

Garmin GNS 530/430

Sample Training Syllabus and Flight Lessons for Use by Flight Schools & Flying Clubs



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In flight schools, flying clubs and aircraft rental organizations, pilots are often required to learn how to operate the various types and makes of avionics installed in the rental fleet. In most cases, no specific training is provided on this equipment other than for rudimentary operation and minimum functions; in some cases no training is provided at all.

In modern aircraft, a number of new navigation techniques and pieces of equipment are available that are designed to enhance the safety of flight operations in visual and instrument meteorological conditions. Advances in navigation technology can provide the greatest benefits in situational awareness and help reduce the cost of flight operations by allowing more direct routes and simplified approach procedures.

Of all of these advances, none of them alone can bring about a major change in the accident rate of general aviation aircraft. Pilot training and periodic evaluation is the key to realizing the safety benefits of new technology and reducing accident rates. The combination of technology and pilot training will help increase safety, lower insurance costs and improve the public perception of general aviation.

Overview

The enclosed sample syllabi and lesson plans are provided as part of the FAA – Industry Training Standards program (FITS). This information is designed to be incorporated into existing flight training/aircraft checkout/recurrent qualification programs.

The syllabi and lesson plans are valid for both GNS 530 and GNS 430 series Garmin avionics. There are 3 main training types that this material may be used for: **home study, flight checkout and recurrent**.

The home study portion is designed to prepare the pilot for use of the avionics and to maximize the flight training segment that follows. This part of the materials is for use with any pilot who plans to fly aircraft equipped with GNS 530/430 avionics. It can be incorporated in any stage of pilot training, including private pilot, instrument and commercial as well as aircraft checkouts and recurrent training, instrument proficiency checks (IPCs), and flight reviews.

The flight training segments emphasize scenario-based training. These flights are designed to be cross-country flights resembling normal flight operations. The en-route segment is ideal for standard air work and provides an opportunity to train a pilot in both VFR and simulated IFR conditions quickly. It challenges the pilot's ability to respond to a suddenly increased workload while testing his or her ability to properly use the avionics systems.

The recurrent training portion uses the same sample enclosed materials for use in conjunction with insurance qualifications, IPCs, or flight reviews and is equally well suited for each. The structure remains the same and is based around the home study review of the avionics in preparation for the flight segment. It encourages use of all system capabilities which, depending on the pilot's typical flight operations, may not be used in the normal course of the flight.

These lessons are only sample lesson plans and are designed to be used in conjunction with other programs. Suggestions and recommendations are welcome and will be taken into consideration in future document revisions. Comments/suggestions can be sent via e-mail to the Garmin FITS Program Manager at: CFI_Tools@garmin.com.



Disclaimer:

These documents are samples only and are provided solely as tools to help Certified Flight Instructors develop their own training programs. It is also the sole responsibility of the CFI and pilot in training to ensure that training is completed to an appropriate level of proficiency.

Home Study Worksheets

Objective:

To develop a basic level of knowledge surrounding the operation of Garmin GNS 530/430 avionics prior to the commencement of actual flight training.

Elements:

- Terminology Review
- Review of requirements for the use of GPS in lieu of other avionics equipment
- Communications radio operation
- VOR/LOC (VLOC) operation
- GPS operation
- Additional interfaces and associated operations
- Avionics use as an aid to the aeronautical decision making process
- PC simulator exercises

Schedule:

Each lesson is designed to take approximately 1 to 2 hours.

Equipment:

- GNS 530/430 Pilot's Guides and Quick References
- GNS 530/430 Interface Addendum
- GNS 530/430 PC simulator
- Lessons
- Worksheets

Student Actions:

Complete all lessons prior to arriving for training/checkout flight(s).

Completion Standards:

Satisfactory completion of all worksheets/lessons prior to flight training as determined by instructor.

GNS 530/430 Home Study 1

Worksheet – Use of GPS in lieu of other avionics, regulations

After reviewing AIM section 1-1-21 f. (Use of GPS for IFR Oceanic, Domestic En Route, and Terminal Area Operations), answer the following questions:

1. In general, can the GNS 430 or GNS 530 be used for IFR operations in place of ADF and/or DME equipment?
2. Describe the requirements for determining aircraft position over a DME fix using GPS.
3. Describe the requirements for flying a DME arc using GPS.
4. Describe the requirements for holding over an NDB/compass locator using GPS.
5. Must the Jeppesen navigation database be current to fly approaches under IFR?
6. What does the abbreviation RAIM stand for?
7. For preflight preparation, how can you obtain GPS RAIM information?
8. While flying an approach, what should the pilot do if a RAIM warning is received prior to arrival at the Final Approach Waypoint?
9. Explain the difference between fly-over and fly-by waypoints and draw a picture of their approach chart symbols.
10. On some approaches, the heading information portrayed on the GPS is slightly different than the heading shown on the chart; why does this happen?

GNS 530/430 Home Study 2

Worksheet – Terminology Review

After reviewing Section 11 of the GNS 430 Pilot's Guide and Reference Manual (Section 12 of the GNS 530 Pilot's Guide and Reference Manual), answer the following questions:

1. VLOC refers to what capability in the GNS 530/430 units?
2. Define DTK, TRK, XTK and their relationship to each other.
3. Define CTS.
4. Define and describe the relationship between VNAV and VSR.
5. What does ESA stand for and what is its purpose?
6. What does the abbreviation FPL stand for?
7. What is the difference between ETA and ETE?
8. What is the difference between HDG and TRK?
9. What is the difference between MSA and ESA?
10. On the satellite status page, the GNS 530/430 units list EPE and DOP. What is the definition of each of these acronyms?
11. What does OBS mean?
12. The term SUA is used as a general reference to what data contained in the Jeppesen aviation database?
13. Define FDE and explain in what types of operations it is required to be used.

GNS 530/430 Home Study 3

Worksheet – COM and VLOC Operation

After reviewing the GNS 430 or GNS 530 Pilot's Guide, complete the following exercises using the Garmin 400 or 500 series PC simulation device.

Exercise 1

Use the simulation device to manually tune the COM radio to the CTAF of 122.7 and make it the active frequency. Next, tune the VLOC to the VOR frequency 114.0 and make it the active frequency. Also, set the unit so that the external CDI is tracking the tuned VOR instead of GPS.

Exercise 2

For this exercise, initialize the simulation device position to KMKC (Wheeler Downtown, Kansas City, MO). After the position is initialized, use the Nav 3 page (400/500 series trainer) to find the ATIS frequency for KMKC and automatically tune the COM radio. Make the ATIS frequency active. Next, tune the Ground frequency in the same manner.

Exercise 3

For this exercise, initialize the simulation device position to KMKC (Wheeler Downtown, Kansas City, MO). After the position is initialized, locate the Nearest VOR page. From the Nearest VOR page, find ANX (Napoleon) and automatically tune the VLOC receiver to it. Make ANX the active frequency and ensure that the external CDI is set to track the VOR.

Exercise 4

Use the simulation device to automatically tune the COM radio to the Tower or CTAF frequency of your home airport, using the database without using the Nearest page.

GNS 530/430 Home Study 4

Worksheet – Direct-to and Flight Plan Navigation

After reviewing the GNS 430 or GNS 530 Pilot's Guide, complete the following exercises using the Garmin 400 or 500 series PC simulation device.

Exercise 1

Using the simulation device, initialize the simulation device position at KOSH (Oshkosh WI). Once the position is initialized, enter a Direct-To navigation to KMSN (Madison, WI).

Exercise 2

Using the simulation device, initialize the simulation device position at KOSH (Oshkosh WI). Create a flight plan using the active flight plan page to go to KALO (Waterloo, IA) via Dells (DLL) VORTAC and the Waukon (UKN) VORTAC.

Exercise 3

Using the simulation device, initialize the simulation device position at KAPA (Centennial Airport, Denver, CO). Create a flight plan to KGJT (Walker, Grand Junction, CO Airport) via the Red Table (DBL) VOR/DME and the Rifle (RIL) VOR/DME. Once over the Red Table VOR/DME, proceed direct to KGJT by highlighting KGJT in the flight plan and using the direct-to key.

Exercise 4

Using the simulation device, initialize the simulation device position at KAPA (Centennial Airport, Denver, CO). Create a flight plan to KGCN (Grand Canyon National Park, AZ) via Blue Mesa (HBU) VORTAC, Farmington (FMN) VORTAC and the Tuba City (TBC) VORTAC. Once over the Blue Mesa VORTAC, proceed direct to KGCN. While en route to KGCN, activate and join the leg from the Tuba City VORTAC to KGCN.

GNS 530/430 Home Study 5

Worksheet – Arrival, Departure and Approach Procedure Operation

After reviewing the GNS 430 or GNS 530 Pilot's Guide, complete the following exercises using the Garmin 400 or 500 series PC simulation device.

Exercise 1

Using the simulation device, initialize the simulation device position at KPNC (Ponca City, OK). Create a flight plan going direct to KICT (Wichita Mid-Continent, Wichita, KS). When 40nm outside of Wichita, load and activate the ILS 1R approach into KICT via the JAMEY IAF.

Exercise 2

Using the simulation device, initialize the simulation device position at KMCI (Kansas City International, Kansas City, MO). Create a flight plan to KSTL the Lakes Four Departure via the Columbia transition (LAKES4.COU). Load and activate the RNAV (GPS) RWY 12L approach into St. Louis International using Vectors-To-Final.

Exercise 3

Using the simulation device, initialize the simulation device position at KICT (Wichita Mid-Continent, Wichita, KS). Create a flight plan going direct to KMKC (Wheeler Downtown, Kansas City, MO) using the Jayhawk Four Arrival, Emporia Transition (EMPJHAWK4). Load and activate the GPS RWY 3 using Vectors-To-Final.

Exercise 4

Using the simulation device, initialize the simulation device position at KICT (Wichita Mid-Continent, Wichita, KS). Create a flight plan going to KIXD (New Century Air Center, Olathe, KS) via the Emporia (EMP) VORTAC. As you approach New Century, select the RNAV (GPS) 17 approach via the OGUCO IAF.



Note: In these exercises be sure to note the difference in Loading an approach and Activating an approach. Also, review the missed approach operations with each lesson, noting the pilot actions that are required to continue on a missed approach procedure.

GNS 530/430 Home Study 6

Worksheet – GNS 530/430 Series Display Interfaces; TIS

1. What are the 2 main types of information that may be displayed (when appropriate equipment is installed) on the GNS 530/430 series units?
2. What does TIS stand for and how does it work?
3. At what ranges (distance and altitude) will TIS display other aircraft?
4. Can TIS data be used as a sole means of traffic avoidance in IMC (instrument meteorological conditions)?
5. Approximately how old is TIS data when displayed?
6. At what distances and altitudes relative to your aircraft will TIS provide a Traffic Advisory?
7. TIS icons on the map page are either open diamonds or solid yellow circles. What is the difference between the two when deciding which aircraft is a threat?
8. TIS icons have a line protruding from them. What does it stand for?
9. What information is displayed next to the TIS traffic icons?



Note: The GNS 530/430 series units will also display L3 (formerly Goodrich) SKY497 Traffic and Ryan TCAD 9900B and 9900BX Traffic. Please refer to the manufacturer's documentation for the proper use and limitations of this additional equipment.

GNS 530/430 Home Study 7

Worksheet – GNS 530/430 Series Display Interfaces; GDL 49 Weather

1. What types of weather information can be displayed on a GNS530/430 series units when a GDL 49 data link receiver is installed?
2. METARs are available in two different formats; what are they?
3. What are the 3 main limitations to using NEXRAD data?
4. There are 2 main views available for NEXRAD data on the dedicated weather page in the Nav page set. What are they?
5. Can NEXRAD weather be overlaid on the GNS 530 EFIS arc Nav page (Nav 1)?
6. Where can you go in the unit to find the symbol decoding for graphical METAR information?



Note: The GNS 530/430 series units will also display L3 (formerly Goodrich) WX-500 derived lightning detection. Please refer to the manufacturer's documentation for proper use of this additional equipment.

GNS 530/430 Home Study 8

The Role of Avionics in Aeronautical Decision Making and Single-Pilot Resource Management

The advent of new avionics technologies has brought significant gains for pilots in the area of in-flight aeronautical decision-making (ADM). Traffic Information Service (TIS) over the Mode S data link is one example of the relatively low cost and highly valuable type of data available to the general aviation pilot to help maintain situational awareness in high traffic environments. Data link weather is another shining example of how technology delivers more information for flight planning and decision making loop at a much lower price of acquisition.

Although such tools offer numerous safety and operational advantages, it should be noted that increased technical capabilities often tempt pilots to operate outside of their personal (or even legal) limits. The availability of GPS and moving map systems, coupled with traffic and near real-time weather information in the cockpit, may lead pilots to believe they are protected from the dangers inherent to “scud running,” or otherwise operating in marginal weather conditions. While advanced cockpit technologies may mitigate certain risks, it is by no means a substitute for sound ADM. The challenge is this: How should a pilot use this new information in flight to improve the safety of flight operations? The answer to this question lies in how well the pilot understands the information, its limitations and how best to integrate this data into the ADM process.

Items such as TIS provide a strong aid to locating traffic in a VFR environment, yet they should not be a substitute for “see and avoid” technique. A pilot who receives a TIS Traffic Alert should visually identify the other traffic and react accordingly. Waiting until the last minute to use this data then scanning for traffic may very well prove too late depending on the closure rate. Instead, the pilot should monitor the TIS data continuously in an effort to visually acquire traffic at the maximum distance.

With readily available data link weather, which provides NEXRAD weather images similar to those found on the Internet, pilots now have greater weather awareness in the cockpit. While data link weather is a powerful new tool, it is not a direct replacement for airborne weather radar. Data link weather is not real-time information and is not detailed enough for a pilot to use in an attempt to penetrate a thunderstorm. Instead, we start to pick up a common thread from the above discussion of TIS: The information is not for last minute use; it should be monitored and it is a planning tool. NEXRAD weather does allow the pilot to develop an idea of the scope of a storm that is not available from airborne weather radar.

NEXRAD weather data, coupled with the METAR reporting capability of most systems, is best used for in-flight planning and deviation strategy development. By continuously monitoring the weather situation in the cockpit, the pilot can make better choices about diverting to other airports and/or changing the route of flight. As the pilot becomes more familiar with the system(s) and is able to correlate the data presentation with the actual weather environment more accurately, NEXRAD will come to enhance his or her decision making process and further the safety of flight.

GNS 530/430 Home Study 8 (cont.)

Last but not least, the use of GPS (particularly that of mapping units) opens up new worlds of possibility in maintaining situational awareness and in helping to reduce the navigational workload when deviating from an established flight plan. Many pilots focus on the need to enter a waypoint first before they deviate. In reality, pilots should refer to the map display when possible and commence a turn-away from the dangerous situation (eg. thunderstorm) while notifying ATC of the change of heading. When the workload decreases and safety of continued flight is ensured, they should then start to focus on resuming navigation to the destination and entering the needed waypoints. It is also important to note that pilots should consider having a back-up or secondary means to navigate or communicate in the event of a primary equipment failure.

As more tools are added to the general aviation cockpit in the form of terrain depictions, TAWS, etc., pilots should learn the limitations of the tools and then integrate the tools' strengths into their own ADM process. When evaluating the ADM process, the key is planning as far ahead as possible to maximize the utility of the information at hand. This ability to "stay ahead of the airplane" when referring to managing flight performance is of equal value and force in using modern avionics. As the old saying goes, "follow the six P's; Proper Prior Planning Prevents Poor Performance."

GNS 530/430 Flight Orientation

The sample lessons are scenario-based and will allow the instructor to maximize the impact of the training with the student, while combining a number of elements into a single flight. An example of a scenario-based training flight would start off with an instrument departure then transition to the en-route portion of the flight. During this portion of the flight, standard air work maneuvers may be completed, such as stalls, slow flight, performance maneuvers, etc. Once the air work is completed, the student should transition back to instrument flight and complete the remainder of the flight through the terminal and approach phases, as desired.

Below is a sample syllabus encompassing the avionics for the flight portion:

Objective:

- ✓ To develop the student's ability to confidently operate GNS 530/430 equipment while operating in the National Airspace System (NAS).

Elements:

- ✓ Flight Planning
- ✓ Communications operation
- ✓ Navigation operation
- ✓ Flight Plan, Direct-To and Approach operations
- ✓ Unit, MFD data field selection and configuration
- ✓ Use of additional data (Weather, Traffic) and the aeronautical decision making process

Schedule:

- ✓ Each lesson is designed to take approximately 2-3 hours.

Equipment:

- ✓ GNS 530/430 Pilot's Guides and Quick References
- ✓ Lessons
- ✓ Notepaper
- ✓ View limiting device (Note: For the first flight or two, the student may or may not want to have the hood on to help him/her acclimate to the cockpit environment)
- ✓ Headset (optional)
- ✓ Aircraft (be sure to get it scheduled!)

Student's Actions:

- ✓ Has completed all ground lessons prior to arriving for training/checkout flight(s).

Completion standards:

- ✓ Satisfactory completion of all flight training as determined by instructor.

Lesson 1: GNS 530/430 Introduction - Cross-Country Flight

Student:	Date:
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Objective	To develop the student's ability to use the key features in the GNS 530/430 in an IFR environment.
Elements	✓ Planning and use of ATIS and other airport/weather information ✓ Unit page/screen navigation ✓ Communications operation ✓ Flight plan entry and manipulation ✓ Approach selection and operation ✓ Audio panel operation
Schedule	✓ Pre-flight briefing and review of student's preparations – 30 min ✓ Student practice – duration of flight (approximately 1 hr) ✓ Post-flight critique – 30 min ✓ Assignment for further student review – 5 min
Equipment	✓ Airplane ✓ POH/AFM (GNS 530/430 Pilot's Guide) ✓ Charts appropriate to flight ✓ Headset ✓ Note-taking materials
Instructor's actions	Preflight ✓ Explain objective ✓ Assign route of flight ✓ Describe typical operation flow ✓ Describe common errors In-flight ✓ Coach student performance Post-flight ✓ Critique
Student's actions	✓ Ask questions regarding objective, elements and common errors ✓ Perform operations as directed ✓ Post-flight – ask pertinent questions
Completion standards	Student should exhibit knowledge of the proper methods for data entry, communication/navigation frequency selection, flight plan entry, in-flight routing changes, approach selection and activation, indicator annunciation and flight data display configuration for the various phases of IFR flight.
Possible errors to watch for	✓ Not using the "enter" button to select stand-by frequencies. ✓ Failure to use both COM radios (dual installations) ✓ Loading but not activating an approach ✓ Improper CDI output selection in GNS 530/430 (GPS when should be VLOC and vice versa) ✓ Use of Direct-To navigation when Flight Plan is more appropriate for long route clearances

Lesson 2: Local Operational Flight Review

Student:	Date:
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Objective	To develop the student's ability to use the key features in the GNS 430 in an IFR environment.
Elements	✓ Planning and use of ATIS and other airport/weather information ✓ Unit page/screen navigation ✓ Communications operation ✓ Flight plan entry and manipulation ✓ Approach selection and operation ✓ Audio panel operation
Schedule	✓ Pre-flight briefing and review of student's preparations – 30 min ✓ Student practice – 1.5 hrs ✓ Post-flight critique – 30 min ✓ Assignment for further student review – 5 min
Equipment	✓ Airplane ✓ POH/AFM (GNS 530/430 Pilot's Guide) ✓ Charts appropriate to flight ✓ Headset ✓ Note-taking materials
Instructor's actions	Preflight ✓ Explain objective ✓ Assign route of flight ✓ Describe typical operation flow ✓ Describe common errors In-flight ✓ Coach student performance Post-flight ✓ Critique
Student's actions	✓ Ask questions regarding objective, elements and common errors ✓ Perform operations as directed ✓ Post-flight – ask pertinent questions
Completion standards	Student should exhibit a high degree of knowledge of the proper methods for data entry, communication/navigation frequency selection, flight plan entry, in-flight routing changes, approach selection and activation, indicator annunciation and flight data display configuration for the various phases of IFR flight. The instructor should not have to provide any operational suggestions and the student should be able to quickly and confidently make the correct changes to the GNS 530/430 as required.
Possible errors to watch for	✓ Not using the "enter" button to select stand-by frequencies ✓ Failure to use both COM radios ✓ Loading but not activating an approach ✓ Improper CDI output selection in GNS 430 (GPS when should be VLOC) ✓ Use of Direct-To navigation when Flight Plan is more appropriate for long route clearances

Lesson 3: GNS 530/430 Dual Installation Introduction

Student:	Date:
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Objective	To develop the student's ability to properly manage an integrated dual-installation of GNS 530/430 avionics stack in an IFR environment.
Elements	✓ GMA 340 audio panel operations ✓ GNS 530/430 configuration and operation ✓ GTX 330 operation and TIS data interpretation ✓ GDL 49 operation and WX data interpretation and its relation to flight planning
Schedule	✓ Pre-flight briefing and review of student's preparations – 30 min ✓ Student practice – 2 hrs ✓ Post-flight critique – 30 min ✓ Assignment for further student review – 5 min
Equipment	✓ Airplane ✓ POH/AFM (appropriate Pilot's Guide) ✓ Charts appropriate to flight ✓ Note-taking materials
Instructor's actions	Preflight ✓ Explain objective ✓ Assign route of flight ✓ Assign approach types to be completed ✓ Assign required operations using TIS and WX data ✓ Describe typical operation flow ✓ Describe common errors In-flight ✓ Coach student performance Post-flight ✓ Critique
Student's actions	✓ Ask questions regarding objective, elements and common errors ✓ Perform operations as directed ✓ Post-flight – ask pertinent questions
Completion standards	Student should be able to complete basic tasks using all available avionics tools to complete the flight and demonstrate function to instructor as requested.
Possible errors to watch for	✓ Not using the "enter" button to select stand-by frequencies ✓ Failure to use both COM radios ✓ Loading but not activating an approach ✓ Improper CDI output selection in GNS 530/430 (GPS when should be VLOC and vice versa) ✓ Use of Direct-To navigation when Flight Plan is more appropriate for long route clearances ✓ Choosing wrong request type through GDL 49 ✓ Inability to interpret a graphical METAR request ✓ Not enabling cross-fill function ✓ Failure to use VNAV/VSR information to help plan descent ✓ Not setting up displays to maximize the amount of data presented without overlapping data

Lesson 4: Dual Installation MFD Operations

Student:	Date:
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Objective	To develop the student's ability to properly manage an integrated dual-installation of GNS 530/430 avionics stack in an IFR environment.
Elements	✓ Operation and configuration of WX interfaces ✓ Use of WX-500/GDL 49 data as ADM aid ✓ Operation and configuration of traffic interfaces (SKY 497/TCAD 9900B series/TIS) ✓ Use of traffic information as ADM and awareness aid. ✓ Proper use of TAWS/Terrain data
Schedule	✓ Pre-flight briefing and review of student's preparations – 30 min ✓ Student practice – 2 hrs ✓ Post-flight critique – 30 min ✓ Assignment for further student review – 5 min
Equipment	✓ Airplane ✓ POH/AFM (appropriate Pilot's Guide) ✓ Charts appropriate to flight ✓ Note-taking materials
Instructor's actions	Preflight ✓ Explain objective ✓ Assign route of flight ✓ Assign approach types to be completed ✓ Describe typical operation flow ✓ Describe common errors In-flight ✓ Coach student performance Post-flight ✓ Critique
Student's actions	✓ Ask questions regarding objective, elements and common errors ✓ Perform operations as directed ✓ Post-flight – ask pertinent questions
Completion standards	Student should be able to properly configure and interpret the data that is displayed via the MFD and correctly maneuver the aircraft in response to the presented information.
Possible errors to watch for	✓ Failure to note the data age for NEXRAD and Stormscope data ✓ Failure to select the appropriate operating mode for WX-500 ✓ Not using the GDL 49 request options from the Nav 2 page and always going to the Aux pages for completing requests ✓ Configuring overlapping data on both MFDs ✓ Not incorporating MFD in instrument scan ✓ Delayed reaction to warning messages for terrain and traffic and not taking correct action to avoid dangerous conditions ✓ Not verifying successful self-test of remote equipment



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