GARMIN

GNS 400(W)/500(W) Series and GTN 6XX/7XX Series Instrument Procedure Leg Awareness

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RECORD OF REVISIONS

Revision	Revision Date	Description
1	12/10/15	Initial Release

1 INTRODUCTION

This document provides clarification for the operation of Garmin GNS 400(W)/500(W) and GTN 6XX/7XX navigators while flying procedures that include heading and altitude-based legs.

The following are best practices for Garmin GNS and GTN systems used for primary navigation guidance during instrument procedures:

- Before using the GTN or GNS navigation system for primary navigation guidance for any part of an instrument procedure, always compare each leg of the applicable and current published charted procedure to the flight plan displayed on the navigator. The navigation system may not support some specific navigation leg types, it is important to understand how each leg will be navigated prior to conducting the procedure.
- When a procedure includes navigation legs defined by a specific heading, or that end at a specific altitude, it is important to understand how the navigation system will behave and how that system behavior can affect autopilot operations, if coupled.
- Before manually sequencing a leg in a procedure, verify what specific navigation guidance will be provided by the GNS/GTN for that leg, and activate the leg only upon arrival at the appropriate point in the procedure.
- Use available documentation, including Flight Manual Supplements, to understand the operation of the specific GNS or GTN system installed in the aircraft.
- Learn and gain a thorough understanding of instrument navigation operations and general system behavior on the ground using the GNS or GTN PC Trainer provided free of charge at http://www.garmin.com.

1.1 Automatic Leg Sequencing vs Manual Leg Sequencing

1.1.1 Automatic Leg Sequencing

The vast majority of procedure legs are point-to-point legs, during which navigation guidance automatically advances from one leg to the next upon arrival at each waypoint in the flight plan. This is known as automatic leg sequencing.

1.1.2 Manual Leg Sequencing

On certain legs of some procedures, it is necessary for the navigator to suspend leg sequencing. This is annunciated on the navigators with a "SUSP" indication. To receive guidance for the next leg in the flight plan, the pilot must manually unsuspend the navigator. This is accomplished by pressing the "UNSUSP" button on the GTN or the "OBS" button on the GNS. This is known as manual leg sequencing.

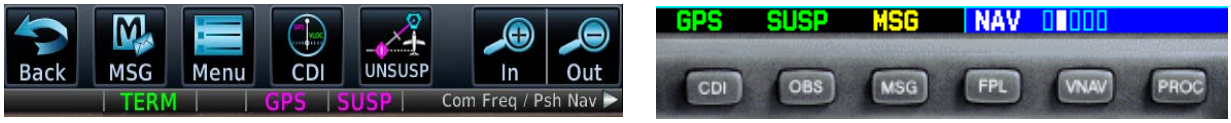


Figure 1-1. GTN and GNS Suspend Indications and Controls

Reasons the navigator may suspend and require manual leg sequencing include:

- The missed approach point has been reached
- Anytime the navigator requires pilot action in order to determine when to begin the next navigation leg:
  - Legs that require a course or heading to be flown indefinitely (for example, "fly heading 360, expect radar vectors")
  - Legs that end at a specific altitude, if the navigator does not have a baro-corrected altitude input (for example, "Climb to 2500, then…")
  - Holding patterns that require a pilot action to exit (for example, a holding pattern at the end of a missed approach procedure)

Guidance for the next leg in the flight plan will begin when the unsuspend button is pressed. In the case of a direct-to leg or other legs without a defined starting fix, the next leg will begin at the location where the unsuspend button is pressed. The pilot must determine *when* it is appropriate to unsuspend, so the guidance for the next leg in the flight plan is used at the appropriate point in the procedure. To make this determination, the pilot must understand what guidance will be provided after unsuspending and make sure the aircraft has reached the point in the procedure where this guidance is needed.

It is not unusual for two back-to-back legs to require manual sequencing. A typical example is a *Leg-to-Altitude* immediately following the missed approach point. In this case, the navigator may immediately suspend again after the first unsuspend action. Always make sure the appropriate point in the procedure has been reached before manually sequencing a leg, particularly when two back-to-back legs require manual sequencing.

1.2 Heading Legs

A heading leg is a segment of a procedure defined by a specific heading to fly rather than a course.

Heading legs typically appear in the charted procedure as an instruction such as, "Fly heading 030°…" and are often at the beginning of a departure, the beginning of a missed approach, or the end of an arrival.

The GNS navigator does not support heading legs and will not display these legs in the flight plan. See *Unsupported Leg Types (GNS)* section of this document.

The GTN navigator does support heading legs and will display them in the flight plan.

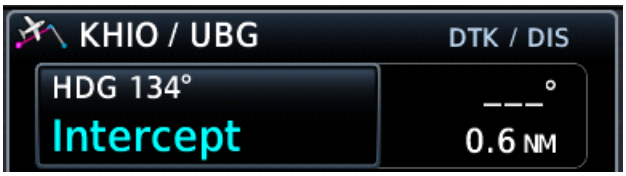


Figure 1-2. Heading Leg in GTN Flight Plan

1.3 Altitude Legs

An altitude leg is a segment of a procedure that ends at a specified altitude.

Altitude legs typically appear in the charted procedure as an instruction such as, "Climb to 2500…" and are often found at the beginning of a missed approach. Another common example is a climb in a holding pattern to a specific altitude. The altitude at which the leg ends is displayed in the flight plan in lieu of a waypoint identifier.

The GTN navigators display altitude legs in the flight plan.

The GNS navigators display some altitude legs in the flight plan. Unsupported altitude legs do not appear in the GNS flight plan.

Figure 1-3. Altitude Leg in GTN/GNS Flight Plans

1.3.1 Altitude Input to the Navigator

An optional altitude input to the navigator can enable automatic leg sequencing on altitude-based legs. When altitude input is available, the navigator determines when the aircraft has reached the termination altitude of an altitude leg and sequence the next flight plan leg. Without the optional altitude input, the navigator will suspend at the start of the altitude leg and will require the pilot to manually sequence (unsuspend) the leg at the appropriate altitude.

The altitude input for automatic sequencing of altitude leg types must come from a digital source that provides MSL altitude with barometric correction. This input typically comes from sources like the Garmin G500/G600. A pressure altitude input (typically provided by a blind encoder for a transponder) cannot be used for automatically sequencing altitude legs.

When automatic altitude leg sequencing is available, the navigator will not annunciate SUSP during an altitude leg. If a suitable altitude input is not available, the navigator will annunciate SUSP during an altitude leg and manual sequencing will be required. The flight manual provides details on the altitude leg capabilities for a particular installation.

1.4 Unsupported Leg Types (GNS)

GNS navigators do not support heading legs which are present at the beginning or end of some procedures.

Example 1 - Heading Leg

Many departure procedures include an instruction to fly a heading to intercept a course. Since the GNS does not support the heading leg, it is not included in the flight plan. The pilot must fly the heading shown on the charted procedure until intercepting the first supported leg in the flight plan.

NOTE

In the example below the course displayed on the navigator (171°) is different from the course published for the procedure (166°). This is due to the difference between the declination of the VOR station and the magnetic variation in the navigation database (a common scenario when navigating VOR courses using GPS).

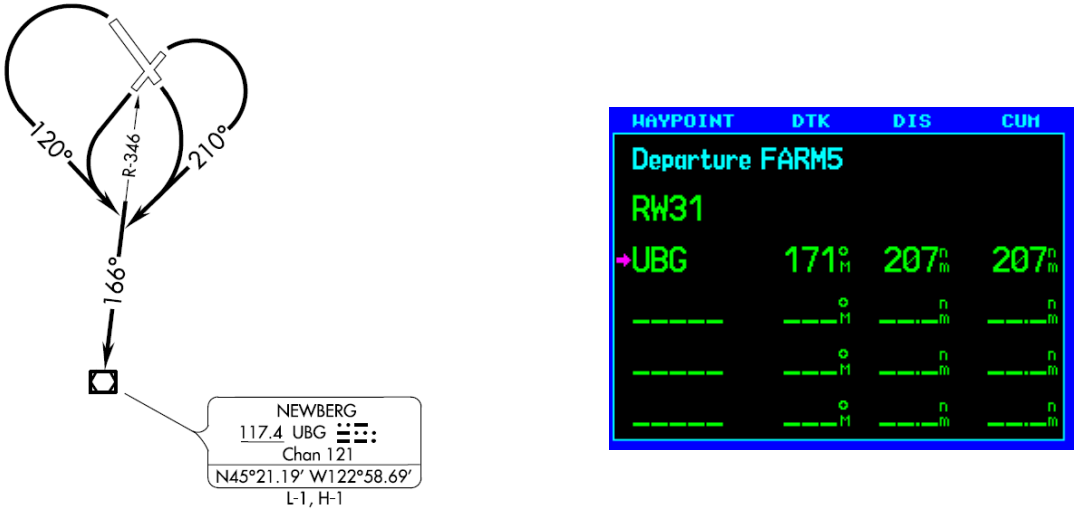
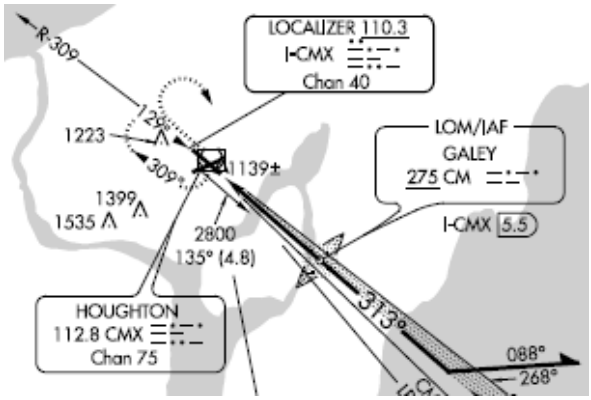


Figure 1-4. Example of Unsupported Heading Legs in GNS Flight Plan

Example 2 - Missed Approach Leg

Many missed approaches include an instruction such as "Climb to 3100, then right turn direct VOR," as shown in the example below. This instruction means that the aircraft should climb to the specified altitude *while continuing along the final approach course*. In the example below, the first supported leg in the GNS navigator is direct-to the VOR, as indicated by "CMX" being the first waypoint after the missed approach point. The pilot should continue along the final approach course, *using the suspended final approach guidance*, and climb to the specified altitude of 3100 feet. Once the aircraft reaches 3100 feet, the pilot should manually sequence the next leg (unsuspend), and the GNS navigator will activate the direct-to leg to the CMX VOR.



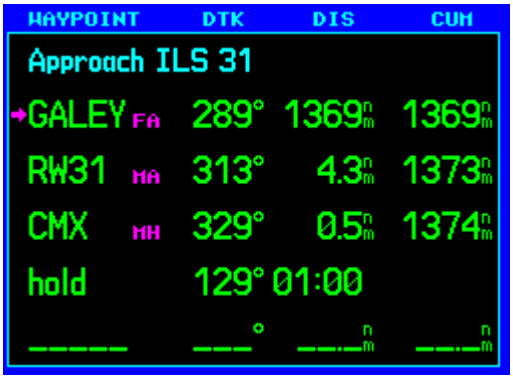


Figure 1-5. Example of Unsupported Missed Approach Leg in GNS Flight Plan

Always review the charted procedure and compare it to the flight plan in the navigator. Identify any unsupported leg types in the procedure and determine when to manually sequence to the next supported leg.

1.5 Autopilot Coupling to Heading Legs (GTN)

By definition, heading legs do not provide deviation guidance on the CDI. Therefore, most autopilots cannot couple to the CDI guidance for these legs in a typical navigation mode (such as NAV and APR modes). Due to variability in autopilot support for heading legs, it is generally recommended that heading legs be flown with the autopilot in HDG mode. In HDG mode, the pilot-selected heading bug is used to command the heading.

Some installations may have the capability to couple the autopilot to a heading leg using GPSS Roll Steering commands. This requires a digital magnetic heading input to the GTN, as well as specific autopilot capability. Pilots should consult the aircraft documentation to familiarize themselves with this capability, if available, prior to use.

1.6 Aircraft Specific Installation Data

Pilots should be familiar with the Airplane/Rotorcraft Flight Manual Supplement to understand the capabilities of the installed navigation system. The AFMS/RFMS should include information on optional inputs to the navigator and autopilot coupling capabilities.