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FAA APPROVED

AIRPLANE FLIGHT MANUAL SUPPLEMENT
or
SUPPLEMENTAL AIRPLANE FLIGHT MANUAL
for
Garmin GNS 480 (CNX 80) SYSTEM INSTALLATION
as installed in

Make and Model Airplane

Registration Number: _____ Serial Number: _____

This document serves as an Airplane Flight Manual Supplement or as a Supplemental Airplane Flight Manual when the aircraft is equipped with the Garmin GNS 480. This document must be carried in the airplane at all times when the Garmin GNS 480 is installed in accordance with Supplemental Type Certificate No. SA01229SE.

The information contained in this document supplements or supersedes the information made available to the operator by the manufacturer in the form of clearly stated placards, markings, or manuals or in the form of an FAA approved Airplane Flight Manual, only in those areas listed herein. For limitations, procedures, and performance information not contained in this document, consult the basic placards, markings, or manuals or the basic FAA approved Airplane Flight Manual.

FAA Approved By: _____



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Section 1. GENERAL

1.1 Garmin GNS 480 GPS/WAAS Nav Com

The Garmin GNS 480 GPS/WAAS Nav Com is a panel-mounted product that contains a GPS/WAAS receiver for GPS approved primary navigation, VHF Com, and VHF Nav in an integrated unit with a moving map and color display. The GNS 480 can also control a remote transponder, and may display TIS-A traffic, or Skywatch traffic data. The previously approved Garmin CNX80 is an equivalent unit with only a bezel and model name change, and all data in this AFMS applies to both models.

The GNS 480 uses a high-resolution color display to provide information about the different functions. Information and “smart keys” unique for each mode of operation are displayed.

When you press the COM, VOR, or XPDR keys on the left side of the display, the display area for that function will be outlined and the information active for editing will be highlighted. The labels for the bottom row of smart keys will change for each function selected. Pressing the CDI key toggles between GPS and VOR/ILS/LOC. The operation of the smart keys across the bottom changes depending on the function selected.

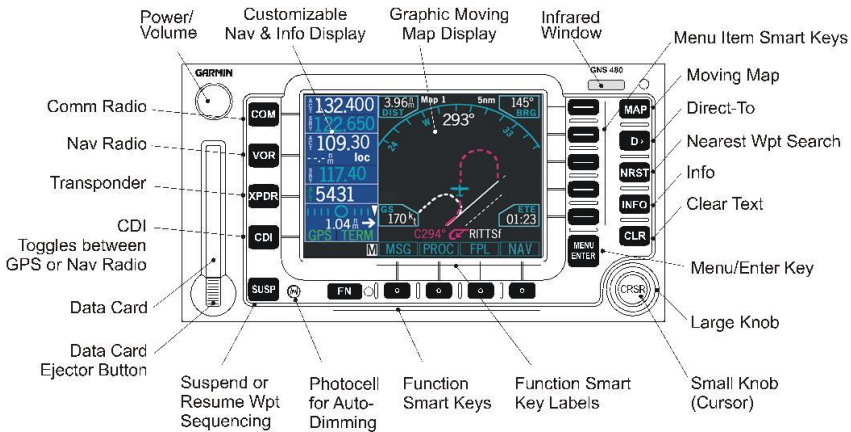


Figure 1 – GNS 480 Control and Display Layout

1.2 Operation

GPS/WAAS TSO-C146a Class 3: The Garmin GNS 480, when installed in accordance with STC SA01229SE, uses GPS and WAAS (within the coverage of a Space-Based Augmentation System complying with ICAO Annex 10) for en route, terminal area, precision and non-precision approach operations (including “GPS”, “or GPS”, and “RNAV” approaches).

Navigation information is referenced to WGS-84 reference system, and should only be used where the Aeronautical Information Publication (including electronic data and aeronautical charts) conform to WGS-84 or equivalent. Waypoints that are not compliant to WGS-84 are noted in the GNS 480 database, and annunciated if embedded in the system's flight plan.

1.2.1 Class II Oceanic, Remote, and other Operations

The Garmin GNS 480, as installed, has been found to comply with the requirements for GPS primary means of Class II navigation in oceanic and remote airspace, when used in conjunction with Garmin AT Route Planning Software, P/N 139-0370-020 (or later FAA approved Version, which is included with the Predictor Program P/N 006-A0154-02 or later FAA approved Version and the Route Planning User's Guide P/N 560-0180-01 or later FAA approved Revision on the P/N 140-0056-004 GNS 480 Product CD). Oceanic operations are supported when GNS 480 annunciates Enroute operations. This provides an alarm limit of 2 nm and a mask angle of 5° (degrees). The GNS 480 also has the ability to predict RAIM availability at any waypoint in the database if WAAS corrections are expected to be absent or disabled. This does not constitute an operational approval for Oceanic or remote area operations. Additional equipment installations or operational approvals may be required.

- a) Use for oceanic navigation requires an additional approved long range oceanic and/or remote area navigation system with independent display, sensors, antenna, and power source.
- b) Use of the GNS 480 for other than U.S. 14 CFR Part 91 operations requires redundant VHF Com and VHF Nav systems. Other limitations may be applicable for Canadian operations.
- c) For FAR 91 operations, the RAIM prediction function may be used in lieu of the prediction software if WAAS corrections are unavailable.
- d) Operations approval may be granted for the use of the GNS 480 RAIM prediction function in lieu of the Route Planning Software for operators requiring this capability. Refer to your appropriate civil aviation authorities for these authorizations.

Section 2. LIMITATIONS

2.1 Pilot's Guide

The Garmin GNS 480 Pilot's Guide, part number and revision listed below (or later FAA approved revisions), must be immediately available to the flight crew whenever navigation is predicted on the use of the Garmin GNS 480.

- Pilot's Guide P/N 560-0984-01 Rev. D or later for software version 2.3 or later

This AFM supplement does not grant approval for IFR operations to aircraft limited to VFR operations. Additional aircraft systems may be required for IFR operational approval, which is beyond the scope of this installation.

If a second redundant GNS 480 is installed outside the acceptable field of view, it should be utilized as a backup system and not the primary source of navigation, unless the primary unit fails. A backup system should not be utilized to originate a flight plan for navigation.

2.2 System Software

The system must utilize the software version listed below (or later FAA approved versions). The software version can be displayed in System Mode Screen on the display. This can be accessed, once the unit is initialized, by depressing the **FN** key twice and selecting **SYS**, followed by **VERS**. Software versions support different functions, check the GNS 480 Pilot's Guide for further information.

Software Item	Approved Software Version <i>(or later FAA approved versions)</i>	
	SW Version	As displayed on GNS 480
Airborne SW	2.4	02.40.00

Table 1 – Approved Software Versions

2.3 Database

The GNS 480 Database Card P/N 138-0329-051 Rev. -- (or later FAA approved version) must be installed.

- a) IFR enroute and terminal navigation is prohibited, unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.
- b) Instrument approaches using the GNS 480 are prohibited, unless GNS 480 approach data is verified by the pilot or crew to be current. Instrument approaches must be accomplished in accordance with approved instrument approach procedures that are loaded from the GNS 480 database.

2.4 Navigation

No navigation is authorized north of 89° (degrees) latitude or south of 89° (degrees) latitude.

Limitations in sections a through d below **are not applicable** if the GNS 480 installation has been upgraded to include GPS WAAS engine software version 3.2,(or later approved) airborne software version 2.3 (or later FAA approved), and either the A33W, GA35, GA36, or GA37 antennas have been installed on the aircraft. The software versions may be verified on the SYS/VERS page on the GNS 480.

The antenna installed in this installation is (one antenna to be checked by installer):

- | | |
|--|---|
| <input type="checkbox"/> A-33 (575-9 / 590-1104) | <input type="checkbox"/> GA56A (011-01154-00) |
| <input type="checkbox"/> GA35 (013-00235-00) | <input type="checkbox"/> A-34 (575-93 / 590-1112) |
| <input type="checkbox"/> GA56W (011-01111-00) | <input type="checkbox"/> GA57 (011-01032-00) |
| <input type="checkbox"/> A33W (013-00261-00) | <input type="checkbox"/> GA36 (013-00244-00) |
| <input type="checkbox"/> GA37 (013-00245-00) | |

Previously FAA approved software and antenna combinations that are not fully TSO-C146a compliant may conduct GPS or WAAS operations under Instrument Flight Rules (IFR) if:

- Aircraft using the GPS or WAAS capability of the GNS 480 navigation equipment under IFR must be equipped with an approved and operational alternate means of navigation appropriate to the flight with the exception of oceanic and remote operations.
- For flight planning purposes, if an alternate airport is required, it must have an approved instrument approach procedure other than GPS or RNAV that is anticipated to be operational and available at the estimated time of arrival. All equipment required for this procedure must be installed and operational.
- For flight planning purposes, Garmin Prediction Program part number 006-A0154-02 (with the installed antenna part number selected) should be used to confirm the availability of RAIM for the intended flight in accordance with the local aviation authority guidelines for TSO-C129a equipment. WAAS NOTAMs (or their absence) and generic prediction tools do not provide an acceptable indication of the availability for the GNS 480 equipment.
- When flight planning an LNAV/VNAV or LPV approach, operators should use the Garmin Prediction Program part number 006-A0154-02 (with the installed antenna part number selected) in addition to any NOTAMs issued for the approach.

2.5 Approaches

- a) During GPS approaches, the pilot must verify the GNS 480 is operating in the approach mode.
- b) When conducting approaches referenced to true North, a manual magnetic variation setting of zero degrees must be used.
- c) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS, VOR approach, or any other type of approach not approved for GPS overlay, is not authorized with GPS navigation guidance.
- d) Use of the GNS 480 VOR/LOC/GS receiver to fly approaches not approved for GPS requires VOR/LOC/GS navigation data to be present on the external indicator.
- e) For aircraft with remote source selection annunciation installed for the CDI/HSI, conducting IFR approaches is prohibited if the remote annunciation is found inoperative during pre-flight. (This limitation does not prohibit the conduct of an IFR approach if the required remote annunciation fails during flight, and the indicator provided on the GNS 480 display may be used as a backup).
- f) Unless in emergency conditions, IFR approaches are prohibited whenever any physical or visual obstruction (such as a throw-over yoke) restricts pilot view and access to the GNS 480.
- g) Instrument approaches using GPS guidance may only be conducted when the GNS is operating in the approach mode. (LNAV, LNAV+V, L/VNAV, LPV, LP, or LP +V)

NOTE

Advisory vertical guidance deviation is provided when the GNS annunciates LNAV+V or LP +V. The controlling minimums remain LNAV or LP even when advisory vertical guidance is provided. Advisory vertical guidance information displayed on the VDI in this mode is only an aid to help flight crews comply with altitude restrictions. When using advisory vertical guidance, the flight crew must use the primary barometric altimeter to ensure compliance with all altitude restrictions in accordance with the LNAV or LP approach procedure.

2.6 Traffic Display

Traffic may be displayed on the GNS 480 when connected to an L-3 Avionics Systems Skywatch, or when the GNS 480 is connected to either a Garmin GTX 33 or GTX 330 series Mode S Transponder providing Traffic Information Services (TIS-A).

Both systems are capable of providing traffic monitoring and alerting to the pilot. The display of traffic is an aid to visual acquisition and may not be utilized for aircraft maneuvering. Operations and display of this traffic data is described in the GNS 480 Pilot's Guide.

2.7 GDL 90 Control

The GNS 480 in this installation IS configured is NOT configured to control a GDL 90. If the GNS 480 is configured to control a compatible transponder (SL70, SL70R, GTX 32, GTX 327, GTX 33, or GTX 330) and the transponder provides control to a GDL 90 UAT Datalink Sensor:

- a) The GDL 90 does not replace any required equipment.
- b) The GDL 90 UAT datalink is approved for Air Traffic Control (ATC) ADS-B Surveillance Services in the United States. For areas where ATC Surveillance Services are provided, the UAT equipment shall broadcast aircraft position, velocity, barometric altitude information, flight identification and/or a 4096 squawk code.
- c) When directed by ATC to turn “off” the ADS-B transmission, pilots should use the GNS 480 transponder standby function (press XPDR, then STBY) to stop ADS-B transmissions while airborne or on the surface.

UAT datalink is also used to receive Traffic Information Services-Broadcast (TIS-B) and Flight Information Services-Broadcast (FIS-B) information. To receive TIS-B and FIS-B information, a display will be needed.

2.8 Flight Plan Display Limitations

The GNS 480 serial 429 data output has been evaluated with the Sandel 3500 series EHSI and Bendix King 40/50 series EFIS system.

For Bendix King 40/50 series EFIS installations, the serial data output must be set according to the GNS 480 installation manual. The display is limited to the types of flight plan legs that can be displayed. Holding patterns, procedure turns, DME arcs, and heading legs cannot be displayed on the system. Pilot Nav legs cannot be displayed. Refer to the GNS 480 for display of the active leg type and guidance.

For Sandel 3500 EFIS HSI installations, the GNS 480 serial data output must be set in accordance with the installation manual. The display is limited to the types of flight plan legs that can be displayed. Heading legs cannot be displayed. Pilot Nav legs cannot be displayed. Refer to the GNS 480 for display of the active leg type and guidance.

2.9 Holding at the Final Approach Fix

The GNS 480 can automatically or manually insert holding patterns at any waypoint. In the event that a course reversal or holding is accomplished at the designated approach FAF, holding patterns within 6.5 degrees of the inbound course will be adjusted for local magnetic variation at the FAF. Depending upon the degree of variation, this will cause the inbound course on the flight plan page to vary slightly. The automatically or manually inserted hold guidance will function normally. Holding patterns at other waypoints will use the locally calculated magnetic variation.

Section 3. EMERGENCY PROCEDURES

3.1 Emergency Procedures

No change.

3.2 Abnormal Procedures

- a) If the Garmin GNS 480 GPS navigation information is not available, or is invalid, internal VHF navigation function may be used, or utilize other remaining operational navigation equipment installed in the airplane as appropriate. If the GNS 480 loses GPS position and reverts to Dead Reckoning mode (indicated by the annunciation “DR” above the groundspeed indication on the moving map display), then the moving map will continue to be displayed. Aircraft position will be based upon the last valid GPS position and estimated by Dead Reckoning methods. Changes in airspeed or winds aloft can affect the estimated position substantially. Dead Reckoning mode terminates at the first Pilot Navigation leg in the flight plan.
- b) If a “Loss of Integrity” (LOI) message is displayed (above the groundspeed indication on the moving map display) during:
 - Enroute/Terminal; continue to navigate using GPS equipment and periodically cross-check the GPS guidance to other approved means of navigation.
 - GPS Approach; GPS approaches are not authorized under LOI, revert to alternate means of navigation. This may be the internal VOR/LOC/GS or other remaining operational navigation equipment as appropriate.
- c) If loss of the VHF Navigation radio message (NAV flag) is displayed, revert to an alternate means of navigation appropriate to the route and phase of flight. GPS position and VHF Comm radio functions are not affected unless annunciated as failed.
- d) If the VHF Comm radio fails (as indicated by the display and associated message), then use another installed VHF Comm radio in the aircraft. GPS position and VHF Navigation radio functions are not affected unless annunciated as failed.
- e) If the GNS 480 transponder control function fails at any time, the SL70 remote transponder will automatically revert to Mode S/C operation and squawk the last code assigned. A GTX 32 or 33 series transponder will retain the last mode of operation at the time of control function failure.
- f) During a GPS LPV precision approach, or GPS LNAV/VNAV approaches, the GNS 480 will downgrade the approach if the Horizontal or Vertical Alarm Limits are exceeded. This will cause the vertical guidance to flag unavailable. The procedure may be continued using LNAV only minimums.
- g) During any GPS approach in which precision and non-precision alarm limits are exceeded, the GNS 480 will revert to terminal operations alarm limits. The GNS 480 will indicate the approach must be aborted in this case. The GNS 480 may be utilized for terminal navigation or other means of primary navigation may be used.

Section 4. NORMAL PROCEDURES

Refer to the GNS 480 Pilot's Guide defined in paragraph 2.1 on page 6 of this document for normal operating procedures.

GNS 480 functionality and user interface is similar to a Flight Management System (FMS). Although intuitive and user friendly, a reasonable degree of familiarity is required to use the GNS 480 without becoming too engrossed in GNS 480 operation at the expense of basic instrument flying in IMC and basic see-and-avoid in VMC. Pilot workload will be higher for pilots with limited familiarity in using the GNS 480 in an IFR environment, particularly without the autopilot engaged. Garmin AT provides excellent GNS 480 training tools with the Pilot's Guide, the Computer Based Training CD ROM with PC based GNS 480 simulator, and the GNS 480 Simulator Mode. Pilots should take full advantage of these training tools to enhance system familiarization. Use of autopilot is strongly encouraged when using the GNS 480 in IMC conditions.

Section 5. PERFORMANCE

No change.

Section 6. WEIGHT AND BALANCE

See current weight and balance data.

Section 7. SYSTEM DESCRIPTIONS

Refer to the GNS 480 Pilot's Guide defined in paragraph 2.1 on page 6 of this document for a complete description of the GNS 480 System.