Garmin GX55 Visual Search Patterns

National Emergency Services Academy
Mission Aircrew School
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Standardized Visual Search Pattern method

- Visual search pattern techniques include:
  - Minimum # of user waypoints
  - GPS nav data displays - Track (TRK), Bearing to Waypoint (BRG), Distance to Waypoint, Cross Track Error "<" and Ground Speed (GS)
  - GPS OBS course line selection
  - Setting Magnetic Variation to true North

- Five primary visual search patterns - Parallel Line, Creeping Line, Sector Search , Expanding Square and Route Search

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GX55 Setup

Garmin GX55 – True North

True North
- Nav button, SYS softkey
- Hit SYS softkey, choose Nav Setup
- Large knob to Mag Variation
- SELECT button
- Set Manual
- Set 0 degrees – ENTER

Garmin GX55 – True North

Garmin GX55 Map setup

- Map button – large knob to Route Line page
- Use softkeys to select:
  - Route line – Yes
  - Map Orient – North
  - Map Ref - Plane

Garmin GX55 Map setup

Garmin GX55 – Map display setup

- The map page can be configured to display nav data or not. Always choose the page with nav data.
- The map will display dist, GS, Brg to the waypoint and track. Crosstrack Error will be just below Brg. It is NOT labeled but is displayed with a "<" or ">" symbol indicating the direction to the course line
- The map display can be configured to show airports, VORs, NDBs etc. Turn off what you don't need with the softkeys.

Garmin GX55 – Map display setup

All patterns can be flown by ref to this data

DIST	Ground Speed
BRG	TRK
XTK	Map Scale

Garmin GX55 – Entering User Waypoints

Creating a User Waypoint by Lat/Long
- Press NAV then press DB smart key
- Turn LARGE knob to the "Create User Wpt by Lat/Lon" page – press ENTER
- Set the Waypoint name – using SMALL knob to set characters, LARGE knob moves cursor to next field
- Continue turning LARGE knob CW until LAT is flashing then change value using SMALL and LARGE knobs
- Press ENTER when finished entering LAT and LONG
- If desired to enter by Radial/Dist, turn large knob 1 to right. Enter reference point and radial/distance. NOTE: you cannot select a User Waypoint as a ref waypoint, only Airports, NDBs and VORs can be used

Garmin GX55 – Entering User Waypoints

FLYING THE SEARCH PATTERNS

PARALLEL LINE
CREEPING LINE
SECTOR
EXPANDING SQUARE
ROUTE SEARCH
PARALLELOGRAM
RANDOM SHAPES

Flying the Patterns using OBS

- All patterns can be flown with one or two user waypoints using the OBS function and reference to Distance, Ground Track (TRK), Bearing to Waypoint (BRG) and Cross Track Error "<"
- Typically GX55 equipped aircraft do not have a HSI installed, the OBS course is selected on the GX55
- Press ĐĐ (direct twice)
- Set the course with the knobs.
- Press Enter Enter (must press enter twice)
- This will give a course line to the waypoint at the entered course.
- Unlike the G1000, it will NOT extend the course line outbound beyond the waypoint. However, distance and crosstrack will work and can be used to fly the outbound course.

Flying the Patterns using OBS

- GX55 will allow you to fly an OBS course to any waypoint you select in a flight plan or "direct to".
- After making the desired waypoint active, set up the OBS function as described in the previous slides.
- Fly the aircraft to intercept the course line.
- Fly inbound to the waypoint on the course line.
- After passing the waypoint you may continue flying outbound on the OBS course, but keep in mind that unlike the G1000, it will NOT extend the course line outbound beyond the waypoint. However, distance and crosstrack will work and can be used to fly the outbound course.

## Flying the Patterns using OBS

Parallel Line (Grid) Search

Single User waypoint, "<" cross track, TRK, BRG, distance (NM) and OBS

1. Input user waypoint at grid entry point by Lat/Long
2. Load a "direct to" user waypoint flight plan
3. 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
4. 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 cross track distance that equals the track spacing (e.g. 1 nm for the second track and 2 nm for the third track etc.)
5. The bottom end (or end opposite the entry end) can be established by distance (NM) from User Waypoint , see next slide
6. Fly each track adjusting heading to achieve the desired TRK while maintaining desired track spacing from the base line
7. The entry edge of the grid can be established by BRG to WPT, in the example given BRG=090 on entry edge of grid
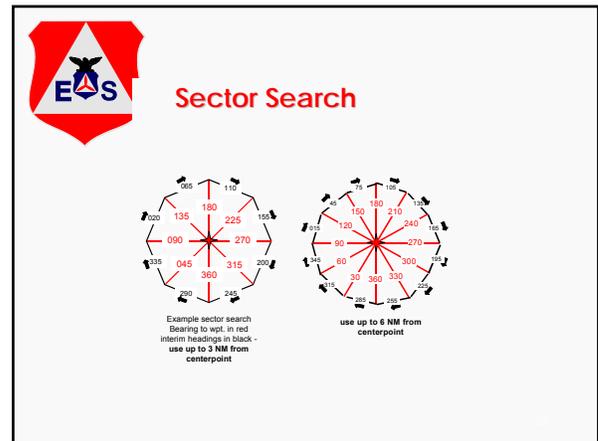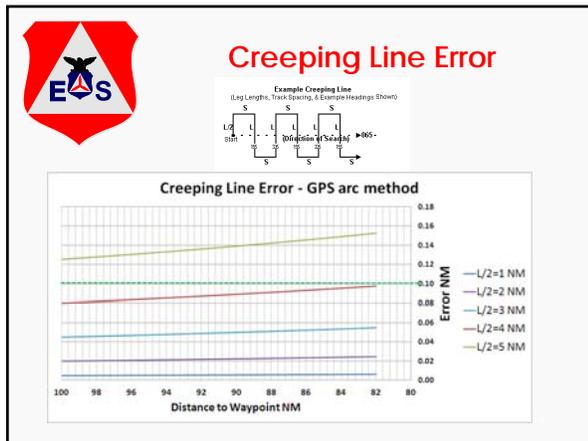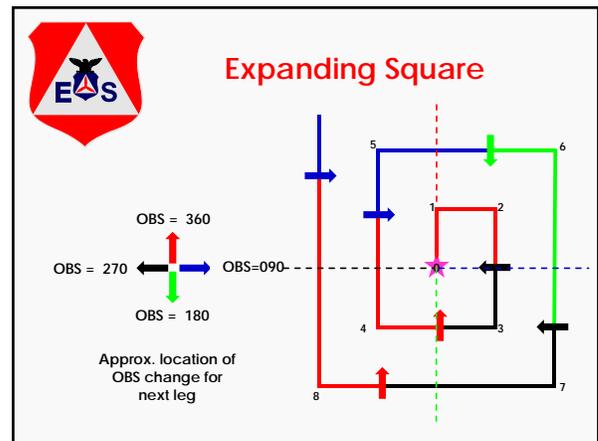8. Repeat until the grid is complete
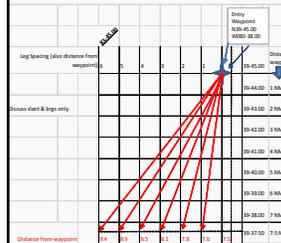
Creeping Line
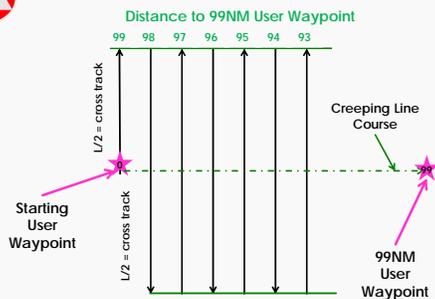
Creeping Line Search (GPS arc method)

Two User waypoints cross track, DIST, and OBS

1. Determine true course between beginning point and end point of search from sectional
2. Insert a waypoint 99 miles beyond the start point of the creeping line enter a flight plan from start to waypoint 99 miles beyond start point (this must not be >99 miles since GX55 will not display 1/10th miles at 99 NM or more)
3. Desired track for left offset of creeping line is DTK – 90°, Right offset of creeping line is DTK + 90°.
4. 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.
5. When the Cross Track Error "<" readout indicates that the aircraft is at the Offset plus at least + 0.5 NM from the course line, perform a turn to intercept the reciprocal track (DTK + 90°)
6. Adjust the turn as necessary so that the aircraft is closer to the course end point by distance equal to track spacing and on a ground track perpendicular to the course line
7. Continue this process until the search pattern is completed.

Creeping Line Error

Example Creeping Line
(Leg Lengths, Track Spacing, & Example Headings Shown)

Creeping Line Error - GPS arc method

- L/2=1 NM
- L/2=2 NM
- L/2=3 NM
- L/2=4 NM
- L/2=5 NM

Error NM
Distance to Waypoint NM

Sector Search

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

**use up to 6 NM from
centerpoint**

Sector Search

Single User waypoint Distance, BRG, TRK and OBS

1. Input user waypoint for center of sector search by Lat/Long.
2. Load a "direct to" user waypoint flight plan
3. Fly aircraft to intercept and fly inbound to the search center on the radial closest to the direction of fight. Select this radial using the OBS function.
4. After arrival at the search center continue to fly the same track TRK out to the search radius on the other side of the center using Distance to verify position from the center and the OBS line for course guidance
5. When Distance > search radius, select 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.

Expanding Square

OBS = 360
OBS = 270   OBS=090
OBS = 180

Approx. location of
OBS change for
next leg

Expanding Square Search

Single User waypoint crosstrack "<", Distance, TRK and OBS

1. Input user waypoint for center of expanding 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 Distance=0.7, turn right using a 20 degree bank angle to a TRK of 090. when "<"=0.7 turn right to 180 using a 20 degree bank angle, roll out "<"=1.
5. Establish heading to stay on "<" = 1.0 and TRK=180, use ground track bug if able
6. When ground track stable, set OBS=270; at "<"=0.7 turn right using 20 degree bank angle, roll out to achieve TRK=270 and "<"=1.0
7. Establish heading to stay on "<" = 1.0, TRK=270
8. When ground track stable, set OBS=360; at "<"=0.7 turn right using 20 degree bank angle, roll out to achieve TRK= 360 and "<"=1.0
9. Establish heading to stay on "<"= 1.0, TRK=360
10. When ground track stable, set OBS=090; at "<"=1.7 turn right using 20 degree bank angle, roll out to achieve TRK= 090 and "<"=2.0
11. Continue this process until the search pattern is completed, refer to figure on next slide

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Route Search

Using flight plan and crosstrack "<"

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

Fly the required parallel track offset by using the GX55 display for cross track "<" relative to the flight plan route

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Questions?