Mountain Fury
Mountain Search Flying
Course Syllabus

Fourth Sortie : High Altitude Search

Objectives

1. Develop trainee's proficiency in planning and execution of mountain search sorties.
2. Develop trainee's ability in mountain pilotage, dead reckoning and use of navigation equipment.
3. Enhance trainee's awareness of safety in search operations.

Timeline

The trainee should expect to spend at least one hour in preflight planning for this sortie prior to meeting with the instructor. The trainee and instructor should plan on an additional hour of discussions and briefing prior to the commencement of the flight. Sortie four will require one and one half to two hours of flight time. Finally, a debrief and completion of paperwork will require one additional hour.

Detailed Description of Fourth Sortie

Preflight Preparation

Every search sortie requires preparation if it is to be flown safely and efficiently. Standard search sortie preparation should be completed including use of planning forms and mission flight plans before beginning the flying part of this sortie. In addition, since this is a training flight, the information required on the outline / data form should also be filled in prior to flight so that the trainee will have a thorough understanding of the conditions and expected aircraft performance. The trainee should complete as many of these planning tasks as possible prior to meeting with the instructor pilot so that the sortie can be accomplished as expeditiously as possible.

Obtain the following information from the instructor pilot and enter it on the outline/data form:

- The instructor's weight and the weight of his/her personal equipment (and that of any other crew members);
- The location or locations in which the sortie will be flown.

Weight and Balance

Obtain data on the aircraft needed to complete a weight and balance computation. Perform a weight and balance calculation including planned fuel load, weights of the trainee and instructor (and any other crewmembers) and their personal equipment. Enter the gross weight, CG, maximum allowable gross weight and percent difference of the operating weight from maximum gross weight on the outline/data form. Note that a **forward CG position produces a higher stall speed**. This should be considered in calculating stall speeds below.

Airspeed and performance calculations

Calculate critical airspeeds from the airport elevation through the highest altitude expected to be flown on this sortie and fill these in on the outline/data form. These include Vx, Vy, Va, stall speeds for flaps up and normal search configuration (typically 10° to 25° of flap), best glide speed, and stall speeds in a 45° and 60° bank turn. Determine from the POH the density altitude at which the aircraft will climb at 300 feet per minute. This is the search ceiling. Record this information on the outline / recording form.

Note: When calculating canyon turn diameter and entry speed, CALIBRATED stall speed must be used. The resulting entry speed in calibrated airspeed must be converted into INDICATED airspeed for use in flight. For most aircraft used by CAP, the difference between calibrated airspeed and indicated airspeed at stall speed is fairly large, but at the canyon turn entry airspeed it is very small. If INDICATED stall speed is used for the calculations, the calculated canyon turn entry speed will be about 15 knots too slow.

Weather Briefing

Obtain a standard briefing for the area in which the sortie will be flown. A DUAT briefing is preferred as it assures that all available weather information is obtained. Print out the briefing or record information from the briefing form on the outline/data form so that the briefing and conditions may be discussed with the instructor pilot. Prepare and file a flight plan (or mission flight plan) for the sortie.

Airport Information:

Since this sortie will be flown from a high altitude airport or search base it is likely that the trainee will not be familiar with the airport. The AFD or other reference should be used to gather information on runway lengths, elevation (at each end), slope, obstructions, and approach and departure patterns. Actual or forecast temperatures should be obtained or estimated and density altitudes should be calculated. Record this information on the outline/data recording form.

Preflight Briefing

Safety. Safety is of paramount concern to everyone. If weather at the time of the sortie is of any concern, postpone the sortie for another day. Complete the CAP personal safety matrix prior to the flight. Once again, if the score is high and unacceptable, postpone the flight for another day.

This sortie will be flown as if it were an actual mountain search flight. An altitude of at least 2,000 feet AGL is suggested for flight enroute and the initial grid survey. Use a minimum of 1,000 feet AGL while searching.

Verify that appropriate survival equipment is on board and that all crewmembers have clothing suitable to spend the night in the open if an off-airport landing occurs. Note wind chill factors and expected night time temperatures. Carriage of sleeping bags and some form of shelter (tarp or tent) is highly recommended for flight operations in mountainous areas.

Weather. The trainee should provide the instructor with his/her personal assessment of the weather conditions based on the contents of a standard weather briefing . Specific items needed include forecast clouds and weather, winds and temperatures aloft, and the presence of

turbulence. The instructor should obtain an independent briefing so that the trainee's assessment can be evaluated.

Flight Plan. The trainee should review the mission flight plan with the instructor, and review route and airport departure procedures.

Aircraft Preflight. If possible, the preflight inspection should be performed in the presence of the instructor. Any non-standard equipment (radios, oxygen, survival gear) should be should be discussed to ensure familiarity of both pilots with that equipment. Any inoperative equipment should be identified and assessed as to whether it is required for the flight. Review the weight and balance calculations performed by the trainee and verify that the aircraft is loaded within limits.

Aircraft Performance. Discuss power settings, maximum rates of climb (and associated airspeeds) estimated takeoff distance and takeoff abort point. The instructor should review the pre-flight data entered by the trainee on the outline / data form. Verify that the density altitude expected in the practice search area will be at or below the search ceiling for the aircraft. If flight above 10,000 feet is planned, oxygen should be available and used by the crew.

Discuss turn effects of bank angle, airspeed and altitude on turn performance.

Plan the sortie using the Sortie Briefing Checklist and Mission Sortie Planning Sheet (included in the Mountain Fury Course materials).

Complete a CAP safety inspection form for the aircraft.

Takeoffs and Enroute

Note points along the runway that correspond to the distance required for ground roll and 50 foot obstacle clearance height, as well as an abort point before beginning the takeoff run. Note the actual takeoff point and 50 foot heights during the takeoff. These provide confirmation that expected aircraft performance is being obtained.

Record the time off and all other information usually recorded during a search sortie.

A safe altitude should be used while flying to and from the assigned grid. Use an altitude that is at least 2000' AGL.

The enroute portion of the flight is a good time to practice navigation skills. The trainee should continuously monitor position with pilotage and dead reckoning. Electronic navaids should also be used to verify position and correct function of this equipment.

Identifying the Grid Area

Every grid search sortie should begin with a survey of the grid to verify visual landmarks for the corners and to assess current weather conditions. Find the corners of the search area through pilotage (using sectional or topographic charts) and verify position with navigation equipment. Visual references should be primary, as their use allows the pilot to look outside and avoid terrain as opposed to being head down in the cockpit looking at an instrument display.

Look for the presence of wind, turbulence, or weather factors that could effect the safe and efficient search of the grid. It is far better to be aware of wind and turbulence at 2000' above the highest point in the grid than it is to first discover adverse conditions while down in the valleys and canyons of the grid. If there are significant safety concerns, modify the planned search or discontinue the flight as necessary.

Check aircraft performance with climb at Vy adjusted for weight and altitude: Record rate of climb. If the climb performance is not at least 300 feet per minute, the aircraft is above its search ceiling and search operations should not be conducted in that area. If there are any doubts about the capability of the aircraft to safely search in this area, return to the mission base.

It's useful to verify that pilot performance is up to the task as well, before flying in close proximity to terrain. A little practice will also increase pilot proficiency and hence increase safety. Move to a position that is well away from high terrain. Practice turns at 30°, 45° and the emergency canyon turn technique.

Searching in the grid area

Search the grid in accordance with normal mountain search procedures. This would normally include searching the highest terrain first. Climb to at least 1000' above highest terrain in the grid before beginning the search.

Search the grid in accordance with the pre-flight plan or any modifications made to the plan during the grid survey.

Demonstrate and practice various methods of searching consistent with terrain. This would include contour search, drainage and canyon search, ridge search and flat-land methods such as creeping line an expanding square. Use methods appropriate to the local terrain.

Proper airspeed and altitude should be maintained. The recommended search speed for the aircraft should be used, and minimum altitudes maintained. Typical search speed is 80-85 KIAS with 10-25° of flap, with minimum altitudes of 500' to 1000' AGL depending on the location and local Wing regulations. Flight that is "low and slow" does not produce the best probability of detection even though it may be tempting to get closer to a possible target. POD will not increase, but risk will be higher.

It is primarily the search pilot's responsibility to record the area's searched, but the observer may perform this function to aid the pilot. The observer may perform other tasks as well. The responsibilities expectations of each crew member should be discussed so that no critical tasks are missed. The primary job of the pilot is to fly the aircraft. All other tasks are secondary. The observer's and scanner's primary job is to search visually. It's critical that the pilot does not become an observer leaving no one flying the airplane.

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Discuss scanning procedures applicable to terrain in the grid. The trainee should know which scanning procedures are applicable to each type of terrain so that the aircraft can be positioned for effective search.

It is extremely important that the search pilot be able to recognize significant winds aloft as they are indicators of possible turbulence and other risk factors. The pilot should calculate the actual winds aloft by timing flight from one side of grid to the other and estimate crosswind by observing the crab angle. At 100 knots groundspeed, each 6° of crab angle is equal to 10 knots

of crosswind component. Calculate the winds aloft and record them on the outline / data form. Then verify these values by using electronic navigation aids such as GPS, LORAN or DME. Record the velocity and direction of the wind.

Optional Tasks

If a practice ELT is available and time and logistics permit, a practice ELT search should be performed. Discuss techniques and strategy thought in the preflight briefing.

If an aircrew locates a possible target, ground crews may be called in to make a positive ID of the object. In such cases, air crews may need to communicate with ground crew members to direct them to the target site. If time and logistics permit, air-ground coordination should be practiced with CAP vehicles / ground team members. This should include radio communication and visual signals.

Return to Base

The sortie is not over until the aircraft safely returns to base. Record the time of leaving the grid. Proceed back to the search base via the planned route and at an altitude of at least 2000' AGL. Record the landing time.

Postflight Debrief

Even a perfectly flown sortie has no value if the information obtained is not passed on to base personnel. Debrief the flight with operations including completing mission paperwork. After this the trainee and instructor should discuss the flight to maximize the learning value of the flight.

Discuss with the pilot and crew what they did and how they may improve performance. Observations from each crewmember should be sought for their perceptions and insights.

Review actual aircraft performance versus predicted performance. Any differences will be valuable in making improved performance predictions on future search flights.

Discuss winds or turbulence encountered, and any weather or other factors that effected the flight. Unexpected turbulence, downdrafts or wind shear should be reviewed so that its source can be recognized in advance on future flights.

Fill out the Flying Gradesheet for maneuvers performed in this sortie. Mark an "S" for satisfactory performance, "T" or more training required, and "U" for unsatisfactory performance. The grade of "T" should be used when performance is marginally acceptable or the trainee shows signs of improvement but is not yet proficient. "U" should be used when the trainee is experiencing considerable difficulty and maneuvers are deemed unsafe or unacceptable.

The check pilot should endorse the trainee's records to show completion of this sortie.

MOUNTAIN FURY
SORTIE NUMBER FOUR
OUTLINE / DATA RECORDING FORM

PILOT _____

CHECK PILOT _____

Check Pilot Number _____

Date of Sortie _____ Aircraft Type _____

Location _____

Preflight Preparation

Verify the following have been performed, and data entered on recording form.
Discuss and review as necessary:

- ❑ Weight and balance
- ❑ Airspeed calculations
- ❑ Weather briefing
- ❑ Preflight briefing
  - ❑ safety, including personal matrix, survival equipment and clothing
  - ❑ weather, including clouds, winds, temperatures and turbulence
  - ❑ flight plan, discussed and filed
  - ❑ aircraft preflight -- discuss non-standard equipment, oxygen, inop equipment
  - ❑ aircraft performance -- discuss and fill in recording form with performance predictions
  - ❑ safety inspection form -- verify completed

Fill in the blanks before the flight

Weights:

Aircraft Basic Empty Weight	_____
Trainee	_____
Trainee's Equipment	_____
Instructor	_____
Instructor's Equipment	_____
Other items in aircraft	_____
Fuel load	_____
Gross Weight	_____
Maximum Gross Weight	_____
Empty CG	_____
CG as loaded	_____
Within CG / Weight limits (Y/N)?	_____
CG in forward 30% of range (higher stall speed) ?	_____
Percent Difference from Max Gross Weight	_____

short field technique:	ground run	over 50' obstacle
Expected takeoff distance:	_____	_____
Expected landing distance:	_____	_____

Airspeeds:

For max gross weight:	sea level	6,000'	8000'	10,000'	12,000'
	---------- density altitude ----------				
Vx	_____	_____	_____	_____	_____
Vy	_____	_____	_____	_____	_____
Vy ROC from POH	_____	_____	_____	_____	_____

stall speed flaps up, KCAS _____
stall speed, search configuration (flaps), KCAS _____
stall speed, search config, 45° bank ↳ x 1.2 = _____
stall speed, search config, 60° bank ↳ x 1.4 = _____
canyon turn entry airspeed KCAS ↳ + 10 = _____
canyon turn entry airspeed KIAS (use table in POH/AFM) _____

Va	_____
best glide	_____

For actual takeoff weight, reduce airspeeds above by 1/2 the percent difference from max gross weight):

	sea level	6,000'	8000'	10,000'	12,000'
	---------- density altitude ----------				
Vx	_____	_____	_____	_____	_____
Vy	_____	_____	_____	_____	_____

search ceiling (altitude for 300 fpm ROC): _____
stall speed flaps up, KCAS _____
stall speed, search configuration (weight, flaps), KCAS _____
stall speed, search config, 45° bank ↳ x 1.2 = _____
stall speed, search config, 60° bank ↳ x 1.4 = _____
canyon turn entry airspeed KCAS ↳ + 10 = _____
canyon turn entry airspeed KIAS (use table in POH/AFM) _____

Va	_____
best glide	_____

From Winds Aloft Forecast (FD)	3000'	6000'	9000'	12000'
wind / temperature	_____	_____	_____	_____
density altitude (calculate)	_____	_____	_____	_____

Altimeter setting	_____
Field elevation	_____
Temperature	_____
Density Altitude	_____

Search ceiling (pressure altitude with climb of 300 fpm): _____

Total time flown on this sortie: _____

FLYING THE SORTIE
(Fill in the blanks in-flight)

Takeoff and Enroute

- ❑ Note expected takeoff points and abort point and find visual markers alongside the runway. Note actual versus expected takeoff points and 50' heights.
- ❑ Record time off: _____
- ❑ Climb to an altitude that is at least 2000 AGL for the route to the practice search area.
- ❑ While enroute and on reaching the grid, attempt to determine position with pilotage, dead reckoning, and each piece of navigation equipment.
- ❑ Record time entering grid: _____

Identifying the Grid Area

- ❑ Find the corners of the search area through pilotage (using sectional or topographic chart) and verify position with navigation equipment.
- ❑ Observe presence of wind, turbulence, or weather factors that could effect the safe and efficient search of the grid. If there are significant safety concerns, modify the planned search or discontinue the flight as necessary.
- ❑ Check aircraft performance with climb at Vy adjusted for weight and altitude: Record rate of climb: _____
- ❑ Move to a position well away from high terrain. Practice turns at 30°, 45° and emergency canyon turn technique.

Searching in the grid area

- ❑ Climb to at least 1000' above highest terrain in the grid.
- ❑ Begin searching the grid in accordance with the pre-flight plan or in-flight amended plan.
- ❑ Demonstrate and practice various methods of searching consistent with terrain.
- ❑ Emphasize that "low and slow" does not produce the best POD
- ❑ Review procedures for tracking route and helping pilot.
- ❑ Discuss scanning procedures applicable to terrain in the grid.
- ❑ Emphasize crew responsibilities: pilot flies, observer and scanners scan.
- ❑ Calculate winds aloft by timing flight from one side of grid to the other and estimating crosswind with crab angle: Record estimated wind: _____
- ❑ Verify winds aloft with electronic navaids. Record wind: _____

Optional Tasks

- ❑ Practice ELT search in mountainous area.
- ❑ Air-ground coordination exercise with CAP vehicles / ground team members.

Return to Base

- ❑ Record time leaving grid: _____
- ❑ Record landing time: _____

Postflight Debrief

- ❑ Debrief with operations including completing mission paperwork.
- ❑ Discuss with pilot and crew what they did and how they may improve performance.
- ❑ Review actual aircraft performance versus predicted performance.
- ❑ Discuss winds or turbulence encountered, any weather or other factors that effected the flight.
- ❑ Complete applicable portions of Flying Gradesheet
- ❑ Instructor Pilot: endorse trainee's records and completion certificate

END OF SORTIE NUMBER FOUR