

**GARMIN<sup>®</sup>**

# **Integrated Avionics System Pilot's Guide**



## **Search and Rescue**



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**WARNING:** The displayed minimum safe altitudes (MSAs) are only advisory in nature and should not be relied upon as the sole source of obstacle and terrain avoidance information. Always refer to current aeronautical charts for appropriate minimum clearance altitudes.

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**WARNING:** The altitude calculated by GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74A Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the PFD or other pressure altimeters in aircraft.

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**WARNING:** Do not use outdated database information. Databases used in the system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.

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**WARNING:** Do not use basemap (land and water data) information for primary navigation. Basemap data is intended only to supplement other approved navigation data sources and should be considered as an aid to enhance situational awareness.

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**WARNING:** For safety reasons, operational procedures must be learned on the ground.

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**WARNING:** The Garmin system, as installed in this aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the system. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.

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**WARNING:** The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the Garmin system utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the system can be misused or misinterpreted and, therefore, become unsafe.

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**WARNING:** To reduce the risk of unsafe operation, carefully review and understand all aspects of the Pilot's Guide documentation and the approved aircraft documentation. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the system to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.

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**NOTE:** All visual depictions contained within this document, including screen images of the panel and displays, are subject to change and may not reflect the most current system and aviation databases. Depictions of equipment may differ slightly from the actual equipment.



**NOTE:** Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to [FlyGarmin.com](http://FlyGarmin.com) and select 'Report An Aviation Data Error Report.'



Record of Revisions				
Part Number	Revision	Date	Page Range	Description
190-00760-00	A	March 2007	i through vi, S-1 through S-12	Production Release
190-00760-00	B	May 2007	All	Revised Garmin UK Address
190-00760-00	C	May 2011	All	Added circle search pattern functionality
190-00760-00	D	May 2015	All	Updated to include latest software and all Garmin integrated avionics systems



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## SEARCH AND RESCUE



**NOTE:** The Search and Rescue (SAR) feature must be purchased and activated before use. Contact a Garmin-authorized service center for configuration and a Secure Digital (SD) unlock card. If Search and Rescue is not enabled, it is not visible on any display pane, screen, or menu.

Instructions are presented here for quickly and easily incorporating search patterns into a flight plan. The Search and Rescue feature has four basic search patterns (Parallel Track, Sector, Expanding Square, and Circle) to provide air crews with step by step tracking procedures for the search and rescue mission.

All patterns have adjustable parameters. The most effective pattern may be chosen based on available information about the search object, the weather, and the terrain. Typical flight planning parameters such as time, speed, distance, and fuel remaining are given throughout the search mission on the flight plan pages.

### SEARCH AND RESCUE SD UNLOCK CARD

The Search and Rescue feature is enabled with a dedicated Secure Digital (SD) unlock card that is inserted into the top SD card slot on the MFD. If SAR configuration is enabled, the SAR flight patterns are available as part of an active flight plan.

Refer to the Garmin Integrated Avionics System Pilot's Guide for your airframe for more information on SD cards.

### SEARCH AND RESCUE FLIGHT PLANS

A Search and Rescue flight plan is a route that systematically covers an area for a search mission.



**NOTE:** When turning on the system for use, the system remembers the last type of search pattern used and the track state prior to shutdown. Once the default settings have been changed, the system retains the new data.

The search patterns may be hand flown or coupled to the Garmin Automatic Flight Control System (AFCS). Refer to the Garmin Integrated Avionics System Pilot's Guide for more information about the AFCS (if installed) and Flight Management.

The Search and Rescue flight plan is configured on the Search and Rescue Menu (on the MFD) or the Search and Rescue Screen (on the Touchscreen Controller). All SAR flight plans must begin with a waypoint to 'anchor' the search pattern. Any waypoint may be used to anchor a search pattern, including user defined waypoints.

The search patterns have adjustable parameters to modify the size and direction of the pattern. Default values appear initially for each type of pattern.



## PARALLEL TRACK SEARCH PATTERN

The Parallel Track Search Pattern (default) is a rectangular pattern that traverses a defined path over the ground in a systematic manner as shown in the figure below. The Parallel Track Search Pattern may begin at any designated waypoint and will continue through the route based upon pilot-entered parameters.

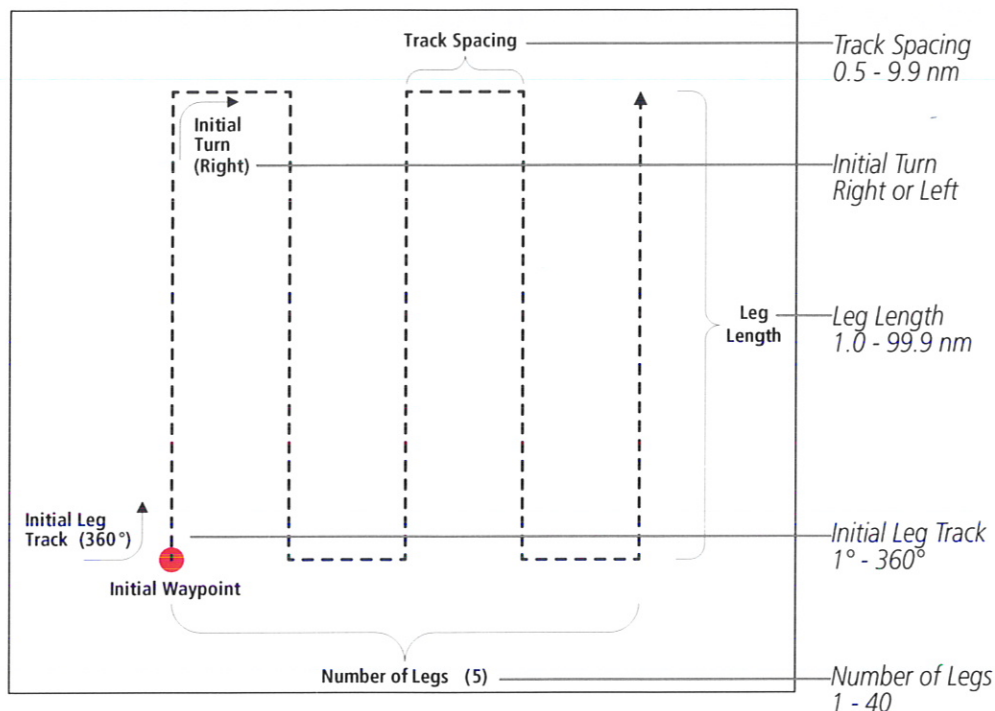


Figure 1 Parallel Track Search Pattern

Parallel Track Parameters	Default Value	Range of Values (resolution)
Initial Track	360°	1 – 360 (1°)
Initial Turn	Left	Left, Right
Leg Length	15 nm	1.0 – 99.9 (0.1 nm)
Track Spacing	1.0 nm	0.5 – 9.9 (0.1 nm)
Number of Legs	10	1 – 40 (1)

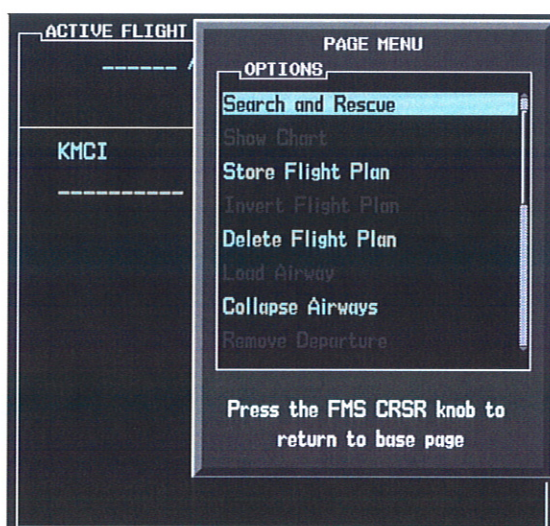
The parallel track flight plan begins with a waypoint to anchor the corner of the search pattern. In the following example (Figure 3), the search requires a wide path over part of western Missouri. KMCI is the crew-selected waypoint from which the Parallel Track Search Pattern begins.

The default entries have been modified in the illustration to fly an initial desired track of 90° with an initial turn to the left. The leg lengths are 8.0 nm with spacing of 1.0 nm between them, and the number of legs is ten.

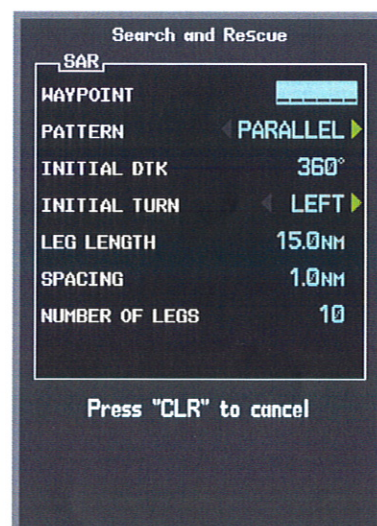


## Creating a parallel track search pattern on the MFD:

- 1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
- 2) If desired, scroll to highlight a flight plan waypoint. It will be selected as the anchoring waypoint and inserted into the WAYPOINT field.
- 3) Press the **MENU** Key to display the PAGE MENU OPTIONS (Figure 2).
- 4) Scroll through the choices with the **FMS** Knob to select 'Search and Rescue'.
- 5) Press the **ENT** Key to complete the selection and view the Search and Rescue Menu. The WAYPOINT field will be highlighted with either the selected waypoint or dashes shown.
- 6) Rotate the large and small **FMS** Knobs to enter the initial waypoint, if required (Figure 3). Press the **ENT** Key to complete the selection and highlight the 'PATTERN' field.
- 7) Rotate the small **FMS** Knob to select 'PARALLEL'. Press the **ENT** Key to highlight the 'INITIAL DTK' field.
- 8) Rotate the **FMS** Knobs to select the initial desired track, or leave the default entry. Press the **ENT** Key to highlight the 'INITIAL TURN' field.
- 9) Rotate the small **FMS** Knob to select 'LEFT' or 'RIGHT'. Press the **ENT** Key to highlight the 'LEG LENGTH' field.
- 10) Rotate the **FMS** Knobs to select the leg length, or leave the default entry. Press the **ENT** Key to highlight the 'SPACING' field.
- 11) Rotate the **FMS** Knobs to select the leg spacing, or leave the default entry. Press the **ENT** Key to highlight the 'NUMBER OF LEGS' field.
- 12) Rotate the small **FMS** Knob to select the number of legs. Press the **ENT** Key to highlight 'ACTIVATE SAR?'.
- 13) Press the **ENT** Key with the 'ACTIVATE SAR?' field highlighted to complete and activate the flight plan search pattern.

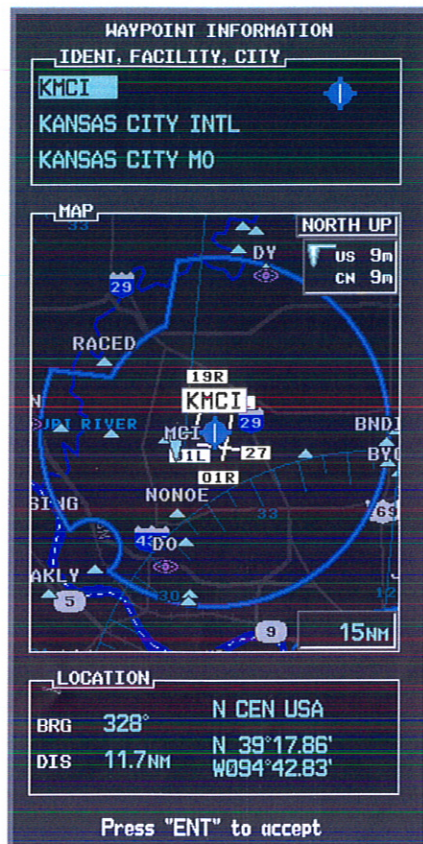


PAGE MENU Access



Default Search and Rescue Menu

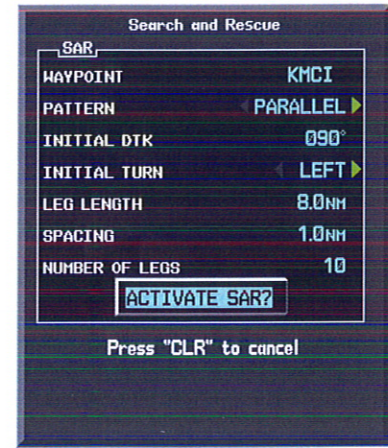
Figure 2 Search and Rescue Selection on the MFD



Waypoint Selection



Default Entries Modified



Pressing **ENT** Key Activates Flight Plan

Figure 3 Parallel Track Search Pattern, Flight Plan Menus

### Creating a parallel track search pattern on the Touchscreen Controller:

- 1) From **Home**, touch **Flight Plan** > **Flight Plan Options** > **Search and Rescue** to display the Insert Search and Rescue At Window. The active flight plan waypoints will be listed in the window.
- 2) Scroll the window, if necessary, and touch the desired waypoint selection button. The Search and Rescue Screen is displayed with the selected waypoint as the initial waypoint for the search pattern, and the default selections for the parameters (Figure 4).





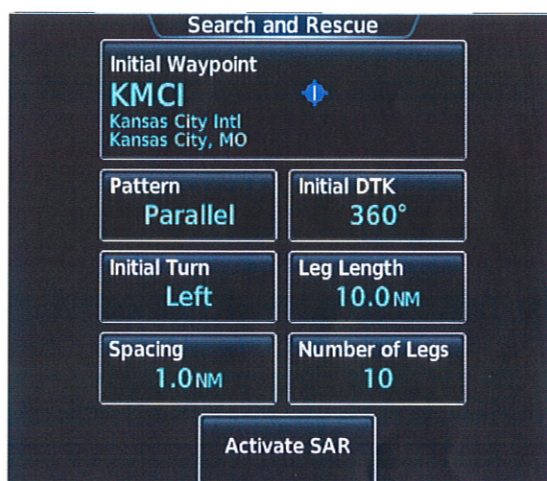
Active Flight Plan Screen



Flight Plan Options Screen



Insert Search and Rescue At Window



Default Search and Rescue Screen

Figure 4 Search and Rescue Selection on the Touchscreen Controller

- 3) Modify any combination of the following parameters, as required: When complete, go to step 4.
  - a) Touch the **Initial Waypoint** Button if a different Initial Waypoint is desired. Use the keypad to select the initial waypoint. Touch the **Enter** Button to complete the selection and return to the Search and Rescue Screen.
  - b) Touch the **Pattern** Button to display the Search and Rescue Pattern Screen. Touch the **Parallel** Button to select the parallel track pattern and return to the Search and Rescue Screen.
  - c) Touch the **Initial DTK** Button to display the keypad. Touch the keypad buttons to select the initial desired track. Touch the **Enter** Button to complete the selection and return to the Search and Rescue Screen.
  - d) Touch the **Initial Turn** Button to display the Search and Rescue Initial Turn Screen. Touch the **Left** Button or **Right** Button to select the initial turn direction and return to the Search and Rescue Screen.
  - e) Touch the **Leg Length** Button to display the keypad. Touch the keypad buttons to select the length of each leg. Touch the **Enter** Button to complete the selection and return to the Search and Rescue Screen.



- f) Touch the **Spacing** Button to display the keypad. Touch the keypad buttons to select the spacing between each leg. Touch the **Enter** Button to complete the selection and return to the Search and Rescue Screen.
  - g) Touch the **Number of Legs** Button to display the keypad. Touch the keypad buttons to select the number of legs. Touch the **Enter** Button to complete the selection and return to the Search and Rescue Screen.
- 4) Touch the **Activate SAR** Button to activate the flight plan search pattern (Figure 5).



Figure 5 Search and Rescue Screen - Parallel Track

Once the flight plan is activated, the pattern appears on the map pages (Figure 6 and 7) and is flown like any other flight plan. The waypoints are numbered to indicate the sequence to be flown. A turn anticipation arc is shown in the corners of the pattern, based on the aircraft ground speed.

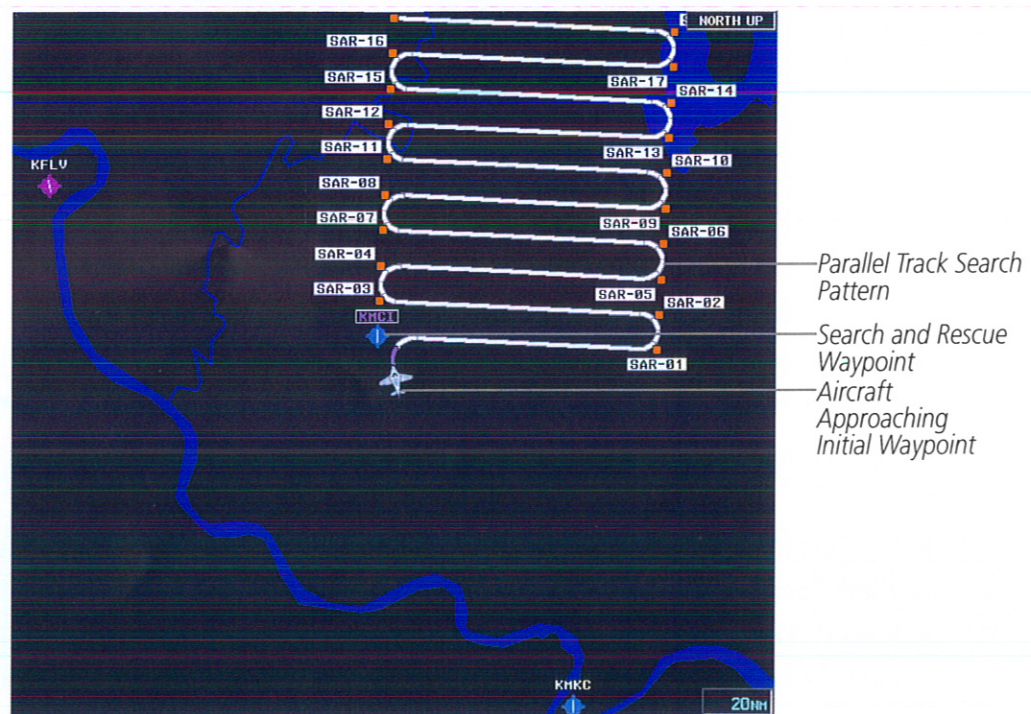


Figure 6 Parallel Track Search Pattern, Navigation Map Page



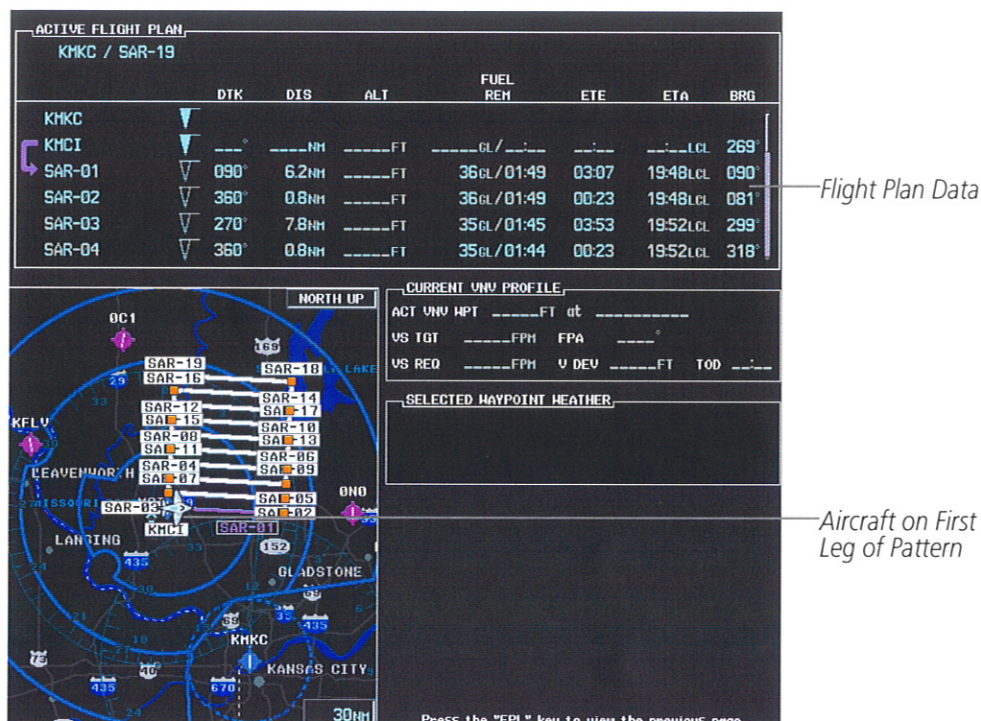


Figure 7 Parallel Track Search Pattern, Flight Plan Page, Wide Screen View

If the search pattern needs to be changed after being activated, follow the procedure to create a search pattern to return to the Search and Rescue Menu or Search and Rescue Screen. The parameters previously entered will still be selected on the Search and Rescue Menu. Make the changes and activate the corrected search pattern.

## SECTOR SEARCH PATTERN

The Sector Search Pattern consists of three triangular sectors, each composed of three legs as shown in Figure 8. The Sector Search Pattern begins at any designated waypoint and proceeds through the route based upon pilot-entered parameters.

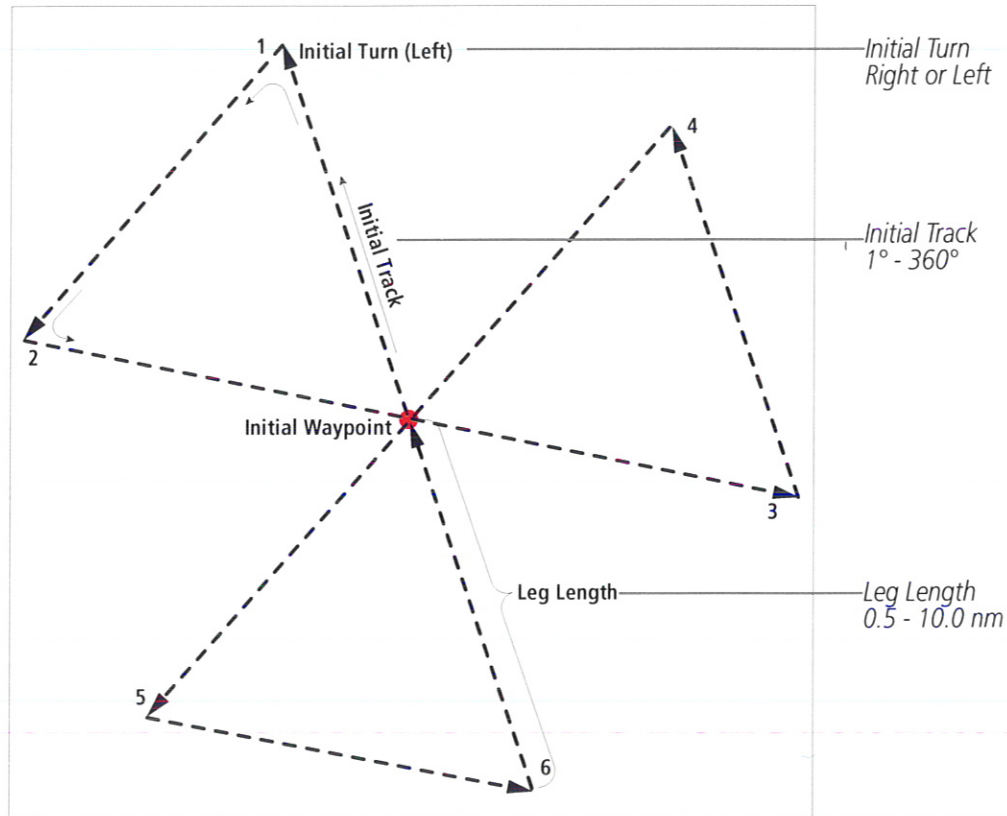


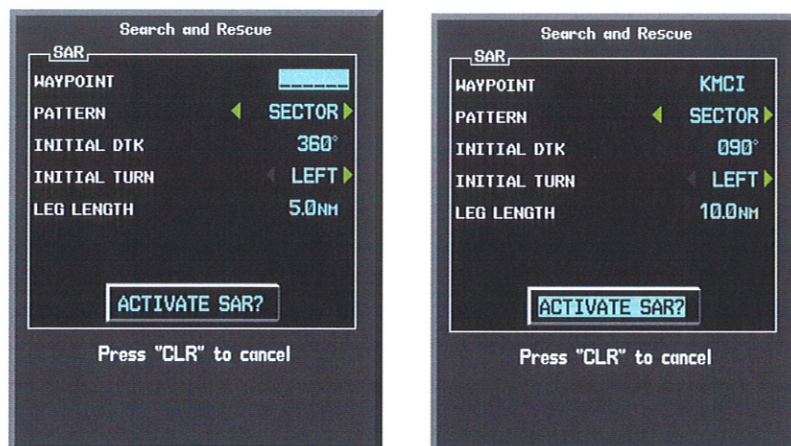
Figure 8 Sector Search Pattern

Sector Parameters	Default Value	Range of Values (resolution)
Initial Track	360°	1 – 360 (1°)
Initial Turn	Left	Left, Right
Leg Length	5.0 nm	0.5 – 10.0 (0.1 nm)

The initial waypoint defines the center of the sector pattern, but is not numbered as one of the SAR waypoints. Each of the three sectors is an equilateral triangle, with each side of the triangle one leg length long.

The Sector Search Pattern can be created on the MFD or on the Touchscreen Controller with the same procedure as the Parallel Track Search Pattern, except there are no settings for track spacing or number of legs. In this modified example, the initial desired track is 90 degrees, the turns are to the left and the leg length is 10.0 nm.





Default Entries

Pressing **ENT** Key Activates Flight Plan

Figure 9 Sector Search Pattern, Flight Plan Menu

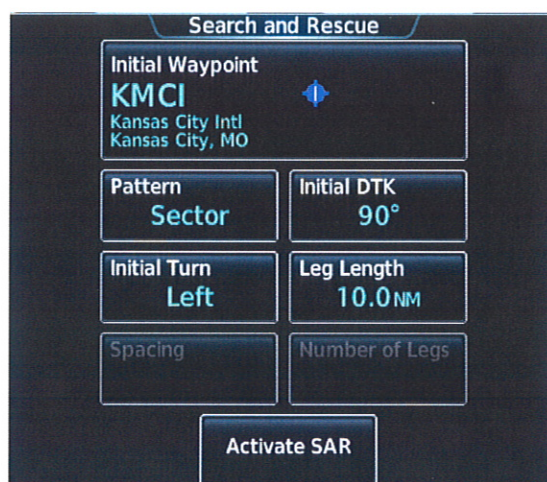


Figure 10 Search and Rescue Screen - Parallel Track

Upon flight plan activation, the pattern appears on the map pages. A turn anticipation arc is shown in the corners of the pattern, based on the aircraft ground speed. The waypoints are numbered to indicate the sequence to be flown.

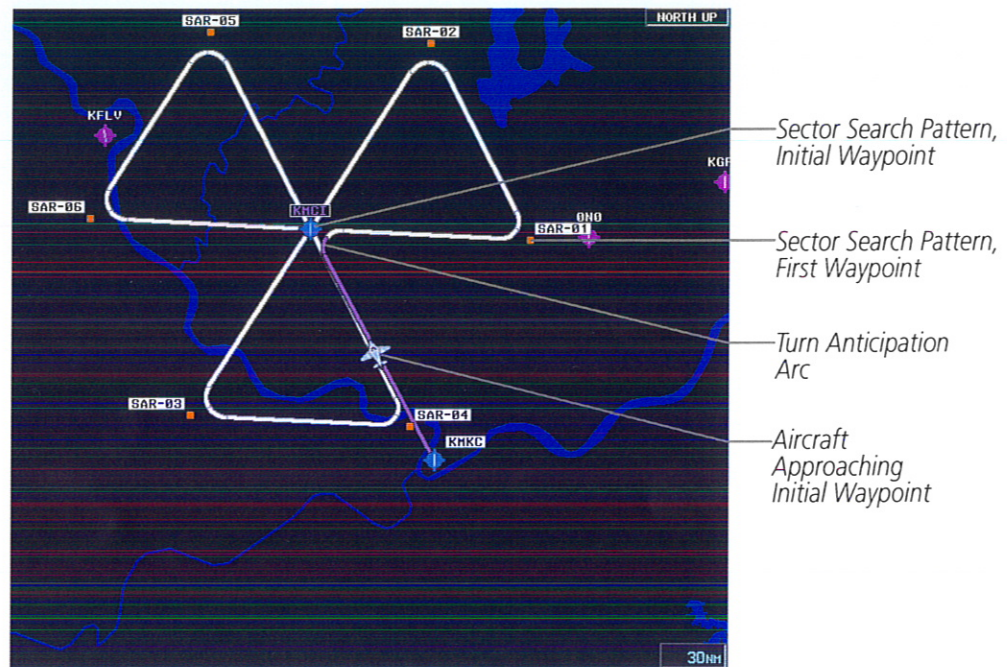


Figure 11 Sector Search Pattern, Navigation Map Page

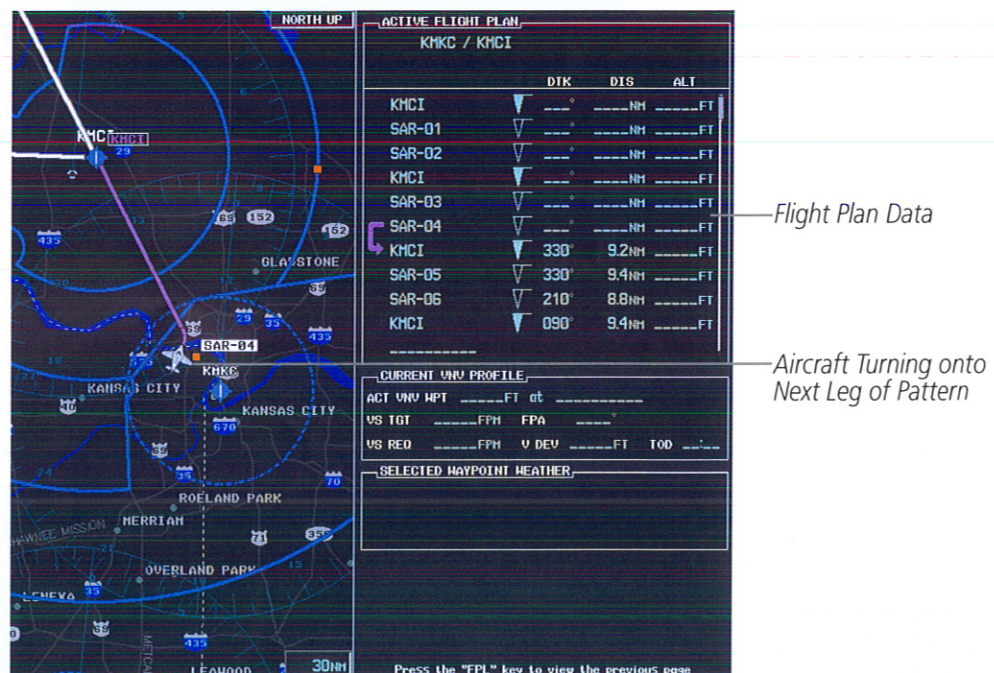


Figure 12 Sector Search Pattern, Flight Plan Page, Narrow Screen View



## EXPANDING SQUARE SEARCH PATTERN

The Expanding Square Search Pattern consists of a square-shaped route that begins at a designated waypoint and continually expands away from the center (Figure 13). The waypoints are numbered to indicate the sequence to be flown.

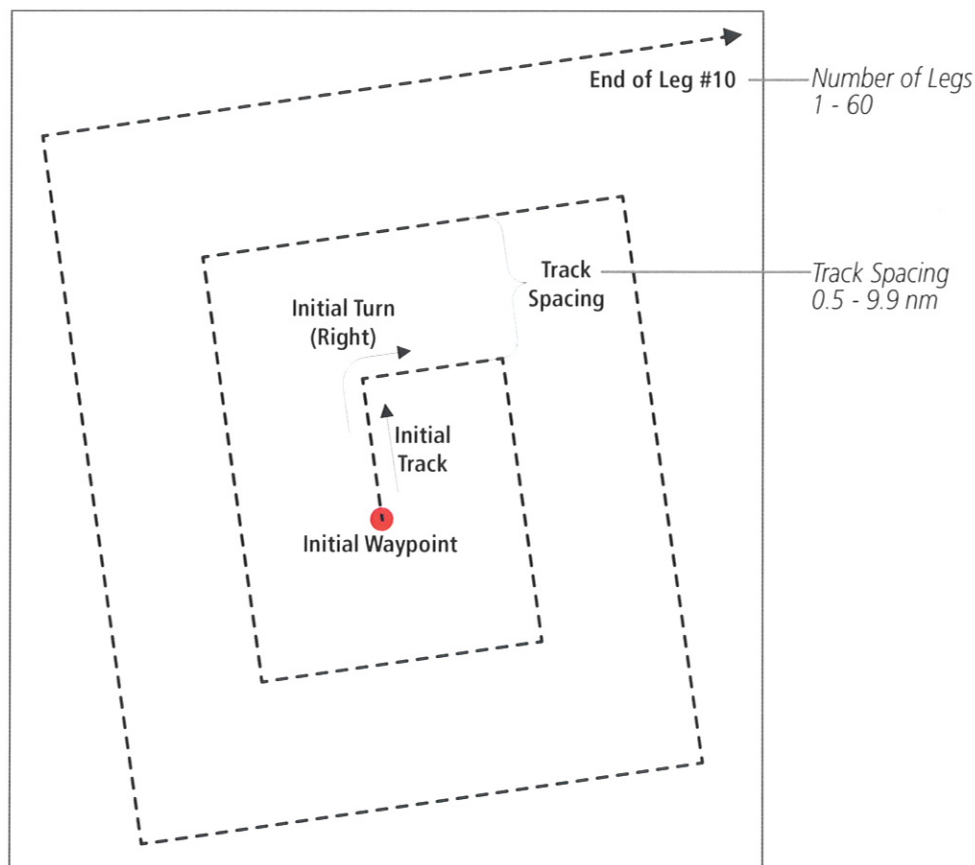
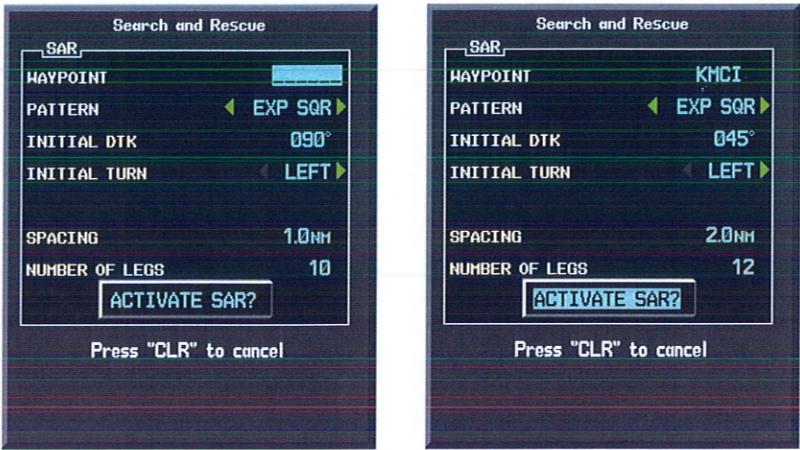


Figure 13 Expanding Square Search Pattern

Expanding Square Parameters	Default Value	Range of Values (resolution)
Initial Track	90°	1 – 360 (1°)
Initial Turn	Left	Left, Right
Track Spacing	1.0 nm	0.5 – 9.9 (0.1 nm)
Number of Legs	10	1 – 60 (1)

The Expanding Square Search Pattern can be created on the MFD or on the Touchscreen Controller with the same procedure as the Parallel Track Search Pattern, except there is no settings for leg length. The length of each leg is calculated based on track spacing.

In the example shown, the parameters were modified to an initial track of 45 degrees, turns are to the left, 2.0 nm track spacing, and 12 legs.



Default Entries

Pressing **ENT** Key Activates Flight Plan

Figure 14 Expanding Square Search Pattern, Flight Plan Menus

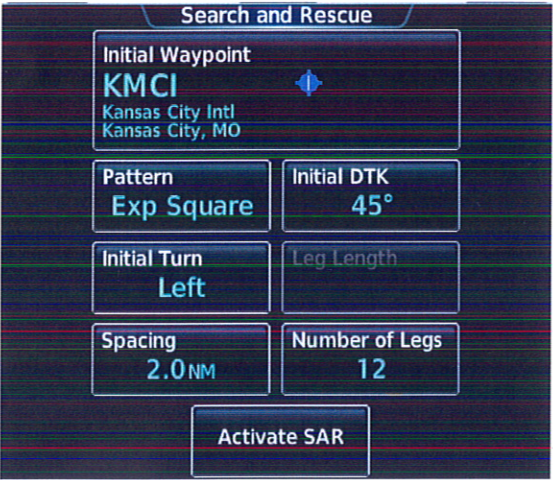


Figure 15 Search and Rescue Screen - Parallel Track



The search pattern is displayed on the map pages when the flight plan is activated. A turn anticipation arc is shown in the corners of the pattern, based on the aircraft ground speed. The aircraft flies to the numbered waypoints in sequence around the center waypoint of the pattern.

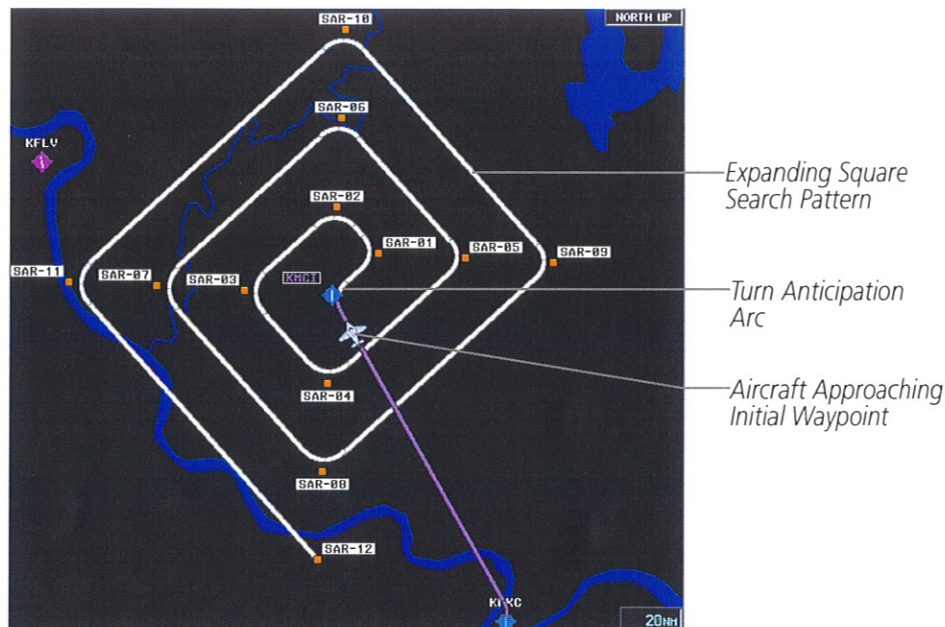


Figure 16 Expanding Square Search Pattern, Navigation Map Page



Figure 17 Expanding Square Search Pattern, Flight Plan Page, Narrow Screen View

CIRCLE SEARCH PATTERN

The Circle Search Pattern is centered around a designated waypoint based on user-entered parameters (turn direction and radius). The beginning/ending waypoint is numbered SAR-00. Unlike the other search patterns, the system does not fly to the designated waypoint first, and then fly the search pattern. The system will fly to the calculated SAR-00 entry point. The turn direction selected determines the location of the SAR-00 entry point to initiate a clockwise (RIGHT) or counter-clockwise (LEFT) path around the circle. A circular search pattern is displayed on the map pages when the flight plan is activated.

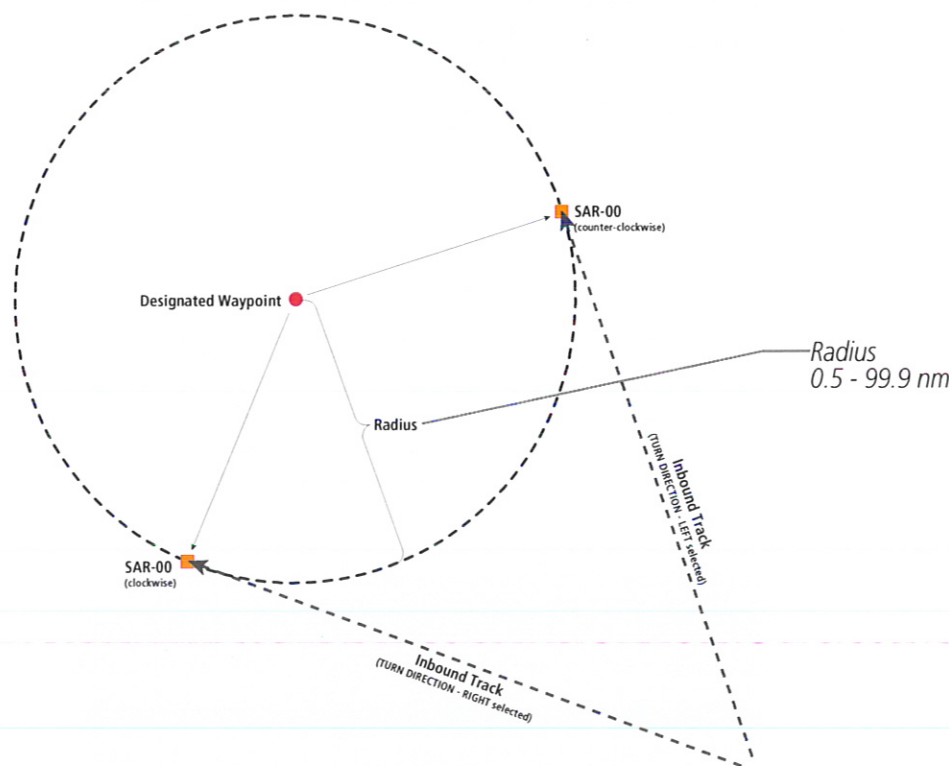


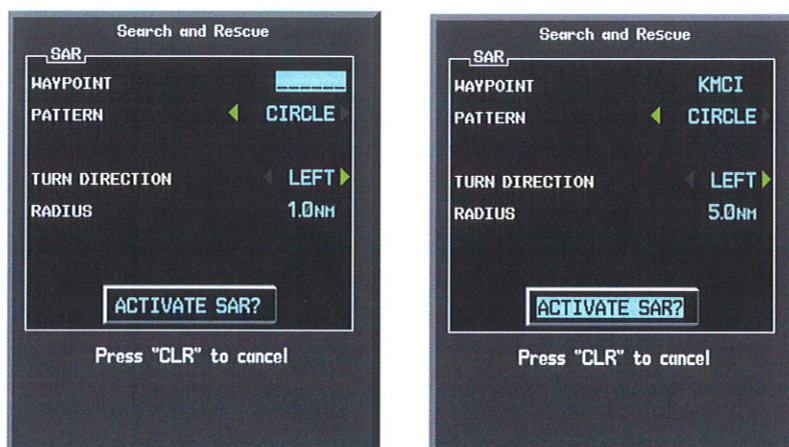
Figure 18 Circle Search Pattern

Circle Parameters	Default Value	Range of Values (resolution)
Initial Turn	Left	Left, Right
Radius	1.0 nm	0.5 – 99.9 (0.1 nm)

The Circle Search Pattern can be created on the MFD or on the Touchscreen Controller with the same procedure as the Parallel Track Search Pattern, except there are only settings for turn direction and radius of the circle.

In the example shown, the parameters were modified to a circle with a radius of 5.0 nm centered on the KMCI.





Default Entries

Pressing **ENT** Key Activates Flight Plan

Figure 19 Circle Search Pattern, Flight Plan Menus

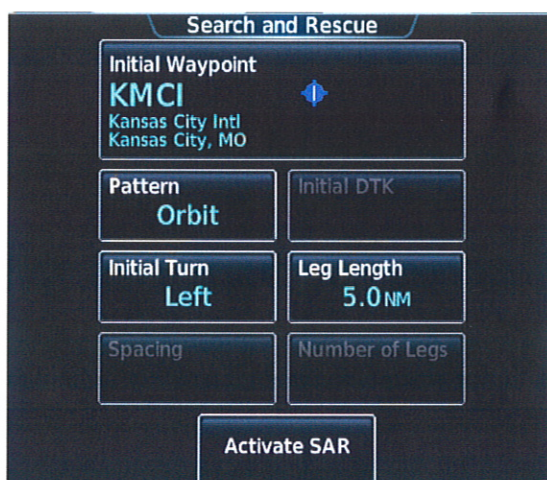


Figure 20 Search and Rescue Screen - Circle

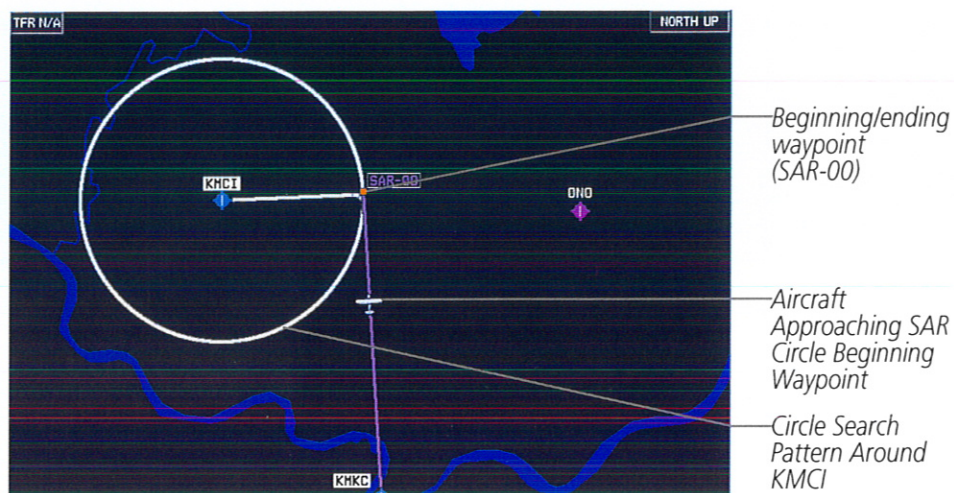


Figure 21 Circle Search Pattern (TURN DIRECTION - LEFT selected), Navigation Map Page

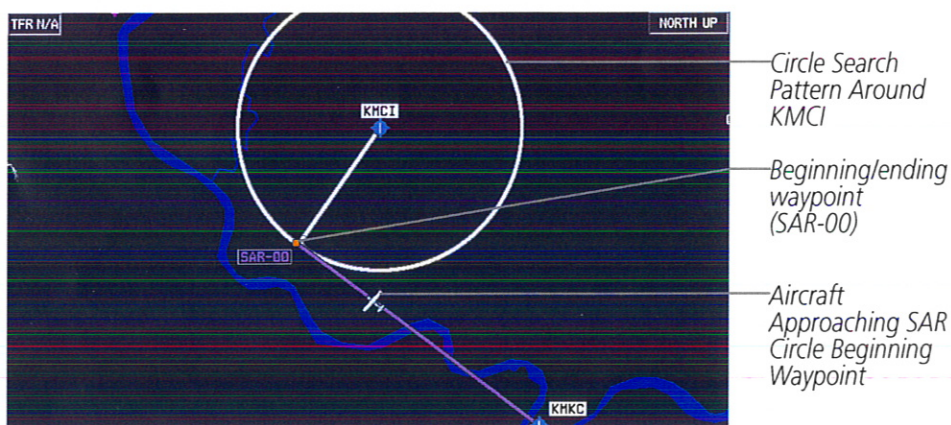


Figure 22 Circle Search Pattern (TURN DIRECTION - RIGHT selected), Navigation Map Page

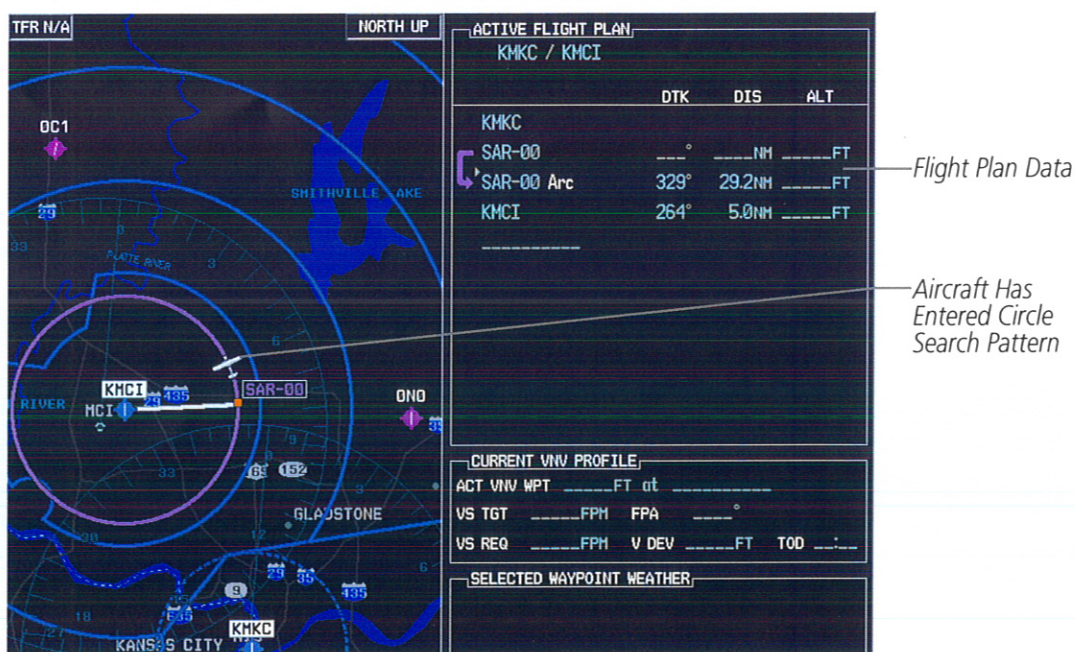


Figure 23 Circle Search Pattern, Flight Plan



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