Kneeboard Checklists

Civil Air Patrol

Universal Search Methods

GPS 400 Aircraft

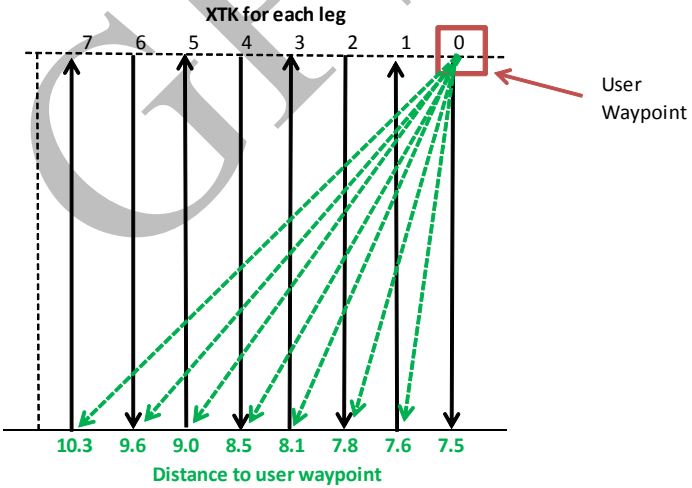
Setup for Search

- Nav page 1 – Menu – Restore all defaults.
- Nav page 2 – Menu – Restore all defaults
- Nav page 1 – Menu – Change fields
  - Field 1 – Dist
  - Field 2 – XTK
  - Field 3 – BRG
- Nav page 2 – Menu
  - Data fields – on
  - Set/change data fields
    - Field 1 – BRG
    - Field 2 – XTK
    - Field 3 – TRK
    - Field 4 – GS
- Nav page 2 – Menu – Setup map – North up – auto zoom off
- Aux page 3 – Units/Mag Var – True
- Aux page 3 – Date/Time – UTC
- Aux page 3 – CDI/Alarms – CDI set to 0.30 NM
- Aux page 3 – Position/Map Datum - hddd°mm.mmm

Parrallel Line Grid Search

1. Input the entry point as a user waypoint Lat/Long.
2. Go “direct to” the user waypoint entry point.
3. Press the OBS softkey.
4. Rotate the course line on the CDI to the direction of the first track (true degrees) then fly the track. This first track will establish the “base line” for subsequent parallel tracks
5. At the end of the first track and at least 0.5NM outside the grid (unless adjacent grid is occupied), turn to establish a new track in the opposite direction at a distance XTK= track spacing (e.g. 1 nm for the second track and 2 nm for the third track etc.)
6. For NS tracks end of grid can be established by DIS from User Waypoint (see next slide)
7. Fly each track adjusting heading to achieve the desired TRK while maintaining desired XTK from the base line
8. The entry edge of the grid can be established by BRG to WPT, in the example given below BRG=090 on entry edge of grid
9. Repeat until the grid is complete.

Parallel Line Distance to Waypoint for N-S Tracks



Parallel Line Slant Distances

... track spacing 1 NM

NORTH SOUTH LEGS

Leg length in minutes latitude ↓	Crosstrack → 0 NM	1NM	2 NM	3 NM	4 NM	5 NM	6 NM	7 NM	8 NM	9 NM
7.5	7.5	7.6	7.8	8.1	8.5	9.0	9.6	10.3	11.0	11.7
8	8.0	8.1	8.2	8.5	8.9	9.4	10.0	10.6	11.3	12.0
9	9.0	9.1	9.2	9.5	9.8	10.3	10.8	11.4	12.0	12.7
10	10.0	10.0	12.2	10.4	10.8	11.2	11.7	12.2	12.8	13.5
11	11.0	11.0	11.2	11.4	11.7	12.1	12.5	13.0	13.6	14.2
12	12.0	12.0	12.2	12.4	12.6	13.0	13.4	13.9	14.4	15.0
13	13.0	13.0	13.2	13.3	13.6	13.9	14.3	14.8	15.3	15.8
14	14.0	14.0	14.1	14.3	14.6	14.9	15.2	15.7	16.1	16.6
15	15.0	15.0	15.1	15.3	15.5	15.8	16.2	16.6	17.0	17.5

EAST WEST LEGS AT 40 DEGREES LATITUDE

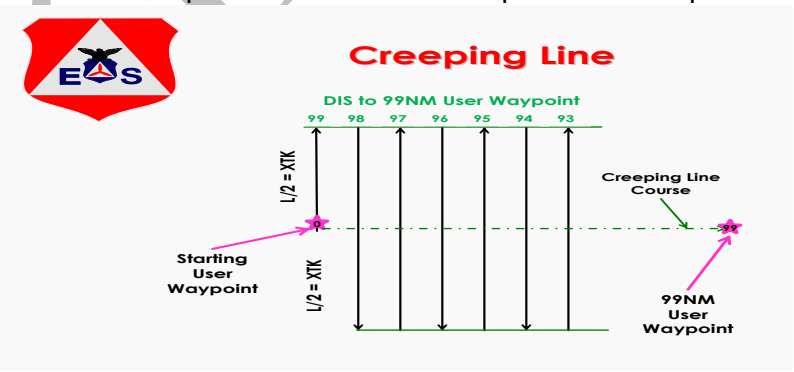
Leg length in minutes latitude at 40 deg lat ↓	Crosstrack → 0 NM	1NM	2 NM	3 NM	4 NM	5 NM	6 NM	7 NM	8 NM	9 NM
7.5	5.8	5.9	6.1	6.5	7.0	7.7	8.3	9.1	9.9	10.7
8	6.2	6.3	6.5	6.9	7.4	8.0	8.6	9.4	10.1	10.9
9	6.9	7.0	7.2	7.5	8.0	8.5	9.1	9.8	10.6	11.3
10	7.7	7.8	8.0	8.3	8.7	9.2	9.8	10.4	11.1	11.8
11	8.5	8.6	8.7	9.0	9.4	9.9	10.4	11.0	11.7	12.4
12	9.2	9.3	9.4	9.7	10.0	10.5	11.0	11.6	12.2	12.9
13	10.0	10.0	10.2	10.4	10.8	11.2	11.7	12.2	12.8	13.5
14	10.8	10.8	11.0	11.2	11.5	11.9	12.4	12.9	13.4	14.1
15	11.5	11.5	11.7	11.9	12.2	12.5	13.0	13.5	14.0	14.6

EAST WEST LEGS AT 30 DEGREES LATITUDE

Leg length in minutes latitude at 30 deg lat ↓	Crosstrack → 0 NM	1NM	2 NM	3 NM	4 NM	5 NM	6 NM	7 NM	8 NM	9 NM
7.5	6.5	6.6	6.8	7.2	7.6	8.2	8.8	9.6	10.3	11.1
8	7.0	7.1	7.3	7.6	8.1	8.6	9.2	9.9	10.6	11.4
9	7.8	7.9	8.1	8.4	8.8	9.3	9.8	10.5	11.2	11.9
10	8.7	8.8	8.9	9.2	9.6	10.0	10.6	11.2	11.8	12.5
11	9.6	9.7	9.8	10.1	10.4	10.8	11.3	11.9	12.5	13.2
12	10.4	10.4	10.6	10.8	11.1	11.5	12.0	12.5	13.1	13.8
13	11.3	11.3	11.5	11.7	12.0	12.4	12.8	13.3	13.8	14.4
14	12.2	12.2	12.4	12.6	12.8	13.2	13.6	14.1	14.6	15.2
15	13.0	13.0	13.2	13.3	13.6	13.9	14.3	14.8	15.3	15.8

Creeping Line Search (GPS Arc Method)

1. Create a user waypoint using the coordinates of the starting point.
2. Determine true course between beginning point and end point of search from sectional. This is the DTK.
3. Create a user waypoint 99 miles beyond the start point of the creeping line, using the starting waypoint as a reference. For example, if the entry point is user waypoint C1, then create a user waypoint C2 using not its coordinates but a bearing and distance from C1. The farther C2 is from C1 the better as the legs in this procedure will actually be arcs around C2, and at 99NM the arc error will not matter. However, the distance should not exceed 99NM as the distance readout will not read tenths at ta greater distance.
4. Create a flight plan from the entry point (C1) to the reference point (C2.
5. Desired track for left offset of creeping line is DTK – 90°, Right offset of creeping line is DTK + 90°.
6. Approach the beginning point from the right side of the search course so that aircraft is established on creeping line track (DTK – 90°) prior to crossing search course. Maintain 99 miles distance.
7. When the Cross Track Error (XTK) readout indicates that the aircraft is at the leg length, perform a turn to intercept the reciprocal track (DTK + 90°) at 98 NM. Maintain 98NM as the XTK counts down to 0 (crossing centerline) and counts up to the leg length.
8. Continue this process until the search pattern is completed.



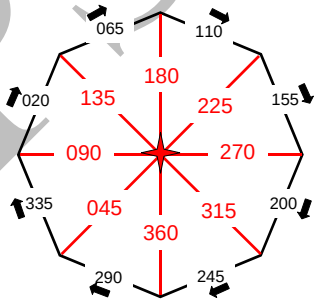
Sector Search

Input user waypoint for center of sector search by Lat/Long.
Enter a flight plan from the departure airport or present position to the center of the sector search (or go direct).

Go to OBS mode. Set in the course of the first inbound/outbound leg. Position aircraft to intercept and fly inbound to the search center on the radial closest to the direction of fight.

After arrival at the search center continue to fly the same track out to the search radius on the other side of the center using DIS to verify position from the center and the OBS line for course guidance

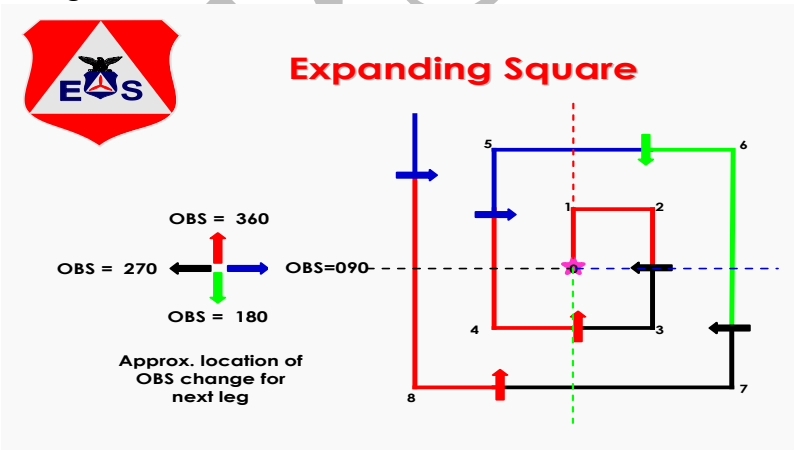
When DIS > search radius, select the next radial using OBS, and turn right to intercept the next inbound radial track. The next radial bearing – 90 degrees is a good heading to fly to intercept the next radial inbound.



Example sector search
Bearing to wpt. in red
interim headings in black -
use up to 3 NM from centerpoint

Expanding Square Search

1. Input user waypoint for center of square search by Lat/Long
2. Load a “direct to” user waypoint flight plan
3. Set OBS to 360, intercept course line and cross waypoint at designated ground speed and altitude
4. At DIS=0.7, turn right using a 20 degree bank angle to a TRK of 090. when XTK=0.7 turn right to 180 using a 20 degree bank angle, roll out XTK=1.
5. Establish heading to stay on XTK = 1.0 and TRK=180, use ground track bug if able
6. When ground track stable, set OBS=270; at XTK=0.7 turn right using 20 degree bank angle, roll out to achieve TRK=270 and XTK=1.0
7. Establish heading to stay on XTK = 1.0, TRK=270
8. When ground track stable, set OBS=360; at XTK=0.7 turn right using 20 degree bank angle, roll out to achieve TRK= 360 and XTK=1.0
9. Establish heading to stay on XTK = 1.0, TRK=360
10. When ground track stable, set OBS=090; at XTK=1.7 turn right using 20 degree bank angle, roll out to achieve TRK= 090 and XTK=2.0
11. Continue this process until the search pattern is completed, refer to figure on next slide

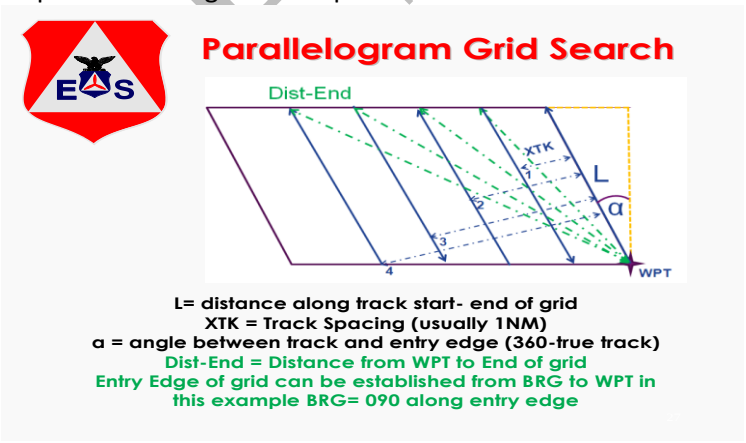


Route Search Using flight plan and XTK

1. Enter and activate a flight plan for the route using a combination of Airports, VORs, NDBs and user waypoints as appropriate. Note the true course for each leg of the flight plan
2. Fly the required parallel track offset by using XTK, relative to the flight plan route

<u>Parallelogram Grid Search - Single User waypoint XTK, TRK, DIS, BRG and OBS</u>

1. Input user waypoint at grid entry point by Lat/Long
2. Establish angle Alpha (360 – true track) and L (track length)
3. Load a "direct to" user waypoint flight plan
4. Rotate (OBS) the course line to the direction of the first track then fly the track. This first track will establish the "base line" for subsequent parallel tracks
5. End of the track can be established by DIS using tables given using your Track Length L and Angle Alpha
6. At the end of the first track and at least 0.5NM outside the grid turn to establish a new track in the opposite direction at a distance XTK= track spacing (e.g. 1 nm for the second track and 2 nm for the third track etc.)
7. Fly each track adjusting heading to achieve the desired TRK while maintaining desired XTK from the base line
8. The entry edge of the grid can be established by BRG to WPT, in the example given BRG=090 on entry edge of grid
9. Repeat until the grid is complete



Random Shapes Grid Search - Single User waypoint XTK, TRK, DIS, BRG and OBS

1. Draw shape on sectional , select longest edge for initial track, measure initial track direction and reciprocal track direction
2. Input user waypoint at grid entry point by Lat/Long
3. Load a “direct to” user waypoint flight plan
4. Rotate the course line (OBS) to the direction of the first track then fly the track. This first track will establish the “base line” for subsequent parallel tracks
5. End of the track can be established by measuring distance on sectional
6. At the end of the first track and at least 0.5NM outside the grid turn to establish a new track in the opposite direction at a distance XTK= track spacing (e.g. 1 nm for the second track and 2 nm for the third track etc.)
7. Fly each track adjusting heading to achieve the desired TRK while maintaining desired XTK from the base line
8. The ends of the track can be established by either BRG to WPT or by DIS from user waypoint whichever makes most sense
9. Repeat until the grid is complete