

FAA APPROVED
AIRPLANE FLIGHT MANUAL SUPPLEMENT
for
Piper PA-31T1
with
Garmin GNS-430 VHF Communication Transceiver
VOR/ILS GPS Receiver System
Reg. No.: N191MA
Serial No.: 31T-8104019

This document must be carried in the aircraft at all times. It describes the operating procedures for the Garmin GNS-430 navigation system when it has been installed in accordance with Garmin Installation Manual P/N 190-00140-02 Revision L dated December, 2002 and FAA form 337 dated 2-16-04.

For aircraft with a FAA approved Aircraft Flight Manual, this document serves as the FAA approved Aircraft Flight Manual Supplement for the Garmin GNS-430. For aircraft that do not have an approved flight manual, this document serves as the FAA approved Supplemental Flight Manual for the Garmin GNS-430.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed. For limitations, emergency procedures, normal procedures and performance information, consult the Airplane Flight Manual.

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Scot E. Thompson, Avionics
Flight Standards District Office
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Minneapolis, MN 55450

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SECTION 1: GENERAL

The GNS-430 system is a fully integrated, panel-mounted instrument, which contains a VHF communications transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) navigation computer. The system consists of a GPS antenna, GPS receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF communications antenna and a VHF communications transceiver. The primary function of the VHF communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

Provided the Garmin GNS-430's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

- VFR/IFR en route, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR/DME, TACAN, NDB, NDB/DME, and RNAV) operation within the U.S. National Airspace System in accordance with the criteria of AC 20-138.
- One of the approved sensors, for a single or dual GNS-430 installation, for North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace in accordance with AC 91-49 and AC 120-33.
- The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION 2: Limitations

The Garmin GNS-430 Pilot's Guide, P/N 190-00140-00, Revision F, dated July, 2000, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

The Garmin 400 Series Pilot's Guide Addendum, Display Interface for Traffic and Weather Data, must be immediately available to the flight crew if the BF Goodrich WX-500 Stormscope® or the BF Goodrich SKYWATCH™ Traffic Advisory System (TAS) is installed.

The GNS-430 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
Main	2.00
GPS	2.00
Comm	1.22
VOR/LOC	1.25
G/S	2.00

The Main software version is displayed on the GNS-430 self-test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "SOFTWARE/DATABASE VER".

IFR en-route and terminal navigation predicated upon the GNS-430's GPS receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

Instrument approach navigation predicated upon the GNS-430's GPS receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.

- (a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
- (b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS-430's GPS receiver is not authorized.
- (c) Use of the GNS-430 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.
- (d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigational aid and the required navigation aid must be operational.
- (e) VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down Fix altitude protection, or arrival at approach minimums in normal position to land.

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If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS-430 prior to operation (refer to Pilot's Guide for procedure in necessary):

- a. dis, spd.....nm kt (sets navigation units to "nautical miles" and "knots")
- b. alt, vs.....ft fpm (sets altitude units to "feet" and "feet per minute")
- c. map datum....WGS 84 (sets map datum to WGS-84, see note below)
- d. posn.....deg-min (sets navigation grid units to decimal minutes)

NOTE:

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS-430 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS-430 prior to use for navigation.

SECTION 3: Emergency Procedures

If the Garmin GNS-430 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

If "RAIM POSITION WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS-430 VOR/ILS receiver or an alternate means of navigation other than the GNS-430's GPS receiver.

If "RAIM NOT AVAILIBLE" message is displayed in the en-route, terminal or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS-430's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS-430's VOR/ILS receiver or another IFR approved navigation system.

If "RAIM IS NOT AVAILIBLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 MHz into the "Active" frequency window.

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SECTION 4: Normal Procedures

DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the Garmin GNS-430 Pilot's Guide, P/N 190-00140-00, Revision A, dated October 1998, or later appropriate revision.

PILOT'S DISPLAY

The GNS-430 system data will appear on the Pilot's HSI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

AUTOPILOT / FLIGHT DIRECTOR OPERATION

Coupling of the GNS-430 system steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS-430 system and the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS-430. For detailed autopilot/flight director operational instructions, refer to the FAA approved Flight Manual Supplement for the autopilot/flight director.

CROSSFILL OPERATIONS

For dual GNC-400 Product Series or GNC400/500 Product Series installations, crossfill capabilities exist between the number one and number two Systems. Refer to Garmin GNS-430 Pilot's Guide for detailed crossfill operating instructions.

AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS-430 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer/glide slope guidance as the aircraft approaches the localizer course inbound to the final approach fix. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS to localizer/glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix. Refer to the GNS-430 Pilot's Guide for detailed operating instructions.

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DISPLAY OF LIGHTNING STRIKE DATA

For installations that interface the BF Goodrich WX-500 Stormscope and the GNS-430, lightning strike data detected by the WX-500 will appear on the GNS-430. For detailed operating instructions regarding the interface of the GNS-430 with the WX-500, refer to the WX-500 Pilot's Guide and the GNS-430 Pilot's Guide Addendum for the WX-500 Stormscope interface.

DISPLAY OF TRAFFIC ADVISORY DATA

For installations that interface the BF Goodrich SKYWATCH Traffic Advisory System (TAS) and the GNS-430, traffic data detected by the SKYWATCH will appear on the GNS-430. For detailed operating instructions regarding the interface of the GNS-430 with the SKYWATCH, refer to the FAA approved Flight Manual Supplement for the SKYWATCH, the Pilot's Guide for the SKYWATCH and the GNS-430 Pilot's Guide Addendum for the SKYWATCH Traffic Advisory System interface.

SECTION 5: Performance

No change.

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AIRPLANE FLIGHT MANUAL SUPPLEMENT
for
Piper PA-31T1
with
Garmin GNS-530 VHF Communication Transceiver
VOR/ILS GPS Receiver System
Reg. No.: N191MA
Serial No.: 31T-8104019

This document must be carried in the aircraft at all times. It describes the operating procedures for the Garmin GNS-530 navigation system when it has been installed in accordance with Garmin Installation Manual P/N 190-00181-02 Revision G dated May, 2003 and FAA form 337 dated 2-16-04.

For aircraft with a FAA approved Aircraft Flight Manual, this document serves as the FAA approved Aircraft Flight Manual Supplement for the Garmin GNS-530. For aircraft that do not have an approved flight manual, this document serves as the FAA approved Supplemental Flight Manual for the Garmin GNS-530.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed. For limitations, emergency procedures, normal procedures and performance information, consult the Airplane Flight Manual.

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SECTION 1: GENERAL

The GNS-530 system is a fully integrated, panel-mounted instrument, which contains a VHF communications transceiver, a VOR/ILS receiver, and a Global Positioning System (GPS) navigation computer. The system consists of a GPS antenna, GPS receiver, VHF VOR/LOC/GS antenna, VOR/ILS receiver, VHF communications antenna and a VHF communications transceiver. The primary function of the VHF communication portion of the equipment is to facilitate communication with Air Traffic Control. The primary function of the VOR/ILS Receiver portion of the equipment is to receive and demodulate VOR, Localizer, and Glide Slope signals. The primary function of the GPS portion of the system is to acquire signals from the GPS system satellites, recover orbital data, make range and Doppler measurements, and process this information in real-time to obtain the user's position, velocity, and time.

Provided the Garmin GNS-530's GPS receiver is receiving adequate usable signals, it has been demonstrated capable of and has been shown to meet the accuracy specifications for:

- VFR/IFR en route, terminal, and non-precision instrument approach (GPS, Loran-C, VOR, VOR/DME, TACAN, NDB, NDB/DME, and RNAV) operation within the U.S. National Airspace System in accordance with the criteria of AC 20-138.
- One of the approved sensors, for a single or dual GNS-530 installation, for North Atlantic Minimum Navigation Performance Specifications (MNPS) Airspace in accordance with AC 91-49 and AC 120-33.
- The system meets RNP5 airspace (BRNAV) requirements of AC 90-96 and in accordance with AC 20-138, and JAA AMJ 20X2 Leaflet 2 Revision 1, provided it is receiving usable navigation information from the GPS receiver.

Navigation is accomplished using the WGS-84 (NAD-83) coordinate reference datum. Navigation data is based upon use of only the Global Positioning System (GPS) operated by the United States of America.

SECTION 2: Limitations

The Garmin GNS-530 Pilot's Guide, P/N 190-00181-00, Revision A, dated April, 2000, or later appropriate revision, must be immediately available to the flight crew whenever navigation is predicated on the use of the system.

The Garmin 500 Series Pilot's Guide Addendum, Display Interface for Traffic and Weather Data, must be immediately available to the flight crew if the BF Goodrich WX-500 Stormscope® or the BF Goodrich SKYWATCH™ Traffic Advisory System (TAS) if installed.

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The GNS-530 must utilize the following or later FAA approved software versions:

Sub-System	Software Version
Main	2.00
GPS	2.00
Comm	1.22
VOR/LOC	1.25
G/S	2.00

The Main software version is displayed on the GNS-530 self-test page immediately after turn-on for 5 seconds. The remaining system software versions can be verified on the AUX group sub-page 2, "SOFTWARE/DATABASE VER".

IFR en-route and terminal navigation predicated upon the GNS-530's GPS receiver is prohibited unless the pilot verifies the currency of the database or verifies each selected waypoint for accuracy by reference to current approved data.

Instrument approach navigation predicated upon the GNS-530's GPS receiver must be accomplished in accordance with approved instrument approach procedures that are retrieved from the GPS equipment database. The GPS equipment database must incorporate the current update cycle.

- (a) Instrument approaches utilizing the GPS receiver must be conducted in the approach mode and Receiver Autonomous Integrity Monitoring (RAIM) must be available at the Final Approach Fix.
- (b) Accomplishment of ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for GPS overlay with the GNS-530's GPS receiver is not authorized.
- (c) Use of the GNS-530 VOR/ILS receiver to fly approaches not approved for GPS require VOR/ILS navigation data to be present on the external indicator.
- (d) When an alternate airport is required by the applicable operating rules, it must be served by an approach based on other than GPS or Loran-C navigation, the aircraft must have the operational equipment capable of using that navigational aid and the required navigation aid must be operational.
- (e) VNAV information may be utilized for advisory information only. Use of VNAV information for Instrument Approach Procedures does not guarantee step-down fix altitude protection, or arrival at approach minimums in normal position to land.

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If not previously defined, the following default settings must be made in the "SETUP 1" menu of the GNS-530 prior to operation (refer to Pilot's Guide for procedure in necessary):

- a. dis, spd.....nm kt (sets navigation units to "nautical miles" and "knots")
- b. alt, vs.....ft fpm (sets altitude units to "feet" and "feet per minute")
- c. map datum.....WGS 84 (sets map datum to WGS-84, see note below)
- d. posn.....deg-min (sets navigation grid units to decimal minutes)

NOTE:

In some areas outside the United States, datums other than WGS-84 or NAD-83 may be used. If the GNS-530 is authorized for use by the appropriate Airworthiness authority, the required geodetic datum must be set in the GNS-530 prior to use for navigation.

SECTION 3: Emergency Procedures

If the Garmin GNS-530 navigation information is not available or invalid, utilize remaining operational navigation equipment as required.

If "RAIM POSITION WARNING" message is displayed the system will flag and no longer provide GPS based navigational guidance. The crew should revert to the GNS-530 VOR/ILS receiver or an alternate means of navigation other than the GNS-530's GPS receiver.

If "RAIM NOT AVAILIBLE" message is displayed in the en-route, terminal or initial approach phase of flight, continue to navigate using the GPS equipment or revert to an alternate means of navigation other than the GNS-530's GPS receiver appropriate to the route and phase of flight. When continuing to use GPS navigation, position must be verified every 15 minutes using the GNS-530's VOR/ILS receiver or another IFR approved navigation system.

If "RAIM IS NOT AVAILIBLE" message is displayed while on the final approach segment, GPS based navigation will continue for up to 5 minutes with approach CDI sensitivity (0.3 nautical mile). After 5 minutes the system will flag and no longer provide course guidance with approach sensitivity. Missed approach course guidance may still be available with 1 nautical mile CDI sensitivity by executing the missed approach.

In an in-flight emergency, depressing and holding the Comm transfer button for 2 seconds will select the emergency frequency of 121.500 MHz into the "Active" frequency window.

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SECTION 4: Normal Procedures

DETAILED OPERATING PROCEDURES

Normal operating procedures are described in the Garmin GNS-530 Pilot's Guide, P/N 190-00181-00, Revision A, dated April 2000, or later appropriate revision.

PILOT'S DISPLAY

The GNS-530 system data will appear on the Pilot's HSI. The source of data is either GPS or VLOC as annunciated on the display above the CDI key.

AUTOPILOT / FLIGHT DIRECTOR OPERATION

Coupling of the GNS-530 system steering information to the autopilot/flight director can be accomplished by engaging the autopilot/flight director in the NAV or APR mode.

When the autopilot/flight director system is using course information supplied by the GNS-530 system the course pointer is not automatically driven to the desired track, the course pointer on the HSI must be manually set to the desired track (DTK) indicated by the GNS-530. For detailed autopilot/flight director operational instructions, refer to the FAA approved Flight Manual Supplement for the autopilot/flight director.

CROSSFILL OPERATIONS

For dual GNC-500 Product Series or GNC500/400 Product Series installations, crossfill capabilities exist between the number one and number two Systems. Refer to Garmin GNS-530 Pilot's Guide for detailed crossfill operating instructions.

AUTOMATIC LOCALIZER COURSE CAPTURE

By default, the GNS-530 automatic localizer course capture feature is enabled. This feature provides a method for system navigation data present on the external indicators to be switched automatically from GPS guidance to localizer/glide slope guidance as the aircraft approaches the localizer course inbound to the final approach fix. If an offset from the final approach course is being flown, it is possible that the automatic switch from GPS to localizer/glide slope course guidance will not occur. It is the pilot's responsibility to ensure correct system navigation data is present on the external indicator before continuing a localizer based approach beyond the final approach fix. Refer to the GNS-530 Pilot's Guide for detailed operating instructions.

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DISPLAY OF LIGHTNING STRIKE DATA

For installations that interface the BF Goodrich WX-500 Stormscope and the GNS-530, lightning strike data detected by the WX-500 will appear on the GNS-530. For detailed operating instructions regarding the interface of the GNS-530 with the WX-500, refer to the WX-500 Pilot's Guide and the GNS-530 Pilot's Guide Addendum for the WX-500 Stormscope interface.

DISPLAY OF TRAFFIC ADVISORY DATA

For installations that interface the BF Goodrich SKYWATCH Traffic Advisory System (TAS) and the GNS-530, traffic data detected by the SKYWATCH will appear on the GNS-530. For detailed operating instructions regarding the interface of the GNS-530 with the SKYWATCH, refer to the FAA approved Flight Manual Supplement for the SKYWATCH, the Pilot's Guide for the SKYWATCH and the GNS-530 Pilot's Guide Addendum for the SKYWATCH Traffic Advisory System interface.

SECTION 5: Performance

No change.

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AIRPLANE FLIGHT MANUAL SUPPLEMENT

for

Piper PA-31-T1

with

BF Goodrich Avionics Systems
Skywatch Traffic Advisory System Model SKY-497

Reg. No.: N191MA

Serial No.: 31T-8104019

This document must be carried in the aircraft at all times. It describes the operating procedures for the BF Goodrich Avionics Systems Skywatch system model SKY-497 when it has been installed in accordance with BF Goodrich Avionics Systems Installation Manual P/N 009-10800-001 Revision C dated February, 2001 and FAA form 337 dated 2-16-04.

The information contained herein supplements or supersedes the basic Airplane Flight Manual only in those areas listed. For limitations, emergency procedures, normal procedures and performance information, consult the Airplane Flight Manual.

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2. If the pilot is advised by ATC to disable transponder altitude reporting, Skywatch must be turned off.
3. Operation of the Skywatch system requires that the Skywatch Pilot's Guide is kept on the aircraft and available to the pilot at all times.
4. Skywatch can only detect aircraft that are transponder equipped.

SECTION 3: Emergency Procedures

No change.

SECTION 4: Normal Procedures

A. SELF-TEST

1. The Skywatch system should be tested prior to flight.
2. The Multifunction Display (MFD) should present the Self-Test display.
3. After completion of self-test, the "Traffic Advisory System Test Passed" audio annunciation will be heard and the MFD will revert to the Skywatch standby screen.
4. If the "Traffic Advisory System Test Failed" message is heard or the SKY-497 Failed screen appears on the MFD the Skywatch system should be turned off.

NOTE: The self-test is inhibited when the aircraft is airborne.

B. STANDBY CHARACTERISTICS

1. The Skywatch system will display SKY-497 STANDBY when the aircraft is on the ground and not tracking or processing traffic information. Standby gives the system the ability to track targets while on the ground. Pressing the OPR button activates the system and changes the display from the Standby screen to the Above (ABV) mode and 6nm range. The ranges available are 6nm and 2nm and are selectable by pressing the Display Range button.
2. To go back into Standby, press the STB button. The system will go back to the SKY-497 STANDBY screen and will not track targets again until the system is either manually switched out of Standby, while on the ground or automatically switched out of Standby 8 seconds after the aircraft has departed.
3. The Self-Test works while in the SKY-497 STANDBY screen by pressing the TEST button.

4. The Skywatch system while in flight or operating on the ground will display 3 altitude modes: Above (ABV), Normal (NRM), and Below (BLW). Pressing the Altitude display button activates these modes. Refer to the pilot's guide for the Skywatch Traffic Advisory System Model SKY-497 P/N 009-10801-001 Revision A or latest FAA approved revision.

C. ABNORMAL PROCEDURE

1. If "TRAFFIC ADVISORY SYSTEM TEST FAILED" is heard or the SKY-497 FAILED screen appears on the Skywatch system should be turned off.
2. If the Mode C source fails in flight, turn the Skywatch off.

D. RESPOND TO TRAFFIC ADVISORIES

1. When the SKY-497 issues a TA, scan outside for the intruder aircraft. Call ATC for guidance and if you visually acquire the traffic use the normal right-of-way procedures to maintain separation.
2. Do not attempt maneuvers based solely on traffic information shown on the SKY-497 display. Information on the display is provided to the flight crew as an aid in visually acquiring traffic; it is not a replacement for ATC and See and Avoid techniques.

SECTION 5: Performance

No change.