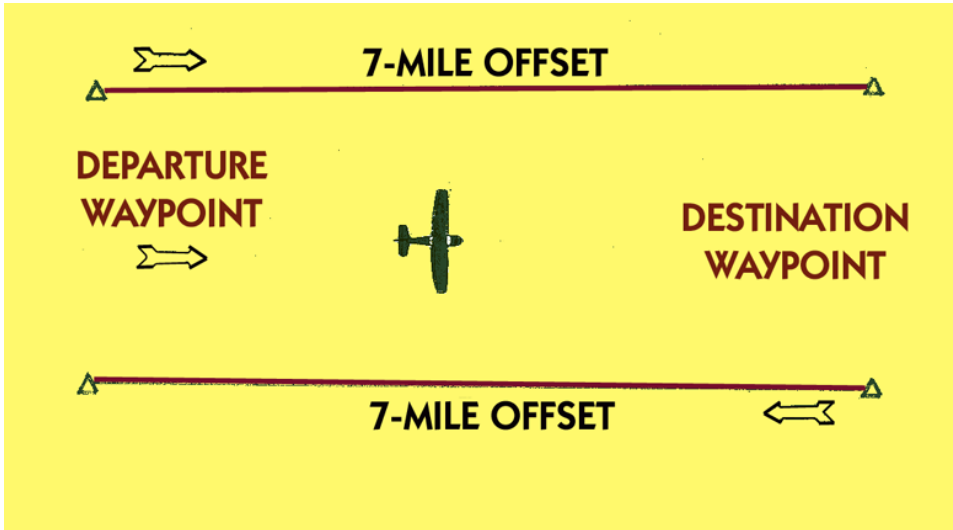


Sufficient Altitude Prevents Blocked Signal

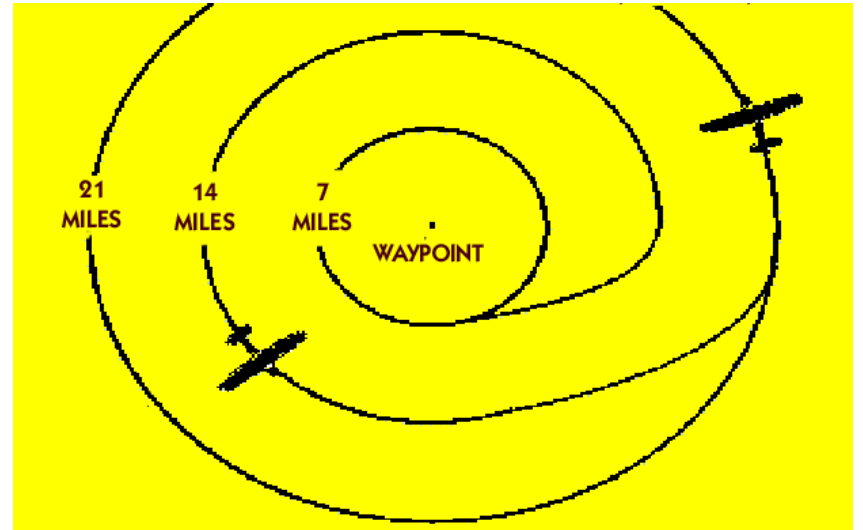


ELT Signal Bounce in Mountainous Terrain

# ELT Searches



Route Search: 9,000 to 11,000 MSL



Expanding Circle: 9,000 to 11,000 MSL

# Grid Navigation

- Identify grid area utilizing GPS, VOR radial, visual confirmation of terrain features.
- Use GPS and/or autopilot to remain within grid.
- Monitor location within grid.
- Assess weather and winds in the search area.
- Evaluate terrain features and topography within grid to determine best search method.
- Plan & brief crews on search method.
- Record searched areas on chart or hand drawing.

# Search Strategies

- Ascertain areas of high probability
  - Natural pathways through the terrain. Aircraft often follow valleys and fly through passes particularly when low ceilings were present.
  - False canyons and gradually rising terrain especially if the pilot was unfamiliar with the terrain.
  - Areas of cloud cover or thunderstorm activity.
  - First ridge on a direct route between origin and destination.
- Consider focusing on these areas before conducting an exhaustive contour search.

# Pilot Responsibilities

- Plan and clear the flight path.
- Assure proper terrain clearance.
- Maintain constant altitude.
- Maintain optimal airspeed (about 80 knots).
- Put observers in best position to scan terrain.
- Keep track of areas searched.
- Identify areas remaining to be searched.
- Monitor aircraft systems and performance.



Crash in a corn field





- East face of 10-mile-long mountain ridge with north/south orientation
- Mountain tops 6,500 feet
- Valley 2,000 feet
- 14 crashes have occurred on this east face ... mostly due to severe downdrafts from westerly winds



- Crash site in center
- Mountain top 6,684 feet
- Crash at 6,500 feet
- 43-knot winds
- Bellanca Viking
- Radar showed aircraft descending during approach to the ridge



- Crash site in center of picture.
- Almost impossible to see from air.
- Aircraft cut a swath through the trees.
- Note fallen & broken trees with rock outcroppings interfere with the search scan.

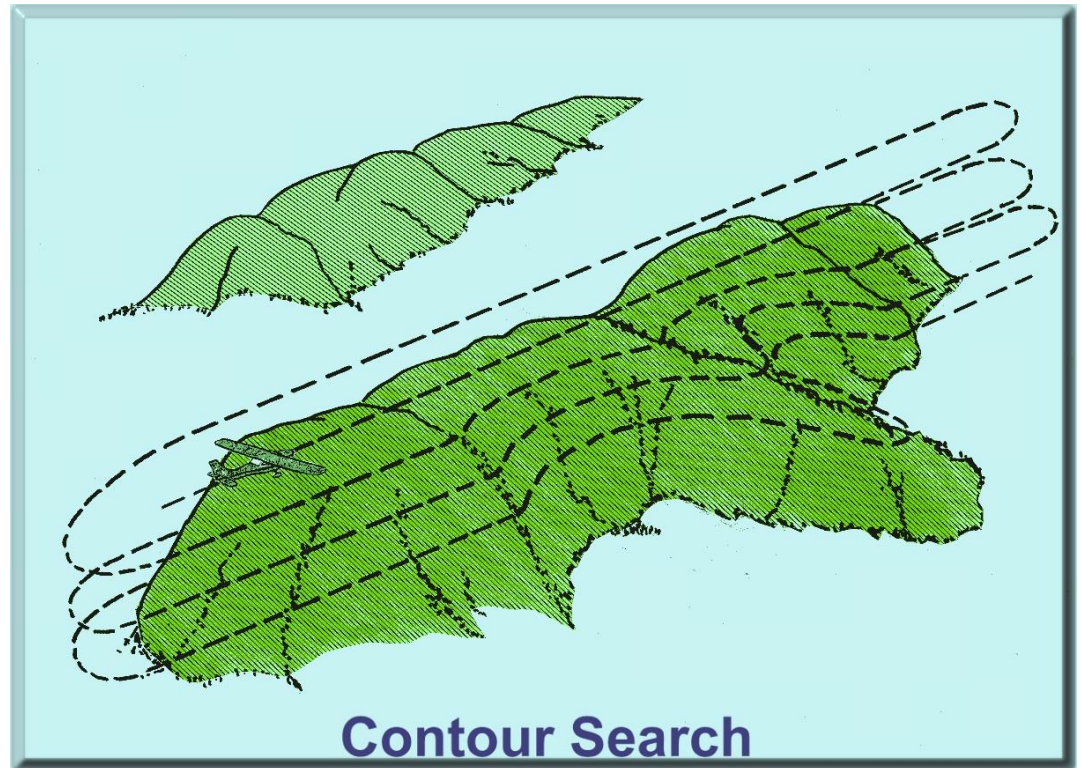
- Same crash as left photo, but taken from the ground looking back through the path the aircraft traveled.
- May be searching as much for broken and sheared trees as for an actual aircraft.





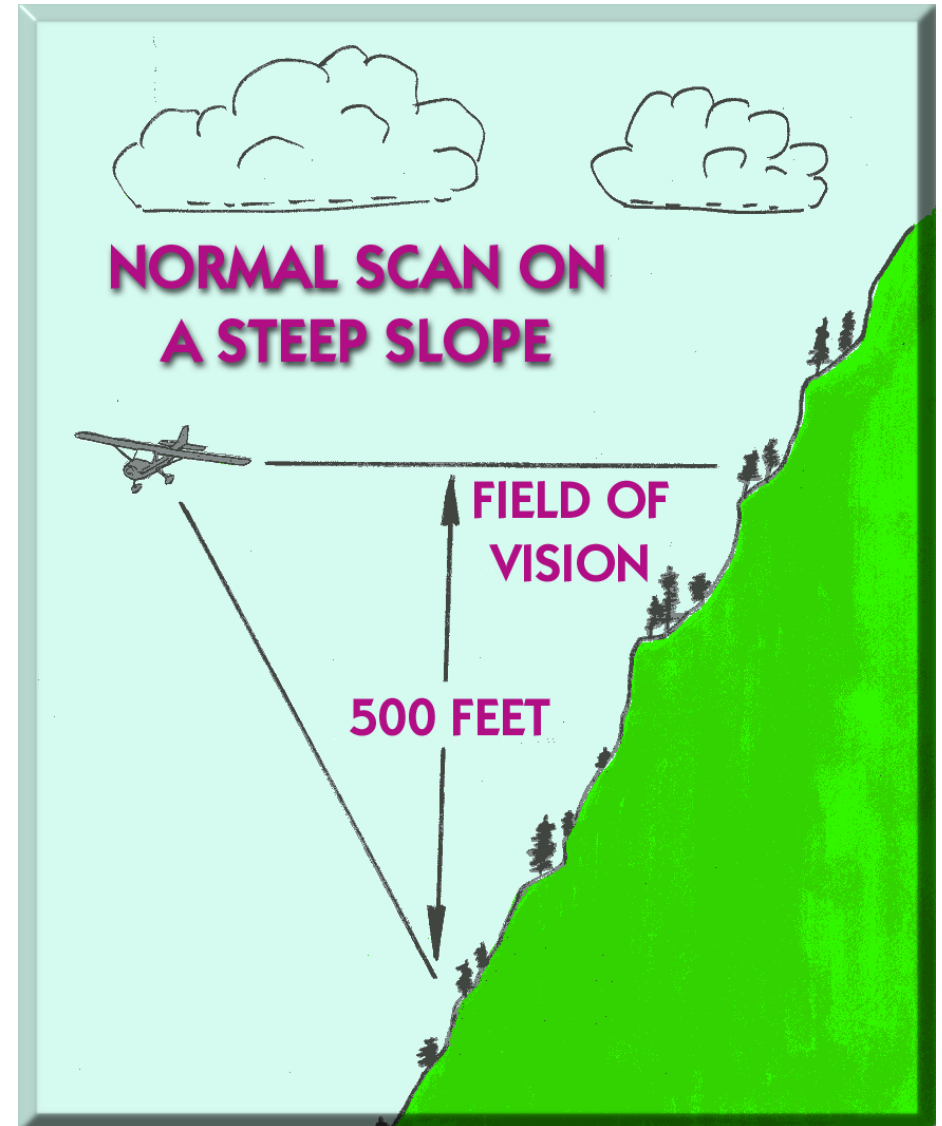
# Contour Searching

- Use contour search techniques in mountainous terrain other than canyons and steep valleys.
- Begin at the highest elevation.
- Maintain a constant altitude while flying adjacent to steep terrain.
- Once all terrain at that altitude has been searched, descend 500 feet and continue contour searching.
- Put your observers in the optimal position to detect the target.
- If you encounter a sub-ridge either:
  - Include it in your current contour search.
  - Return later to search it separately.
- Two options in searching ridge or mountain:
  1. Contour all the way around the terrain before descending.
  2. Contour one face at a time.
- Resist temptation to scan when the terrain is on left side of the aircraft. Pilots job is to safely fly the airplane.



# Search Spacing

- ❑ 500 feet vertically and laterally is ideal
- ❑ Closer and terrain appears as a blur
- ❑ Farther and objects cannot be detected
- ❑ Turbulence, downdrafts, terrain features might prevent this spacing.
- ❑ Generally maintain this spacing, following terrain
  - Do not turn into small gullies and ravines
  - Return later to fly a drainage search pattern



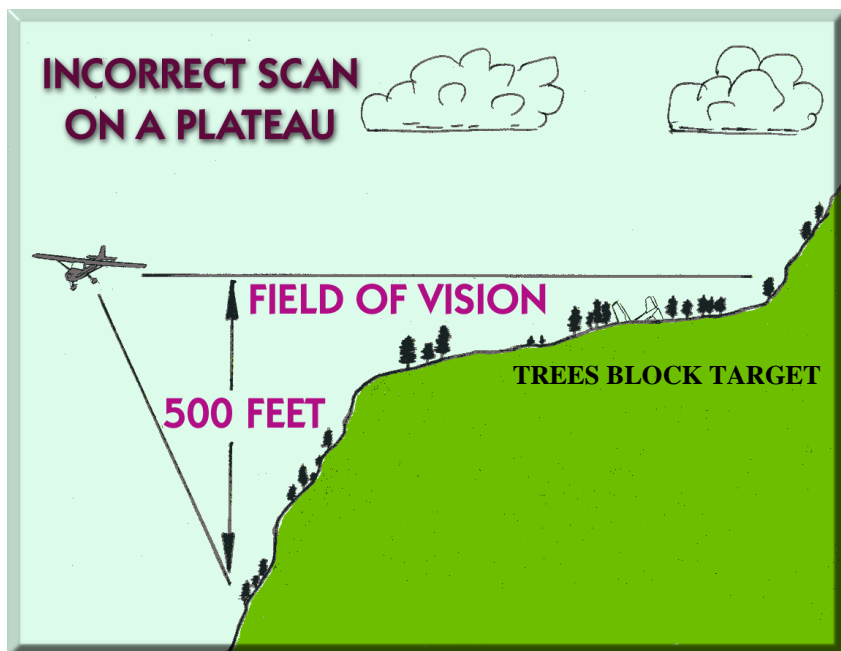
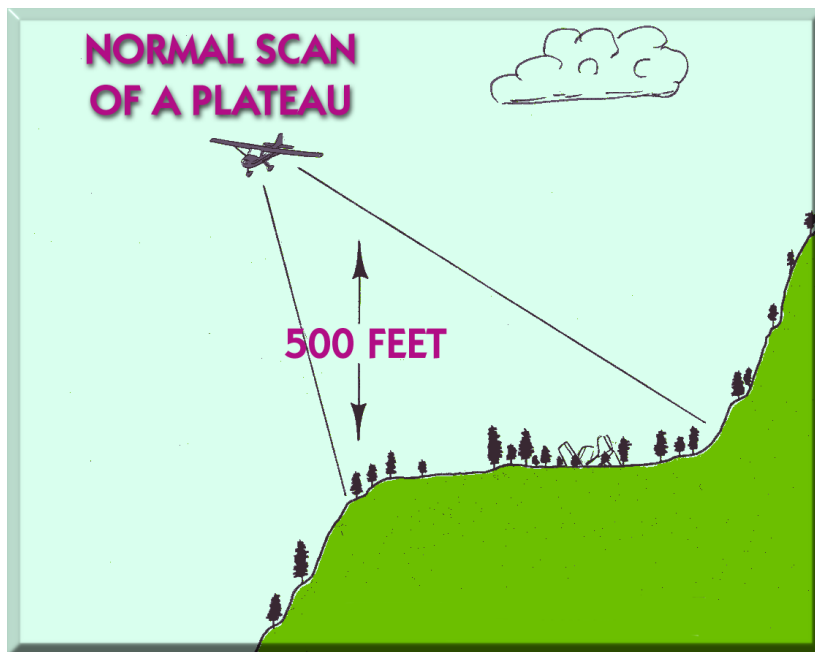
# Scanning a Plateau

Normal search position and spacing inadequate

- Unique feature requires specific technique
- Often partially covered with vegetation
- Must look down into vegetation to detect target

Interrupt contour search to search this feature

- Circle back and climb if necessary to view downwards
- Also attempt to scan under bases of foliage



# Scanning in Foliage

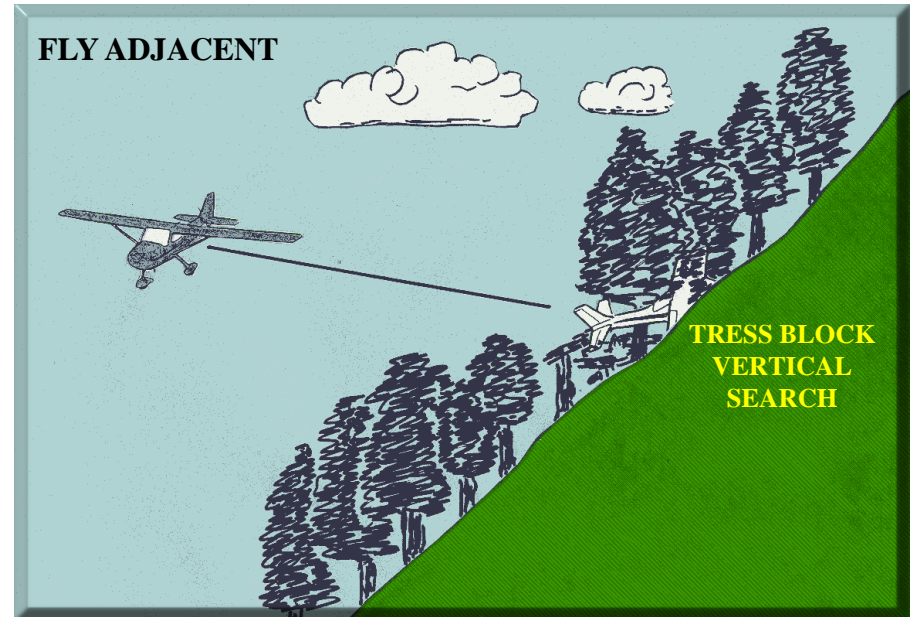
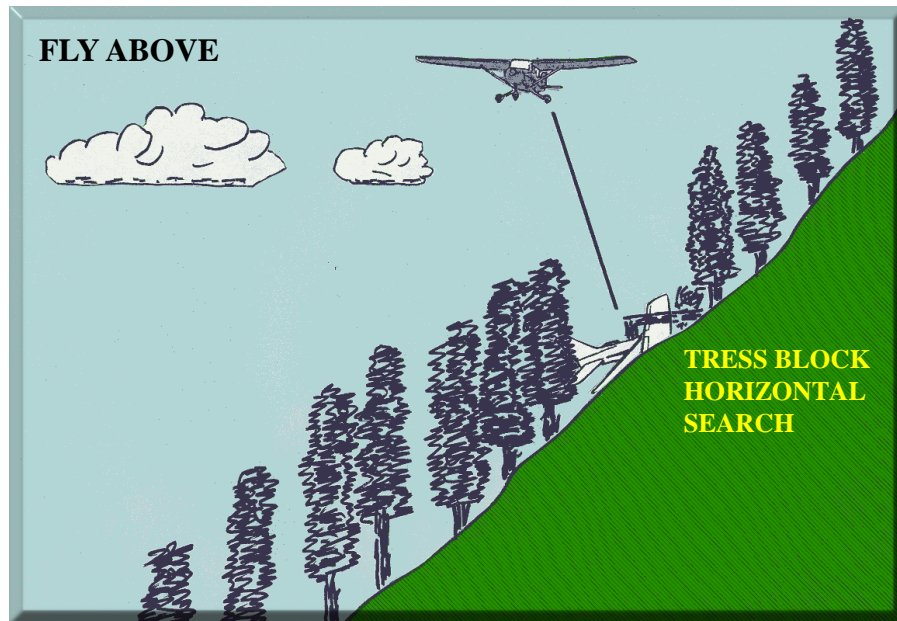
Difficult to spot target in or below trees

May have to fly above, then adjacent to each area

- In pass above, direct observers to look vertically
- In pass adjacent, direct observers to look horizontally

Look for indications of a crash

- Broken trees or limbs
- Dried leaves





# Searching a Cove

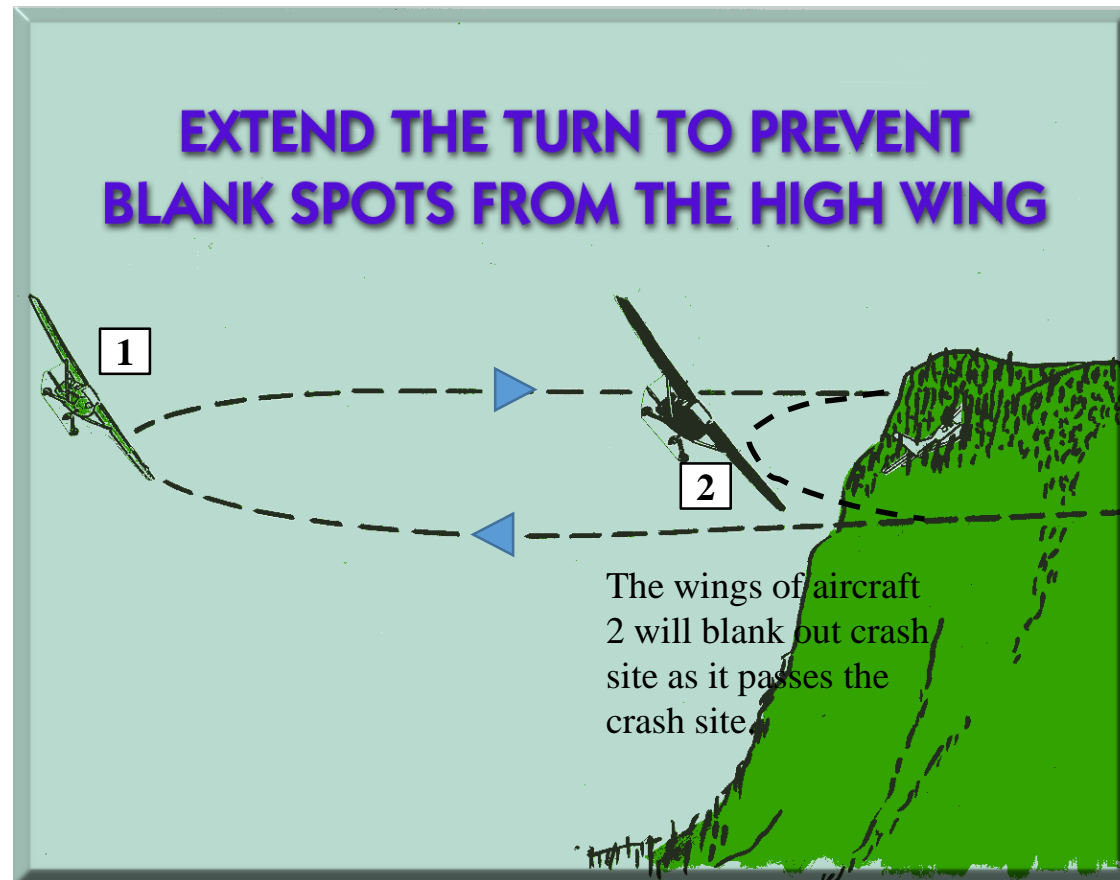
- Be certain your aircraft turn radius will allow flying comfortably into and out of the cove.
- If too tight, use the Drainage search method.
- A low-wing aircraft will block the observer's view.
- Explain your plan to your crew before entering.





# Searching a Promontory

- If the terrain drops sharply away from flight path, do not turn sharply to follow.
- High wing will block observer's view.
- Fly away from the promontory before turning.
- Turn beyond a “sharp turn” to avoid blank spots.
- Aircraft will be wings level as it approaches and passes the crash site.



Aircraft 1 will be wings level by the time it passes the crash site.

The wings of aircraft 2 will blank out crash site as it passes the crash site.

# Searching a Drainage / Canyon

- Cannot search narrow or steep valleys (a drainage) or canyons using a contour pattern.
- Reconnoiter from above
  - Confirm correct routing
  - Note presence and location of side canyons
  - Look for power lines and their support structures
- Fly straight down the drainage or canyon
  - Both observers scan each side simultaneously
  - Reduces the chance of turning up a dead end side canyon
- Approach at an altitude a few hundred feet above the top of the drainage or canyon at slowest safe airspeed for aircraft, 80 to 100 knots.
- Use slip to control airspeed with no more than 10° flaps. Ten degrees will not significantly modify aircraft performance. If turbulence encountered its faster to exit a slip than to raise 30° of electric flaps. Easier to compensate for terrain slope changes by changing the amount of slip than to raise or lower flaps.
- Reduce power when beginning descent to keep speed low enough for effective searching.
- S-turns allow scanning bottom of a canyon.
- Maintain positional awareness at all times

## Wooded Crash Site



Photo 1: The crash site is in center of picture. Unable to see crash because of trees.



Photo 2: After flying about 300 feet to the left of Photo 1, the crash is becoming visible.



Photo 3: 500 feet beyond Photo 2. The crash is visible. Another 200 feet and the aircraft disappears again.

# Effects of Lighting

- Shadows can prevent sighting targets
  - Loss of sufficient lighting
  - Loss of contrast
- Direct light may reflect from shiny targets
- Most mountainous terrain is best searched mid-day, 1000 to 1500.
- Steep slopes may be best early or late in the day
- Flying in deepening shadows can be dangerous
  - Difficult to judge distance from terrain
  - Difficult to detect layered backlit obstructions



West slope of a mountain taken with the sun low during the evening. West slopes can be searched later. East slope should be searched early.



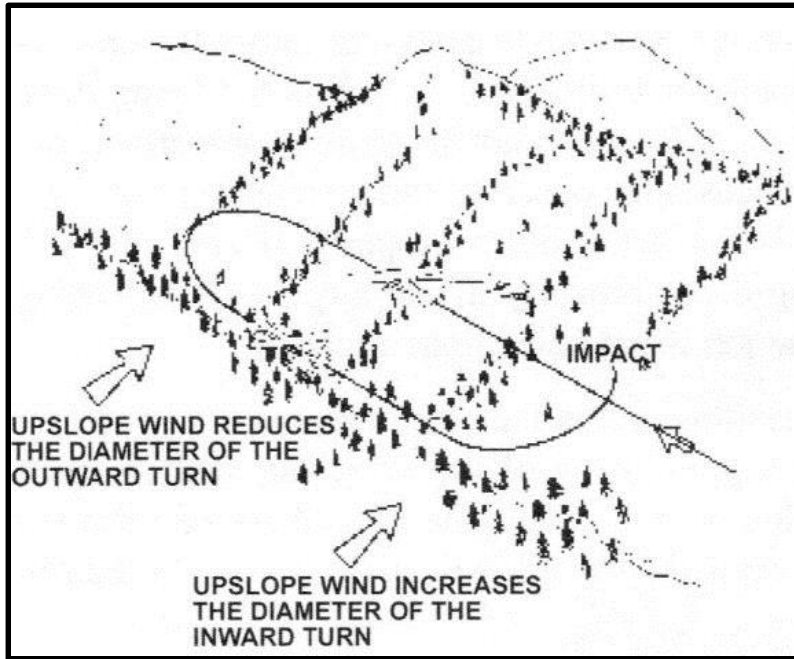
East slope of same mountain taken about one minute later. Note deep shadows. Dangerous to try to search.

# Target Detection

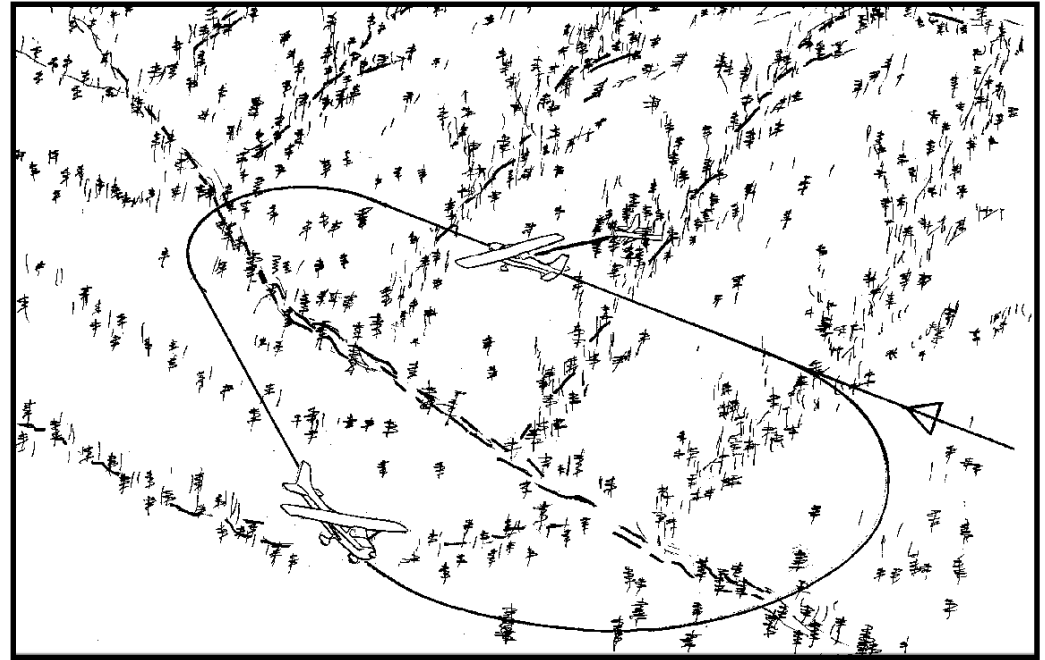
- Immediately note a prominent visual landmark as reference before turning back.
- Capture location on GPS or G1000 MFD.
- Note aircraft altitude at time of acquisition.
- Note actual or estimated target altitude.
- Return to the location at the same altitude
  - Allow time to approach the target wings-level
- Use 360° Modified Racetrack Maneuverer or a 180° Modified Teardrop Procedure
- Be cautious when turning back toward vertical terrain
  - Ensure adequate turning radius
  - Use shallow approach angle



# Modified Racetrack Maneuver



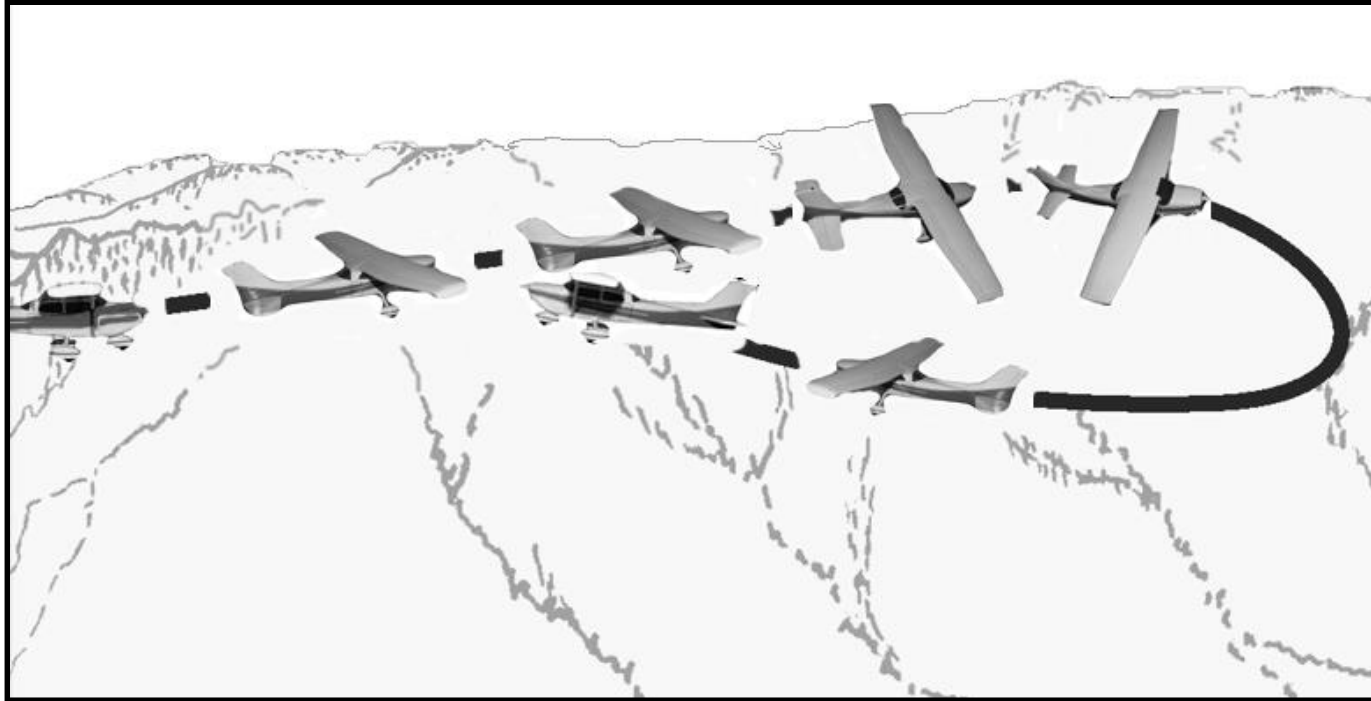
Danger of being blown into the mountain when making a racetrack turn with an upslope wind.



Modified Racetrack Maneuver to get back to a sighting.

The Modified Racetrack Maneuver allows an exact replay of the initial sighting and first pass. It is very important to offset the reciprocal leg away from the terrain to prevent initiating an inward turn with insufficient radius to avoid the mountain. Watch the spacing and the wind drift as you begin the turn toward the mountain. It is sometimes hard to get back to the same point ... make repeated sweeps past the spot until the target is identified.

# Modified Teardrop Procedure



Modified teardrop method of course reversal to return to a possible target. Turn away from the mountain, then move back, approaching at a 45° angle.

Turn the aircraft away from the mountain and continue the turn until approaching the mountain at an angle. This places the airplane in a position to escape toward lower terrain.

This method has the disadvantage of placing the aircraft not only in a direction opposite from the initial sighting but also on the opposite side of the aircraft. If nothing is spotted in the first pass, make the same turn again, turning away from the mountain. During this pass the airplane will be in original position when the target was first sighted.

# Crew Consideration

- Ensure entire crew is fit for duty prior to takeoff
- Consult with crew regarding mission goals and circumstances, correct spacing, flight track, lighting, etc.
- Every 20 or 30 minutes pull away from the terrain and break from searching to relax, drink, snack, stretch, perform ops check, switch fuel tanks, etc.
- Terminate mission when appropriate
  - Two hours “in-grid” is a practical maximum
  - Upon crewmember airsickness, exhaustion, etc.
- From time to time, ask the observer and scanner how they are doing and if they can see clearly. You are on the opposite side of the aircraft from the crew on a contour search, and it may be hard for you to judge the distance from steep terrain. Ask the crew for suggestions.

# Cessna Crashes

Cessna looks like a trash pile ... not an airplane. What you are looking for may not resemble an airplane.



Wing panel of a Cessna. The remainder of the crash was some distance away. Indicates in-flight breakup.



# Sensory Illusion Crash



A sensory illusion caused this crash. The crash site was difficult to see except in a vertical direction. The ELT signal was strong.





**END**