

Flight1 Aviation Technologies G1000 Student Simulator v1.47

3/7/2014

**Comprehensive Description of
Simulated Features and Functionality**

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INTRODUCTION

The Garmin G1000 provides pilots with a dazzling amount of information and capabilities, so it's not surprising if you want to know exactly what our G1000 Student Simulator includes.

First off, know that it's not a real G1000. It's a simulation of a real G1000—designed to accurately simulate the features and functions VFR and IFR pilots use most frequently. We think you'll be surprised at the depth of the simulation, and we're confident you won't find a more realistic, cost-effective, or flexible G1000 simulation for FSX, ESP, or Prepar3D.

There are many different versions of the real G1000 hardware and software, so what we've simulated in the G1000 Student Simulator might not exactly match what you're used to. This initial release is modeled after the Garmin G1000 Cessna Nav III and Diamond aircraft variations of the G1000 software, with an integrated GFC 700 Automatic Flight Control System (AFCS).

In the future, we may add new features and functionality as customer interest dictates. We'll update this document when we make changes.

What follows is worth a careful read so you'll fully understand just how much you can do with this simulation. We'll follow the same structure the real Garmin *G1000 Pilot's Guide* does, since you may be familiar with it.

SYSTEM OVERVIEW

System Description

The Flight1 Tech G1000 Student Simulator simulates the G1000 Integrated Flight Deck as installed in Cessna Nav III aircraft (Cessna 172R, 172S, 182T, T182T, 206, and T206) and the Diamond DA40 and DA42. Each aircraft configuration features the appropriate Vs speeds and Engine Indication System (EIS) layout.

The displays and controls for each of the following Line Replaceable Units (LRUs) are presented in a separate window:

- GDU 1040B Primary Flight Display (PFD)
- GDU 1040B Primary Flight Display (MFD)
- GMA 1347 Audio System with Integrated Marker Beacon Receiver

Each of the above windows can be displayed or hidden via a button on the main G1000 Student Simulator interface.

The addition of the Flight1 Tech Virtual Instructor Station Pro (VISPRO) and G1000 Failures plug-in for VISPRO products provide an instructor with the ability to manually fail specific components of the G1000 PFD and MFD displays.

G1000 Student Simulator Control Center Interface

The G1000 Student Simulator Control Center interface features three tabs.

Main

The Main tab features:

- Aircraft configuration selection and the configuration of custom v-speeds for each configuration.
- Network connection controls.
- Options to save window positions between sessions and auto-hide the interface.
- Buttons to open the PDF manual (“Help”), learn about G1000 plug-ins, check for updates, and exit.

Options

The Options tab features:

- *General Options* can display instructional tooltips when the mouse cursor is over specific G1000 features, show mouse areas on knobs for easier use, and toggle the Nav Range Ring, Fuel Range Ring, Flap and Trim indicators (to use in conjunction with the Flap and Trim controls on the Switches panel), and Track Vector.
- *Terrain Features* options that toggle specific Map Display features on or off (MOAs, railroads, water/ocean names/rivers, and the Topo Scale).
- *PFD and MFD Map Orientation* options that allow the PFD and MFD to be individually set to North Up, Heading Up, Track Up, or Direct Track Up map orientations.

Window Positions

The Window Positions tab features:

- *Position Adjustment* options only available in the Cockpit Builder Edition of the G1000 Student Simulator software.
- *Window Properties* options that facilitate customization of the visual experience when running the G1000 Student Simulator software on a separate monitor. Options include the ability to remove the border and title bar from the PFD, MFD, switches, standby instruments, and audio panel windows; to display a customizable panel background image (“background.bmp,” located in C:\Flight1 Aviation Technologies\G1000 Student), and to display an alignment grid for easier placement of windows.
- *Display Options* to toggle the PFD, MFD, standby Instruments, audio panel, and switches panel.

The Pro version adds two additional tabs:

IESI

The IESI tab permits configuration of the Integrated Electronic Standby Instrument, and removal of the IESI window border and title bar.

Platform

The Platform tab permits selection of the F1Tech 1000, the Emuteq 1000, or the Simkits TRC1000 as the integrated hardware platform.

G1000 Controls

The Student version of the G1000 Student Simulator (for personal, non-commercial use) features photorealistic bezel graphics with functional buttons and knobs so you can control the G1000 with a mouse or via a touchscreen monitor. An option to “Show mouse areas” (available on the main G1000 Student Simulator interface) makes it easier to control the bezel knobs. An editable keyboard.ini file lets you customize the G1000 Student Simulator’s keyboard commands to work with your own hardware setup.

The Pro version (designed for commercial use, or for non-commercial use in a home cockpit) has no bezel graphics. Instead, it interfaces with the SimKits TRC1000 Glass Cockpit (www.simkits.com) and the Emuteq G1000 (<http://www.emuteq.com>). It’s also the version of the G1000 Student Simulator software that’s included with our own [F1 Tech 1000](http://www.f1tech1000.com) and ELITE’s FAA-approved PI-1000 (<http://www.flyelite.com>).

PFD/MFD Controls

The real functionality of most PFD/MFD controls are simulated:

- NAV Frequency Transfer Key
- Dual NAV Knob
- Heading Knob
- CRS/BARO Knob
- Dual COM Knob
- COM Frequency Transfer Key
- Direct-to Key
- FPL Key
- CLR Key (DFLT MAP)
- Dual FMS Knob
- MENU Key
- PROC Key
- ENT Key
- Dual ALT Knob

The COM and NAV VOL/ID knobs and the Joystick are not functional.

The following GFC 700 AFCS controls are simulated:

- AP Key
- HDG Key
- NAV Key

- APR Key
- VS Key
- FLC Key
- FD Key
- ALT Key
- VNV Key
- BC Key
- NOSE UP/NOSE DN Keys

Audio Panel Controls

The real functionality of most Audio Panel controls are simulated:

- COM1 MIC
- COM1
- COM2 MIC
- COM2
- MKR/MUTE
- DME
- NAV1
- ADF
- NAV2
- Reversionary Mode Button

The COM3 MIC, COM3, PA, TEL, MUSIC, SPKR, HI SENS, AUX, REC, PLAY, INTRCOM, and MAN SQ buttons are functional but have no effect in the simulation, The PILOT and PASS volume/squelch knobs are not functional.

Secure Digital (SD) Cards

The use of Secure Digital cards for storing databases and software system updates is not simulated.

G1000 Student Simulator software updates are available via a button on the main G1000 Student Simulator interface.

The G1000 Student Simulator navigational database can be manually upgraded by purchasing an upgrade from Navigraph.com and Flight1 Aviation Technologies.

System Power-Up

When the G1000 Student Simulator software is launched, a simulated MFD power-up screen displays.

PFD initialization is not simulated at this time.

System Operation

Normal Display Operation

As on the real G1000, in normal operating mode the G1000 Student Simulator PFD presents graphical flight instrumentation and the MFD displays a full-color moving map with navigation information, as well as the Engine Indication System (EIS).

Reversionary Display Operation

Reversionary Mode (in which all important flight information is displayed on one display) can be manually activated by pressing the Display Backup button on the Audio Panel. Reversionary Mode is simulated on both the PFD and the MFD.

When used with Virtual Instructor Station Pro (VISPRO) and the G1000 Failures plug-in for VISPRO, you can realistically simulate the switch to Reversionary Mode after a display failure, and present students with challenging scenarios that test their ability to deal with failures when they're least likely to be able to handle them.

AHRS Operation

Loss of attitude and heading information, due to failure of the internal Attitude and Heading Reference System (AHRS) inertial sensors, can be simulated using Virtual Instructor Station Pro (VISPRO) and the G1000 Failures plug-in for VISPRO. When enabled, red 'X' flags display over the corresponding flight instruments.

Other AHRS failures, annunciations, and message advisories are not simulated.

G1000 System Annunciations

When a real G1000 Line Replaceable Unit (LRU) or an LRU function fails, a large red "X" is typically displayed on windows associated with the failed data.

When the G1000 Student Simulator is used with Virtual Instructor Station Pro (VISPRO) and the G1000 Failures plug-in for VISPRO, an instructor has the ability to manually fail individual Line Replaceable Units (LRUs) and other components of the G1000. When failed, appropriate failure flags and/or indications will display on the PFD and MFD to indicate failure of the responsible components.

LRUs and other components that can be failed include:

- GIA 63 Integrated Avionics Unit
- GTX1 and GTX2 Transponders
- GRS 77 AHRS
- GMU 44 Magnetometer
- GDC 74A Air Data Computer
- GFC 700 Automatic Flight Control System
- VHF Comm Radio
- VHF Nav Radio

- DME
- RAIM Availability
- Traffic
- Attitude
- Airspeed
- Vertical Speed
- Heading
- Altitude
- Engine Indicators

Softkey Function

As on the real G1000, softkeys are located along the bottom of the displays. The softkeys shown depend on the softkey level or page being displayed.

When using the Student version of the G1000 Student Simulator, the bezel keys on the photorealistic bezel graphics below the softkeys can be used to select the appropriate softkey. (Customized keyboard commands can also be configured in F1G1000_keyboard.ini.)

When using the Pro version, the physical keys on the hardware bezel can be used.

GPS Receiver Operation

GPS information collected by the Integrated Avionics Units may be viewed on the AUX - GPS STATUS page on the MFD. The GPS Status page displays a basic simulation of:

- Satellite constellation diagram
- Satellite signal information status
- GPS receiver status
- RAIM (Receiver Autonomous Integrity Monitoring) Prediction
- SBAS Selection
- GPS Satellite Signal Strengths

RAIM Prediction at the aircraft present position is simulated, and RAIM can be made unavailable via the separate G1000 Student Failure Generator application.

RAIM Prediction at specific waypoints, WAAS Disabling, and GPS sensor annunciations are not simulated.

Accessing G1000 Functionality

Menus

As on the real G1000, the G1000 Student Simulator has a MENU Key that, when pressed, displays a context-sensitive list of options related to the currently displayed window/page. Options can be selected using the FMS knob and the ENTER Key.

Most but not all menus and options are simulated.

MFD Page Groups

Information on the MFD is presented on pages which are grouped according to function. The G1000 Student Simulator fully or partially simulates the following page groups and pages:

Map Pages (MAP)

- Navigation Map
- Traffic Map
- Terrain Proximity

Stormscope®, Weather Data Link, Terrain-SVS, and TAWS-B pages are not simulated.

Waypoint Pages (WPT)

- Airport Information Pages
 - Airport Information (INFO-1 softkey)
- Intersection Information
- NDB Information
- VOR Information

Airport Directory, Departure Information, Arrival Information, Approach Information, Weather Information, and User Waypoint Information pages are not simulated.

Auxiliary Pages (AUX)

- Trip Planning (in Automatic page mode and Flight Plan mode only)
- Utility (with usable Generic Count Up Timer)
- GPS Status (including RAIM Prediction at present position)
- System Setup (with configurable Time Format, Temperature Display Units, and MFD Data Bar Fields)
- System Status

SiriusXM Satellite pages and the Video page are not simulated.

Flight Plan Pages (FPL)

- Active Flight Plan
- Flight Plan Catalog

Nearest Pages (NRST)

- Nearest Airports
- Nearest Intersections
- Nearest NDB
- Nearest VOR

Nearest User Waypoints, Nearest Frequencies, and Nearest Airspaces pages are not simulated.

Procedure Pages (PROC)

- Departure Loading
- Arrival Loading
- Approach Loading

MFD System Pages

In the Auxiliary (AUX) Page Group, there are two system pages: System Setup and System Status.

The System Setup Page allows management of various system parameters. Manual configuration of Time Format, Temperature Display Units, and MFD Data Bar Fields is simulated.

The System Status Page, which displays the status and software version numbers for all detected system LRUs as well as information on all system databases, is simulated.

Failures triggered using the G1000 Failures plug-in for VISPRO only affect the display of relevant data on the PFD and MFD displays. Triggered failures do not affect LRU Status on the System Status page.

Display Backlighting

The PFD and MFD display backlighting can be manually adjusted using the PFD MENU button options.

Automatic adjustment of display backlighting is not simulated. Adjustment of backlighting for the PFD and MFD bezels, MFD Control Unit, AFCS Control Unit, and audio panel is not simulated.

FLIGHT INSTRUMENTS

Flight Instruments and Supplemental Flight Data

All real G1000 flight instrumentation is simulated. The following flight instruments and supplemental flight data are displayed on the PFD:

- Airspeed Indicator, showing
 - Indicated airspeed
 - True airspeed
 - Trend vector
 - Airspeed awareness ranges
 - Vspeed reference flags
- Attitude Indicator with slip/skid indication
- Altimeter (standard or metric values), showing
 - Trend vector
 - Barometric setting
 - Reference altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) indications
- Outside air temperature (OAT) (in degrees Celsius or Fahrenheit)
- Horizontal Situation Indicator, showing
 - Turn Rate Indicator
 - Bearing pointers and information windows
 - Navigation source

- Course Deviation Indicator (CDI) (including flight phase annunciation, OBS scaling, and OBS mode)
- DME Information Window
- Transponder Mode, Code, and Ident/Reply
- Timer/References Window, showing
 - Generic timer
 - Vspeed values (configurable)
 - Barometric Minimum Descent Altitude (MDA)
- Wind data:
 - Wind direction arrows with headwind/tailwind and crosswind components
 - Wind direction arrow and numeric speed
 - Wind direction arrow with numeric True direction and numeric speed

PFD Annunciations and Alerting Functions

System Alerting

The following alerts are simulated on the PFD (along with the associated softkey annunciations and audio alerts):

Warning Alerts (red):

- LOW VOLTS
- OIL PRESSURE

Caution Alerts (yellow):

- LOW FUEL L
- LOW FUEL R
- LOW VACUUM

System Message Advisories (white) and Safe Operating Annunciations (green) are not simulated.

G1000 System Annunciations

The only System Annunciations simulated are those related to the failures listed in the “G1000 System Annunciations” sub-section of the “System Overview” section of this document (above).

Marker Beacon Annunciations

Marker Beacon Annunciations are fully simulated.

Traffic Annunciation

The G1000 Student Simulator features a robust Traffic Annunciation simulation that works with the AI aircraft generated by the flight simulation. Traffic is displayed symbolically on the PFD Inset Map, the MFD Navigation Map Page, and various other MFD page maps. Refer to the “Hazard Avoidance” section of this document (below) for more details about the Traffic Information Service (TIS) simulation.

TAWS Annunciations

Terrain Awareness and Warning System (TAWS) obstacle annunciations appear at the top of the PFD to the left of the Altimeter.

Altitude Alerting

Altitude alerting is simulated:

- Upon passing through 1,000 feet of the selected altitude
- When the aircraft passes within 200 feet of the selected altitude
- After reaching the selected altitude, if the aircraft deviates +/- 200 feet

Low Altitude Annunciation

A "LOW ALT" annunciation (when the aircraft is low at the FAF on a WAAS approach) is not simulated at this time.

Minimum Descent Altitude/Decision Height Alerting

MDA and DH can be set in the Timer/Reference Window, and the associated visual annunciations and aural alerts are simulated.

Abnormal Operations

Abnormal GPS Conditions

Abnormal GPS Conditions are not simulated.

Unusual Attitudes

Unusual Attitude functionality on the PFD is fully simulated. Red chevrons appear starting at 50 degrees above and 30 degrees below the horizon line. PFD de-cluttering occurs if pitch exceeds +30/-20 degrees or bank exceeds 65 degrees.

ENGINE INDICATION SYSTEM (EIS)

All real Engine Display, Lean Display, and System Display indications are simulated on the MFD Engine Indication System (EIS), and are accessible via softkeys. In manually-activated Reversionary Mode, EIS data is displayed on the left side of the PFD.

Engine Display

The Engine Display shows critical engine and electrical parameters. All real Engine Display gauges, indicators, and readouts are simulated for the aircraft configuration selected in the main G1000 Student Simulator interface.

Cessna Nav III aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN) *Models 182T, T182T, 206H, T206H*
- Tachometer (RPM)

- Fuel Flow Indicator (FFLOW GPH)
- Oil Pressure Indicator (OIL PRES)
- Oil Temperature Indicator (OIL TEMP)
- Cylinder Head Temperature Indicator (CHT) *Models 182T, T182T, 206H, T206H*
- Exhaust Gas Temperature Indicator (EGT) *Normally-aspirated Aircraft*
- Turbine Inlet Temperature Indicator (TIT) *Turbocharged Aircraft*
- Vacuum Pressure Indicator (VAC) *Models 172R and 172S*
- Fuel Quantity Indicator (FUEL QTY GAL)
- Engine Hours (Tach) (ENG HRS) *Models 172R and 172S*
- Voltmeter (M, E BUS VOLTS)
- Ammeter (M, S BATT AMPS)

Diamond DA40 aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN HG)
- Tachometer (RPM)
- Fuel Flow Indicator (FUEL FLOW GPH)
- Cylinder Head Temperature Indicator (CHT)
- Oil Temperature Indicator (OIL TEMP)
- Oil Pressure Indicator (OIL PRES)
- Ammeter (AMPS)
- Voltmeter (VOLTS)
- Fuel Quantity Indicator (FUEL QTY GAL)

The expanded DA40 Engine page is not simulated.

Diamond DA42 aircraft configuration:

- Engine Load Indicator (LOAD %)
- Tachometer (RPM)
- Fuel Flow Indicator (FUEL FLOW GPH)
- Oil Temperature Indicator (OIL TEMP)
- Oil Pressure Indicator (OIL PRES)
- Coolant Temperature Indicator (COOLANT TEMP)
- Fuel Temperature Indicator (FUEL TEMP)
- Fuel Quantity Indicator (FUEL QTY GAL)

Lean Display

The Lean Display provides information for engine leaning. All real Lean Display gauges, indicators, and readouts (including Cylinder selection) are simulated for the aircraft configuration selected in the main G1000 Student Simulator interface.

Cessna Nav III aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN) *Models 182T, T182T, 206H, T206H*
- Tachometer (RPM)
- Fuel Flow (FFLOW GPH)
- Exhaust Gas Temperature Bar Graph (EGT °F)
- Cylinder Head Temperature Bar Graph (CHT)
- Fuel Quantity Indicator (FUEL QTY GAL)

Lean Assist is not fully simulated at this time.

Diamond DA40 aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN HG)
- Tachometer (RPM)
- Fuel Flow (FFLOW GPH)
- Exhaust Gas Temperature Bar Graph (EGT °F)
- Cylinder Head Temperature Bar Graph (CHT °F)

Lean Assist is not fully simulated at this time.

System Display

The System Display shows critical engine, fuel, and electrical parameters. All real System Display gauges, indicators, and readouts (including fuel calculations) are simulated for the aircraft configuration selected in the main G1000 Student Simulator interface.

Cessna Nav III aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN) *Models 182T, T182T, 206H, T206H*
- Tachometer (RPM)
- Oil Pressure (OIL PSI)
- Oil Temperature (OIL °F)
- Engine Hours (Tach) (ENG HRS) *Models 182T, T182T, 206H, T206H*
- Vacuum Pressure Indicator (VAC) *Models 182T, T182T, 206H, T206H*
- Fuel Flow (FFLOW GPH)
- Calculated Fuel Used (GAL USED)
- Set Fuel Remaining (GAL REM)
- Fuel Quantity Indicator (FUEL QTY GAL)
- Voltmeter (M, E BUS VOLTS)
- Ammeter (M, S BATT AMPS)

Diamond DA40 aircraft configuration:

- Engine Manifold Pressure Gauge (MAN IN HG)
- Tachometer (RPM)
- Oil Temperature (OIL °F) and Oil Pressure (OIL PSI)

- Voltmeter (VOLTS) and Ammeter (AMPS)
- Fuel Flow (FFLOW GPH)
- Fuel Pressure (FPRESS PSI)
- Set Fuel Remaining (GAL REM)
- Calculated Fuel Used (GAL USED)
- Calculated Endurance (ENDUR)
- Calculated Range (RANGE NM)
- Total Time in Service (TTL TIME IN SVC)

Diamond DA42 aircraft configuration:

- Engine Load Indicator (LOAD %)
- Tachometer (RPM)
- Voltmeter (VOLTS)
- Ammeter (AMPS)
- Gearbox Temperature Indicator (GEARBOX °C)
- Coolant Temperature Indicator (COOLANT °C)
- Oil Temperature Indicator (OIL °C)
- Oil Pressure Indicator (OIL BAR)
- Deice Fluid Indicator (DEICE FLUID) (*Optional*)

Fuel Display

The Diamond DA40 and DA42 aircraft configurations also feature a Fuel Display. All real Fuel Display gauges, indicators, and readouts (including fuel calculations) are simulated.

Diamond DA42 aircraft configuration:

- Engine Load Indicator (LOAD %)
- Tachometer (RPM)
- Fuel Quantity Indicator (FUEL GAL)
- Fuel Flow Indicator (FUEL GPH)
- Fuel Temperature Indicator (FUEL °C)
- Set Fuel Remaining (GAL REM)
- Calculated Fuel Used (GAL USED)
- Calculated Endurance (ENDUR)
- Calculated Range (RANGE NM)
- Total Time in Service (TTL TIME IN SVC)

AUDIO PANEL AND CNS

Overview

The Communication/Navigation/Surveillance (CNS) system includes the Audio Panel, communication radios, navigation radios, and Mode S transponder. Most Audio Panel and CNS elements are simulated, within the limits of the flight simulation.

COM Operation

Most communications radio functionality is simulated, and works with the air traffic control feature of FSX, ESP, and Prepar3D. Features simulated include:

- COM transceiver selection and activation
- Manual tuning and auto-tuning from both the PFD and MFD
- 25-kHz frequency spacing

Transmit/Receive indications, 8.33-kHz frequency spacing, automatic squelch, and volume control, are not simulated.

NAV Operation

Most navigation radio functionality is simulated, including:

- NAV radio selection and activation via the PFD CDI Softkey
- NAV radio audio monitoring
- VOR/LOC ID, manual tuning and auto-tuning from both the PFD and MFD
- Marker beacon receiver indications and audio

Volume control is not simulated.

GTX 33 Mode S Transponder

Most transponder features are simulated, and work with the Air Traffic Control feature of FSX, ESP, and Prepar3D. Features simulated include:

- Transponder Mode Selection (Ground, Standby, Manual On, Manual and Auto Altitude)
- Reply Status
- Transponder code entry via softkeys
- VFR Code
- Ident

Entry of a transponder code using the PFD FMS knob, and Flight ID Reporting are not simulated.

Additional Audio Panel Functions

Audio panel power-up, Speaker, Intercom, Intercom Volume and Squelch, PA System, Clearance Recorder and Player, and entertainment inputs are not simulated.

FLIGHT MANAGEMENT

Introduction

The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD. The G1000 Student Simulator simulates most of the flight management features of the real G1000.

Navigation Status Box

As on the real G1000, the Navigation Status Box located at the top of the PFD contains two fields that display: the active flight plan leg *or* flight plan annunciations, and distance and bearing to the next waypoint *or* flight plan annunciations.

The Navigation Status Box located at the top of the MFD contains four data fields that can be configured on the AUX – SYSTEM SETUP Page.

Configuration of the MFD Navigation Status Box data fields to display Endurance, Enroute Safe Altitude, Fuel On Board, Fuel Over Destination, Minimum Safe Altitude, Track Angle Error, or Vertical Speed Required is not simulated.

Using Map Displays

Some of the most useful features of the G1000 are its many map displays. In the G1000 Student Simulator, the following maps are simulated:

- PFD Inset Map
- MFD Navigation Page Map
- MFD Waypoint Pages Map
- MFD Nearest Pages Map
- MFD Active Flight Plan Page Map
- MFD Trip Planning Page Map (Automatic page mode only)

Map Orientation

By default, all maps are displayed using a North Up (NORTH UP) orientation. PFD and MFD maps can individually be changed to Heading Up (HDG UP), Track Up (TRK UP), or Desired Track Up (DTK UP) orientations via the G1000 Student Simulator Control Center interface.

Map Range

As on the real G1000, all maps feature 28 different ranges, from 500 feet to 2000 NM.

Auto Zoom

Auto zoom, which allows the G1000 to change the map display range to the smallest range clearly showing the active waypoint, is not simulated.

Map Panning and Measuring Bearing and Distance

Map panning, and measuring bearing and distance using the G1000 Joystick, is not simulated.

Topography

As on the real G1000, all navigation maps can display various shades of topography colors representing land elevation. Topographic data can be displayed or removed using the TOPO Softkey or the PFD Map

Setup menu. A Topographic Scale can be toggled on and off on the “Options” tab of the G1000 Student Simulator Control Center interface, or using the PFD Map Setup menu.

Map Symbols

Symbols displayed on the maps include:

Land symbols

- Latitude/Longitude
- Highways and roads
- Railroads
- Large Cities (>200,000)
- Medium Cities (>50,000)
- Small Cities (>5,000)
- States and Provinces
- Rivers and Lakes

Aviation symbols

- Active Flight Plan Leg
- Non-active Flight Plan Legs
- Active Flight plan Waypoint
- Large Airports
- Medium Airports
- Small Airports
- Taxiways (if the Flight1 Tech SaferTaxi plug-in for the G1000 Student Simulator software is installed)
- Runway Extensions
- Intersections
- NDB
- VOR
- Class B Airspace/TMA
- Class C Airspace/TCA
- Class D Airspace
- Restricted Areas
- MOAs
- Other/ADIZs

Map symbols can be configured using the MFD Map Setup menu.

User Waypoints and TFRs are not simulated at this time.

Map Declutter

Like on the real G1000, four levels of map declutter are available that remove progressively more information from the map.

Airways

Low Altitude and High Altitude Airways can be toggled on and off using the AIRWAYS softkey on the Map page of the MFD, or via the MFD Map Setup menu. Low Altitude Airways are drawn in gray and High Altitude Airways are drawn in green. Airway waypoints (VORs, NDBs and Intersections) are also displayed.

Track Vector

Like on the real G1000, the Navigation Map can display a track vector. The track vector look-ahead time is selectable, and determines the length of the track vector. The track vector shows up to 90 degrees of a turn for the 30 and 60 second time settings. The Track Vector can be toggled on and off on the “Options” tab of the G1000 Student Simulator Control Center interface, or via the MFD Map Setup menu.

Wind Vector

Wind vector information is displayed in the upper-right portion of the MFD map (as a white arrow pointing in the direction in which the wind is blowing at least 1 knot).

Nav Range Ring

The Nav Range Ring shows the ground track on a rotating compass card. The range is determined by the map range. The Nav Range Ring can be toggled on and off on the “Options” tab of the G1000 Student Simulator Control Center interface, or via the MFD Map Setup menu.

Fuel Range Ring

The Fuel Range Ring shows the range of the aircraft given the current fuel state. A dashed green circle indicates the selected range to reserve fuel. A solid green circle indicates the total endurance range. If only reserve fuel remains, the range is indicated by a solid yellow circle. The Fuel Range Ring can be toggled on and off on the “Options” tab of the G1000 Student Simulator Control Center interface, or via the MFD Map Setup menu. The amount of fuel remaining must be manually set on the G1000 Engine System page.

Field of View (SVS)

The map can display the boundaries of the PFD Synthetic Vision System (SVS) lateral field of view. The field of view is shown as two dashed lines forming a V shape in front of the aircraft symbol on the map, and can be toggled on and off using the Map Setup menu.

The Synthetic Vision System itself is not simulated.

Selected Altitude Intercept Arc

The map can display the location along the current track where the aircraft will intercept the selected altitude. The location will be shown as a light blue arc when the aircraft is actually climbing or descending. The altitude intercept arc can be toggled on and off via the MFD Map Setup menu.

Waypoints

Information is available for Airport, Intersection, NDB, and VOR waypoints. On all MFD Waypoints pages, waypoints can be selected by entering the ICAO identifier. If duplicate entries exist for an identifier, a

Duplicate Waypoints Window is displayed. Frequency auto-tuning and Direct-to Navigation is possible directly from these pages.

Airports

Information is available for every airport in the updatable worldwide Navigraph navigation database. Like in the real G1000, after engine startup, the Airport Information Page defaults to the airport where the aircraft is located. After a flight plan has been loaded, the Airport Information Page defaults to the destination airport.

On all Airport Information pages, airports can be selected by entering the ICAO identifier, facility name, or location name. If duplicate entries exist for an identifier, a Duplicate Waypoints Window is displayed. Frequency auto-tuning and Direct-to Navigation is possible directly from these pages.

The MFD Airport Information pages feature most of the information available on the real G1000 pages.

Fuel Availability, UTC Offset, Lighting Availability, and AOPA Directory information are not displayed in the simulation.

The PFD Airport Information Window features most of the information in the real G1000 window.

City, UTC Offset, and Region are not displayed in the simulation at this time.

The MFD Nearest Airport page simulates most real functionality, including displaying a line to the nearest airport on the Navigation Map.

The Nearest Airports window on the PFD displays most real G1000 information.

Intersections

The Intersection Information and Nearest Intersection pages feature most of the information on the real G1000 pages.

Nearest VOR and Reference VOR information is not displayed in the simulation.

NDBs

The NDB Information and Nearest NDB pages feature most of the information on the real G1000 pages.

NDB Type and Nearest Airport information is not displayed in the simulation.

VORs

The VOR Information and Nearest VOR pages feature most of the information on the real G1000 pages.

VOR Class, Magnetic Variation, and Nearest Airport Information are not displayed in the simulation.

User Waypoints

User-created waypoints and their associated pages are not simulated.

Airspaces

The following types of airspaces are displayed on maps: Class B/TMA, Class C/TCA, Class D, Restricted, and MOA (Military).

Other, Air Defense Interdiction Zone (ADIZ), and Temporary Flight Restriction (TFR) airspace is not displayed in the simulation.

The Nearest Airspaces Page on the MFD and Airspace Alerts on the PFD are not simulated.

Direct-to Navigation

Most real G1000 Direct-to functionality is simulated in both the MFD and PFD Direct-to Windows, including setting VNV Altitude at Arrival, and selecting an active flight plan waypoint as a Direct-To destination.

Selection of a RECENT, USER or AIRWAY waypoint as a Direct-to destination; selecting a manual Direct-to course; selection of a waypoint as a Direct-to destination using the Joystick pointer; and setting an along-track VNV offset are not simulated.

Flight Planning

As on the real G1000, a flight plan is built by entering waypoints one at a time, adding waypoints along airways, and inserting departures, arrivals, or approaches as needed. Flight planning information can be entered from either the MFD or PFD. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment of the flight plan currently being flown (departure, enroute, arrival, approach, or missed approach).

Flight Plan Creation

As on the real G1000, flight plans can be created via the:

- Active Flight Plan page on the MFD
- Active Flight Plan Window on the PFD
- Flight Plan Catalog page on the MFD

Importing and exporting flight plans to/from an SD card is not simulated.

Adding Waypoints to an Existing Flight Plan

Waypoints can be added to the active flight plan, in front of existing waypoints.

Creating and adding user waypoints to the existing flight plan using the Joystick pointer, and adding waypoints to stored flight plans, is not simulated.

Adding Airways to a Flight Plan

Airways can be added to the active flight plan if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure.

Adding Procedures to a Stored Flight Plan

Adding procedures to a stored flight plan is not simulated.

Flight Plan Storage

As on the real G1000, up to 99 flight plans can be stored. An active flight plan can be stored from the Active Flight Plan page (MFD) or the Active Flight plan Window (PFD) using the MENU key.

The active flight plan is erased when the G1000 Student Simulator software is restarted or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Page and on the Stored Flight Plan Page.

Flight plans are stored in the Flight Plan Catalog in the order created, and can be individually deleted.

Alphanumeric sorting based on flight plan name, inverting a stored flight plan, copying a stored flight plan, and editing a stored flight plan is not simulated.

Display of the selected stored flight plan on the Flight Plan Catalog page map is not simulated.

Flight Plan Editing

The active flight plan can be edited via the Active Flight Plan page (MFD) or the Active Flight Plan Window (PFD), and the edits made affect navigation as soon as they are entered. You can:

- Delete the active flight plan using the MENU key
- Delete flight plan items using the CLR key
- Delete an entire arrival or approach from the PFD Active Flight Plan Window using the CLR key
- Delete an individual waypoint using the CLR key

Deleting an entire airway from an active flight plan, and deleting an individual waypoint, an entire airway, or an entire procedure from a stored flight plan, is not simulated.

Changing the comment (name) of an active or stored flight plan is not simulated.

Along Track Offsets

Along track offsets are not simulated.

Parallel Track

Parallel track is not simulated.

Activating a Flight Plan Leg

A highlighted leg can be made the “active leg” (the flight plan leg which is currently used for navigation guidance) via the MENU key.

Inverting a Flight Plan

An active flight plan may be inverted (reversed) for navigation back to the original departure point using the MENU key.

Inverting a stored flight plan is not simulated.

Flight Plan Views

Flight plan views (leg-to-leg vs. cumulative distance, wide and narrow views, and collapsing airways) are not simulated.

Closest Point of FPL

Creation of a new user waypoint along the flight plan at the location closest to a chosen reference waypoint is not simulated.

Vertical Navigation

Vertical guidance based on specified altitudes at waypoints in the active flight plan, or VNV Direct-to, is simulated, and both manual and autopilot-coupled guidance (VPTH) are supported.

Altitude Constraints

Altitude constraints associated with lateral waypoints can be manually entered, or are automatically entered for procedures (from the published “Cross as” altitudes in the navigation database). Altitude constraints can be followed using Vertical Path Tracking Mode (VPTH).

Procedures

The simulation of G1000 Procedures functionality is comprehensive. Departure, Arrival, and Approach procedures can be added and removed from active flight plans using the PROC key.

Departures

Departures procedures can be loaded into the active flight plan using the PROC key.

Viewing available departures on the Airport Information page using the DP softkey is not simulated.

Arrivals

Arrival procedures can be loaded into the active flight plan using the PROC key, and removed by highlighting the header in the Active Flight plan (on the PFD) and pressing the CLR key.

Viewing available arrivals on the Airport Information page using the STAR softkey is not simulated.

Approaches

Non-precision and precision approaches can be loaded into an active flight plan, activated, or activated as “Vector-to-Final,” using the PROC key. Approaches can be removed by highlighting the header in the Active Flight plan (on the PFD) and pressing the CLR key. Missed approach procedures are simulated, including Course to Altitude (CA) legs and manually activating a missed approach via the PROC MENU (or by manually activating the next leg).

The LD APR softkey on the Nearest Airport page, and the ability to view available approaches on the Airport Info page using the APR softkey, are not simulated.

Trip Planning

Automatic Page and Flight Plan Modes are simulated, and trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data is displayed on the AUX – TRIP PLANNING page of the MFD. Weight planning is also available, based on fuel sensor data and the active flight plan (to estimate remaining fuel).

Manual entry of data via Manual Page and Waypoints mode is not simulated.

RAIM Prediction

RAIM (Receiver Autonomous Integrity Monitoring) Prediction at the aircraft present position is simulated on the AUX-GPS STATUS page. RAIM can be made unavailable via the separate G1000 Student Failure Generator application.

RAIM Prediction at a selected waypoint and WAAS Disabling are not simulated.

Abnormal Operation

Reversion to Dead Reckoning (DR) Mode in Enroute (ENR) or Oceanic (OCN) phases of flights is not simulated.

HAZARD AVOIDANCE

XM Satellite Weather

Optional subscription-based XM Satellite Weather services are not simulated.

WX-500 Stormscope

An optional WXC-500 Stormscope is not simulated.

Terrain and Obstacle Proximity

Red and yellow obstacle icons (<1000' AGL and >1000' AGL) are displayed on the:

- PDF Inset Map
- Navigation Map page
- Terrain Proximity page
- Trip Planning page
- Flight plan page

The display and color of an obstacle icon is dependent on the aircraft height above the obstacle.

Terrain-SVS

Terrain-SVS is not simulated.

TAWS-B

Three TAWS-B Aural Alerts and annunciations are simulated:

- Excessive Descent Rate Caution: "TERRAIN" and "Sink Rate"
- Excessive Descent Rate Warning: "PULL UP" and "Pull Up"
- Altitude Callout "500" (just aural alert): "Five Hundred"
- Reduced Required Obstacle Clearance Caution: "TERRAIN" and "Caution, Obstacle; Caution, Obstacle")

Forward Looking Terrain Avoidance, Premature Descent Alerting, the Negative Climb Rate After Takeoff Alert ("Don't Sink"), and the dedicated TAWS-B page are not simulated at this time.

Traffic Information Service (TIS)

Basic Traffic Information Service (TIS) functionality is simulated, to help you detect and avoid aircraft generated by the flight simulation. Traffic Advisory symbols, vectors, altitude differences, and altitude trends are displayed on the:

- PFD Inset Map
- Navigation Page Map
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

TIS Alerts simulated include:

- Aural “Traffic”
- “TRAFFIC” annunciation on PFD

Additionally, the PFD Inset Map auto-displays when a Traffic Advisory is detected.

Traffic Advisory System (TAS)

The Mode S transponder-based Traffic Advisory System is not simulated.

ADS-B Traffic

The GDL 90 data link radio-based Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic function is not simulated.

AUTOMATIC FLIGHT CONTROL SYSTEM

The G1000 Student Simulator includes an integrated Garmin GFC 700 digital Automatic Flight Control System (AFCS) that realistically simulates the Flight Director and Autopilot. Flight Director command bars and AFCS status are displayed on the PFD.

AFCS Status Alerts and Overspeed Protection are not simulated.

Vertical modes simulated include:

- Pitch Hold Mode (PIT)
- Selected Altitude Capture Mode (ALTS)
- Altitude Hold Mode (ALT)
- Vertical Speed Mode (VS)
- Flight Level Change Mode (FLC)
- Vertical Navigation Modes (VPTH, ALTV)
- Glidepath Mode (GP) (WAAS Only)
- Glideslope Mode (GS)
- Go Around Mode (GA)

Go Around Mode (GA) is activated by pressing a key command assigned to “GAButton” in the F1G1000_keyboard.ini. (If running the G1000 Student Simulator and the flight simulation on the same PC, note that the G1000 Student Simulator must have “focus” in Windows when the GA key command is pressed—click in a G1000 Student window before pressing the key command).

Pressing the GA key command engages the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around.

Automatic activation of the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned is not simulated at this time.

Lateral modes simulated include:

- Roll Hold Mode (ROL)
- Heading Select Mode (HDG)
- Navigation Modes (GPS, VOR, LOC, BC)
- Approach Modes (GPS, VAPP, LOC)

Control Wheel Steering (CWS) is not simulated.

ADDITIONAL FEATURES

SafeTaxi® diagrams are simulated if the Flight1 Tech SaferTaxi plug-in for the G1000 Student Simulator software is installed.

The following additional G1000 features are not simulated:

- *Synthetic Vision System (SVS)(Optional)*
- *ChartView and FliteCharts® electronic charts (Optional)*
- *AOPA Airport Directory*
- *XM Radio entertainment (Optional)*
- *Scheduler*
- *Electronic Checklists (Optional)*
- *Flight Data Logging*
- *Auxiliary Video (Optional)*

ABNORMAL OPERATION

Reversionary Mode

Reversionary Mode (in which all important flight information is displayed on one display) can be manually activated by pressing the Display Backup button on the Audio Panel. Reversionary Mode is simulated on both the PFD and the MFD.

When used with Virtual Instructor Station Pro (VISPRO) and the G1000 Failures plug-in for VISPRO, you can realistically simulate the switch to Reversionary Mode after a display failure, and present students with challenging scenarios that test their ability to deal with failures when they're least likely to be able to handle them.