Glass Cockpit Transition Training Guide

Featuring the GRT Sport EFIS

28-Jan-2014

Rev A

1.1 Introduction

Congratulations on making the jump to modern "glass-cockpit" avionics!

The amount of information available right in front of you for every flight may seem overwhelming at first, but there are many reasons you will grow to love having it. Eventually, you will wonder how you got along for so many years without it. Glass cockpit avionics are designed to minimize pilot workload and fatigue by giving you timely information closer to your central instrument scan. The technology we use in the Sport system has opened doors for dozens of features such as real-time display of weather radar and traffic, GPS flight plan overlay, 3D terrain imagery, and much more.

This guide will help ease your transition from round "steam gauges" to GRT glass by breaking down the parts into a logical sequence so you can fly your airplane in confidence and, at the same time, get to know your avionics piece-by-piece. If you feel overwhelmed, you are not alone. Most high-time round dial pilots need at least 5 or 10 hours of flight time using an EFIS before they feel comfortable with glass cockpit technology. Spend as much time as you can with a qualified and experienced CFI to help get you started. Most pilots find it useful to spend some time in the airplane on the ground, plugged in to an external power source, pressing buttons and viewing pages on their EFIS before actually flying it. Bring this manual with you as a tutorial.

1.2 General Terminology

Throughout this manual, you will see terms and abbreviations that refer to GRT avionics systems. Here are the basics:

Sport- The model of GRT instrument display screen that you have. Other models include the Horizon HX and large-screen Horizon HXr, both usually used for IFR-capable aircraft.

Display Unit- The actual Sport "box." *EFIS* and *Display Unit* are often used interchangeably.

EFIS- Electronic Flight Information (or Instrumentation) System. The term "EFIS system" is used to describe the Display Unit and all of its sensors (engine, GPS, magnetometer, etc.) together as one.

AHRS- Attitude-Heading Reference System (pronounced A - hars). This is the instrument inside the Sport display unit that measures the attitude, heading and motion of the aircraft using accelerometers and algorithms.

Magnetometer- A small, lightweight module that precisely measures the Earth's magnetic field. This is critical for many types of data displayed on your Sport, and is located somewhere far away from all magnetic and electrical interference. In Jabiru aircraft it is usually behind the baggage compartment. In RV's and other metal aircraft, it is usually in the tail or wingtip.

EIS- Engine Information System- Grand Rapids Technologies engine monitor. This little green box is connected to a variety of probes on the engine. It gathers information from the probes and feeds it into the Sport EFIS to create the Graphical Engine Display. The EIS can be mounted on the instrument panel face or in a remote location. Most Sport-equipped Jabiru LSA built after 2010 have the EIS mounted under the instrument panel box on a hinged access panel.

Softkey- The buttons on the display unit. They are called "softkeys" because their functions are driven by software; what they do changes depending on what screen is showing. (In contrast, "hard keys" always perform the same function, such as a hard-wired On/Off switch. There are no true hard keys on GRT display units. All buttons and knobs are software driven.)

Knob- One of two round knobs on the bottom of the display unit bezel face. They can be turned and pushed and are used to highlight, select and enter data.

PFD- Primary Flight Display. In GRT systems, the "PFD screen" or "PFD page" refers to the primary flight instruments for flying the aircraft, quickly recognized by the blue sky over brown or green terrain.

MAP- Moving Map. This is a GPS-derived representation of where the airplane is over the Earth's surface. Airports, navaids, cities, and terrain features are displayed on the map. Flight plans, terrain, weather radar imagery, and traffic can also be displayed on the map.
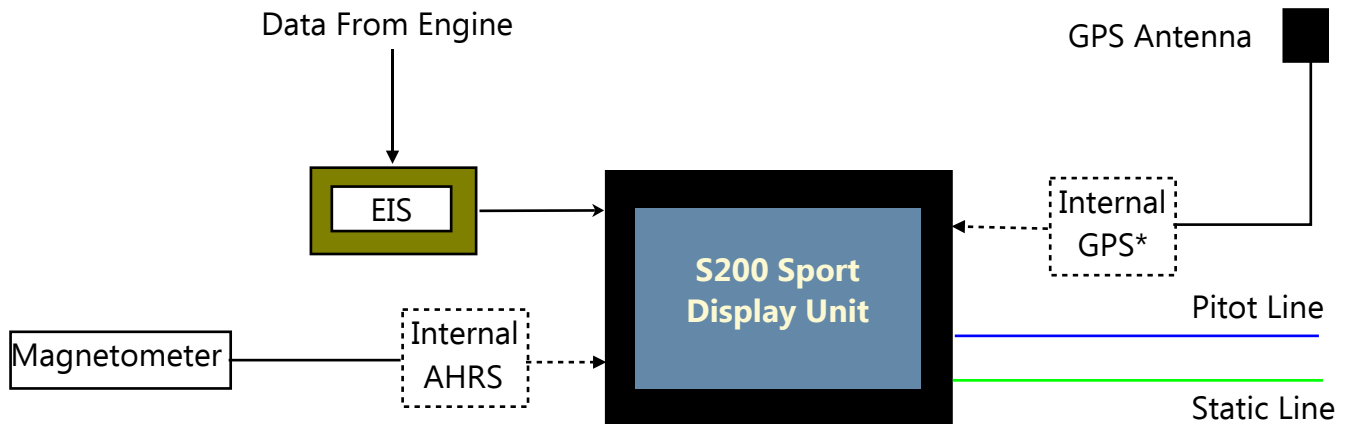
ENG- Engine display page, or Graphical Engine Display. Displays engine and systems data in a large format of dials, graphs and data boxes.

Set Menu- The page that allows the user to program the EFIS system's customizable features. Access by pressing any softkey, then pressing the NEXT softkey repeatedly until SET MENU appears as one of the softkey labels. Press the SET MENU softkey to access.
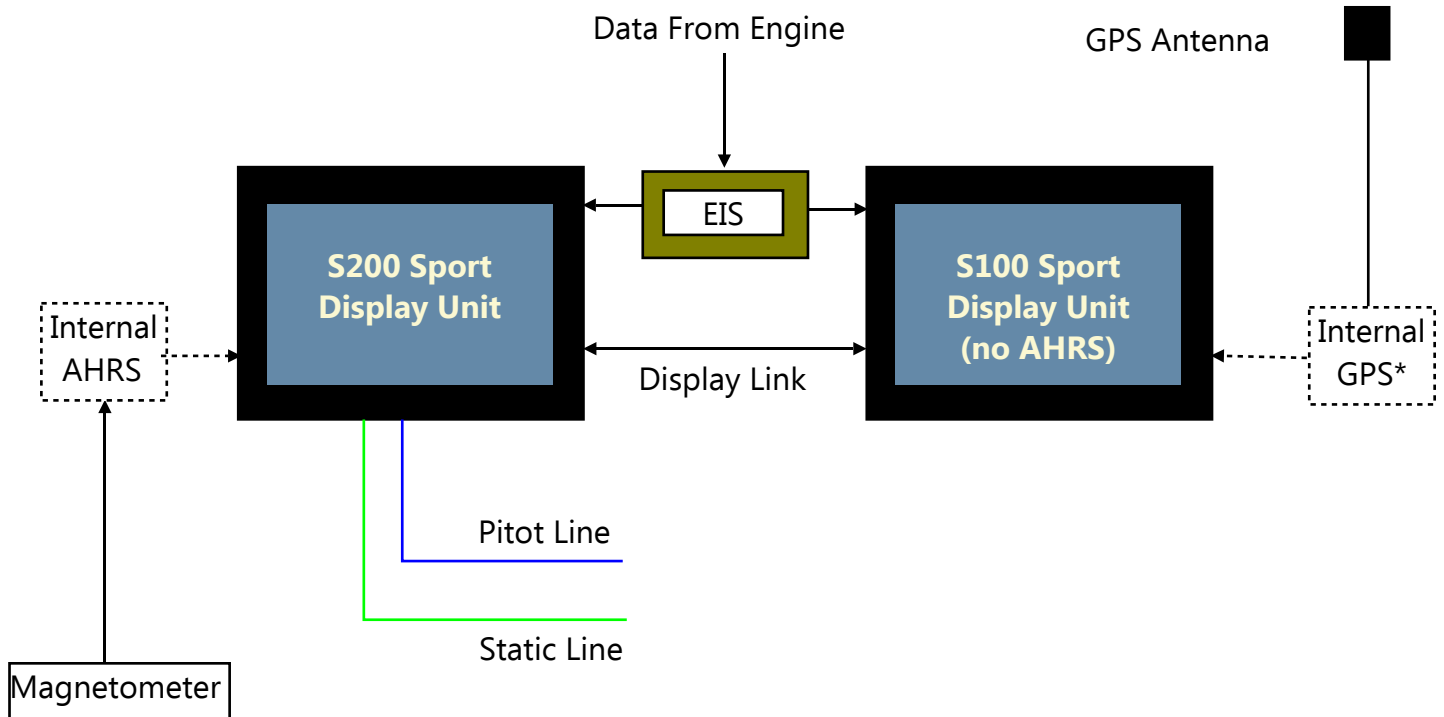
1.3 Basic Sport System Components- Recommended Configuration

Note that some airplanes may be wired differently. Most LSA built by Jabiru USA Sport Aircraft and Arion Aircraft follow this general schematic, which is our recommended system configuration. Some dual-screen systems may have dual S200s, each containing an internal AHRS for redundant flight instrumentation. To tell if your second screen has an internal AHRS, read the information on the boot-up screen. If it is an S200, that model number and an AHRS software version will be listed.

Single Display Unit with EIS

```
Data From Engine                              GPS Antenna  ■

      ↓
   [ EIS ] ──────→  ┌─────────────────┐   ┌─ Internal ─┐
                    │  S200 Sport     │ ◄─┊   GPS*      ┊
                    │  Display Unit   │   └────────────┘
Magnetometer ─→ ┌─ Internal ─┐ ┄┄► │                 │ ──────── Pitot Line
                ┊   AHRS      ┊     │                 │ ──────── Static Line
                └─────────────┘     └─────────────────┘
```

Dual Display Units with EIS

```
              Data From Engine          GPS Antenna  ■

                     ↓
  ┌─────────────┐ [ EIS ] ┌─────────────┐
  │ S200 Sport  │◄──┘ └──►│ S100 Sport  │
  │ Display Unit│         │ Display Unit│   ┌─ Internal ─┐
┌─ Internal ─┐ │         │ (no AHRS)   │◄─┊   GPS*      ┊
┊  AHRS      ┊►│         │             │   └────────────┘
└────────────┘ │◄───────►│             │
  │            │ Display Link
  │ Pitot Line
  │ Static Line
Magnetometer
```

In dual VFR-only systems, we recommend using a display unit that contains an internal AHRS on the pilot's side, and a display unit with no AHRS, but an internal GPS, on the right. If the right display unit stops functioning, GPS information will be lost. If the left display unit stops functioning, flight instruments will be lost. The EIS communicates engine information to both display units. *NOTE: Internal GPS was an optional feature until 2013, but most units have it.

1.4 Basic Buttonology

The default softkey logic is as follows:

1. Press any softkey once to make the softkey labels appear.

2. Choose and press the softkey that applies to what you want to do.

3. Some softkeys appear to have a stack of labels. In this case, press the softkey repeatedly until the option you want is highlighted in a thin white box, then either do nothing and let the screen labels disappear OR press EXIT to activate your choice.

"Home" Pages

Each display unit can show primary flight instruments, moving map, or engine data at any time. These three sets of pages are the "home" pages, and are selected using the first three white buttons, or softkeys, as shown below:
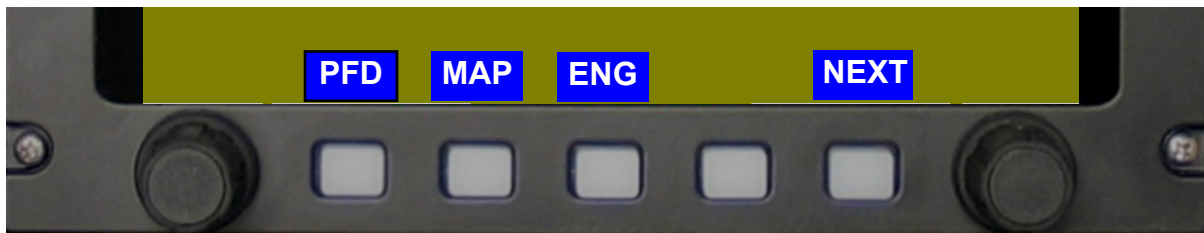
PFD- Primary Flight Display. Press this softkey repeatedly to view different PFD pages. When you find the one you want, simply quit pressing the button, and eventually the softkey labels will disappear and the page will stay that way. You can display the moving map and engine display next to it in a "split screen" format, or you can just view it on its own.

MAP- Moving Map. Press this softkey repeatedly to view different map pages. Just like the PFD, the Map can be displayed in several different ways.

ENG- Engine Display. Press this softkey repeatedly to view different engine and systems data pages.

Additional Softkeys

NEXT- Because there are only 5 buttons, it is often necessary to flip through additional menu pages to access different Sport functions. Keep pressing NEXT until you see the softkey label you are looking for, such as SET MENU to access the settings.

EXIT- (not shown here) When you press EXIT, the screen will always go back to the last-viewed "home" page. For example, if you are using the basic MAP screen and enter a flight plan, when you are finished in the flight plan page, you would press EXIT to return to the MAP screen.

When learning to fly with your Sport, leave the screen on the default PFD page for the first hour or two until you get used to the primary instruments, described in the next section.

1.5 How to Simplify Your Sport for Training

Just because your Sport *can* display so much information, doesn't mean you *should* display everything while you are learning the system and possibly a new airplane. Transition training is easier if you can simplify the screen for the first hour or two. Follow these steps to eliminate some things, and add them back in gradually as training progresses.

One of the biggest problems reported during glass cockpit transition training is that the pilots-in-training spend far too much time looking inside the cockpit during VFR conditions. Eliminating some of the details will help you avoid much of the "wow factor" inside the cockpit and focus on the marriage of the basic flight instruments + the view outside the windshield.

Turn off Synthetic Vision (if equipped)

For training, the screen should show the simplest version of blue sky over brown ground. This is a quick and easy way to eliminate a lot of distractions on the PFD.

1. From the PFD home page, press NEXT repeatedly until you see the SV label.

2. Press the SV softkey until OFF is highlighted. When the softkey labels disappear, the simple PFD screen will appear.

Changing Display Unit Settings in the "Set Menu" Pages

The rest of our simplification suggestions are turned off through the Set Menu pages in each display unit. All the items in the Set Menu are changed in the same way, described below.

1. From any home screen, press NEXT until the label SET MENU appears. Press the SET MENU softkey to access the setup menu for the display unit.

2. Turn the right knob to move the highlight cursor up and down the screen. The settings are broken up into several different categories. Choose a category and press the knob to view the page.

3. Rotate the knob to highlight different settings. Keep in mind that many pages extend below the visual limits of the screen, so if you don't see what you want, keep scrolling until the list stops.

4. To select a setting, highlight it and press the knob. Turn the knob to scroll through different options. When you see the option you want, press the knob again to enter it.

5. Many settings say "Change to Activate Menu." This simply means that if you highlight it, press the knob, then turn the knob, a new menu page opens that is dedicated to that particular item.

6. All changes to settings must be saved before you exit the setup menu. Softkey labels appear on the screen to SAVE, EXIT, CANCEL, and go back to MAIN menu.

IMPORTANT: SAVE YOUR ORIGINAL EFIS SETTINGS!

The **EFIS Settings Backup** feature allows you to save your original settings on a USB stick and reload them at a later date or in a new display unit. **If you purchased your airplane as a finished & flying airplane, you should save the original settings on all display units before changing any of the settings for transition training as instructed in this manual.**

To make it easy, back up each display unit separately with its own USB drive. Information does not take up much memory–Much less than 1 MB. This process will save all display unit settings, user waypoints, and flight plans.

1. Insert the USB thumb drive into the display unit.

2. Turn on the system. Go to the **Set Menu** page and select **Display Unit Maintenance.**

3. Right at or near the top is **EFIS Settings Backup**. Highlight this and push the knob.

4. Highlight Backup All Settings and push the knob. Answer YES at the prompt. The system will back up all the display unit's settings onto the USB drive.

5. Remove the USB stick and store it in a safe place. When it comes time to restore your original settings and display features after training, use the Restore All Settings option.

OPTIONAL: You may save settings files for multiple display units on one USB stick. Note the first setting in the Backup All Settings menu, Backup Directory. The default value is Main Directory, which saves the SETTINGS.BAK file onto the root directory of the USB stick (meaning it is not inside a folder).

The display unit will only recognize files named SETTINGS.BAK as settings files. If they were both stored in the main directory, one of the files would need to be named something different, which the display unit would not recognize. To get around this, highlight Backup Directory, press the knob and turn it one click. You will see BACK0000. Keep turning the knob to enter your display unit's serial number, then press the knob to enter. This will tell the display unit to create a folder on the USB stick by that name. The display unit will recognize this file folder as its own settings folder and open it to retrieve the SETTINGS.BAK file when it comes time to restore settings. Now, you can use the same USB stick to store the settings for multiple display units– just repeat this step with each display unit before saving their respective settings files.

Simplification Step 1- General Setup Page

1. Follow steps 1 and 2 in "Changing Display Unit Settings" earlier in this section to select the **General Setup** menu page.

2. Scroll down to and highlight the line called **Page Change**. This setting needs to be set to the default value of "Double Click." If it is set for Single Click, the softkeys will activate without displaying the labels first, which is difficult to use unless you have all the softkeys memorized.

3. Below **Page Change,** you will find **Initial Menu Timeout (sec)**. This is the amount of time it takes for the softkey labels to disappear after your first softkey press. If this time is too short, it can be frustrating because the labels disappear while the pilot is still searching for the right one. Set this for somewhere between 5 and 8 seconds to start. Later on when you find yourself impatiently waiting for the softkey labels to disappear, then you can come back and shorten the time.

4. Next on the list is **Used Menu Timeout (sec)**. This is the amount of time it takes for all of the softkeys to disappear after you select one. This time should be shorter than the Initial Menu Timeout. Usually 2-3 seconds is a good place to start.

5. Further down the list is **Default Page**. This should be set to your favorite page, the one you will use most often during training. This is the screen that will come on when the display unit boots up. The pilot's side display should always default to one of the PFD pages. In airplanes with two display units, often the right side display default page is set to show the map or engine. Our suggested Default Page for training is the *PFD/ENG Top/Bottom* selection. This displays the full-width primary flight instruments with the engine strip across the bottom, as shown here. In dual-screen aircraft, the right screen can be set to the CFI's favorite screen during training, then switched to the Map or whatever the pilot desires later on. NOTE: Older Sport WS systems are limited in page selection, and are not tall enough to display the engine strip. They should be set to default to the simplest PFD page.

6. Next is **Page Selection**. The PFD, Map and Engine pages all have multiple views that combine various elements of map, flight instruments, and engine information. These pages are viewed and selected by pressing the PFD, MAP or ENG softkeys multiple times. This is a chance for you to "clean house" if you think there are too many choices. Some pilots like to use all of them, but most pilots only choose a few views for each home screen to keep things simple. The following is a list of screens that we feel are useful for basic VFR training. Later on, you might want to display things such as the HSI for VOR navigation. If you prefer the Center view of the map page (with the aircraft in the center of a 360° compass rose) or North-Up map

presentation, choose those instead of or in addition to the Arc views.

> Full Screen: PFD
> Full Screen: Map, Arc View (shown at right, with radar)
> Full Screen: ENG
> Split: PFD Top, ENG bottom
> Split: PFD/MAP/ENG
> Split: MAP top/ENG bottom

7. Below **Page Selection**, you will find several settings for units of measure. If you prefer MPH over Knots, now is the time to change it– However, for S-LSA and E-LSA pilots, all units need to stay the same as those used in the POH and on the operating placards of the aircraft.

8. We recommend turning the autopilot features off during the early stages of training, again to simplify learning the flight instruments and basic menu structure of the Sport. To do this, scroll to **Lateral Autopilot Functions** and **Vertical Autopilot Functions**, and turn them OFF.

9. Scroll to **Traffic Altitude Filter** if your airplane is equipped with Mode S TIS traffic or ADS-B traffic alerts. Set the Traffic Altitude Filter to +/- 2000, especially if you are operating in busy airspace. If you leave it set to Unlimited, you will receive traffic targets that are many thousands of feet above and below you- airplanes not worthy of your attention that will just clutter the screen.

10. Toward the bottom of the General Setup page is the **SNAP button**. This feature puts a SNAP softkey on many screens which is used to take an instant snapshot from your display, saving it to an installed USB stick. This can be very handy for our techs, or for your engine techs– if a problem is observed, often the indications can be captured on a screenshot. It's also very handy for us for manual writing and website design, and it can be fun to capture things like extreme groundspeeds, interesting weather radar returns, or other things encountered during flight. However, during training, it can be a distraction. You have the option here to turn it off.

11. Be sure to **SAVE your settings** before leaving the General Setup page!

Removing Items from the Primary Flight Display

Go back to the main Set Menu page, scroll to Primary Flight Display and press the knob. Here you will find many features of the PFD that can be customized or turned off completely. We've put together this list of items that often cause distraction during initial training. Most or all of these items are very useful, especially on cross-country trips, so plan on turning at least some of them back on for cross-country flying after initial training.

1. **GPS CDI**- (Off) This is a small scale across the bottom of the screen that shows how far you are from the GPS course.

2. **Turn Rate Indicator**- (Off) These are two small green triangles on the attitude indicator that work with the Sky Pointer to display the bank angle for a standard-rate turn, varying with airspeed. These are not necessary for VFR flying.

3. **Wind Indicator Mode** and **Digital Head/Crosswind Display** (Off) The EFIS can calculate the winds aloft based on airspeed, ground speed, and ground track. This is a really neat function but it also adds to the clutter on the PFD.

4. **Flight Path Marker**- (Off) This little gadget looks like the front view of a missile and floats around on the PFD screen. It represents where the central mass of the aircraft is going, regardless of heading. If you put the FPM on the on-screen runway image during a crosswind approach, your nose could be 45 degrees off runway heading, but you will know you're headed straight for the runway. It tends to distract pilots during initial training– ("What IS that thing!?) – So save it for crosswind practice.

5. **Altitude Alerting**- (Off) A useful tool for cross-country or in controlled airspace when you're flying on ATC instructions, but an annoyance during basic stick and rudder training. This will cause the altitude alert to flash when you are beyond a certain altitude from your altitude bug setting. Most pilots and CFIs find it easier to turn it off during initial training. However, leave it on and learn how to use the altitude bug if your training will happen under direct ATC control. If you elect to leave it on, select a **Max Altitude Deviation**– usually 150-200 feet.

6. **Data Boxes**- (Off) The lower portion of the PFD screen can be used to display some very useful information, such as GPS waypoints, estimated time of arrival, ground speed, system voltage, etc. Use this portion of the menu to choose which boxes you would like to display, or just really simplify things and turn **Data Boxes** off.

Section 2: Flight Instruments

2.1 The Important Stuff

The Sport displays a huge amount of information, and it is important to know where the vital information is for flying your airplane before you leave the ground for the first time. The vital information is the bare minimum instrumentation required for VFR, including airspeed, altimeter, and magnetic heading. The location of the basic engine instruments of oil temperature, oil pressure, and tachometer should also be learned on the ground before flight. This section will cover the basic flight instruments– what you need to know to fly safely.

2.2 Fly With The Basic 4-pack

There are only 4 things you need to look at on the primary flight display when you are learning how to fly a new LSA– Airspeed, Altimeter, Heading, and Slip/Skid Ball. We'll throw in one engine instrument, the tachometer, so you can adjust your power settings. Don't worry too much about the engine information for now. Engine parameters such as oil pressure will blink red and alert you on this screen if they go beyond their programmed limits. (We'll talk about programming limits and acknowledging alerts later.)

NOTE: We show the tach on the PFD screen here, but pilots with older Sport WS systems will need to read the RPM directly from the EIS screen or a second Sport display. The EIS section of this manual has information on how to use the EIS and how to set the RPM, Oil Temp and Oil Pressure as the default EIS screen, so it's always visible with no button pushing.

Magnetic Heading

Airspeed

Altitude

Slip/Skid Ball

Tach
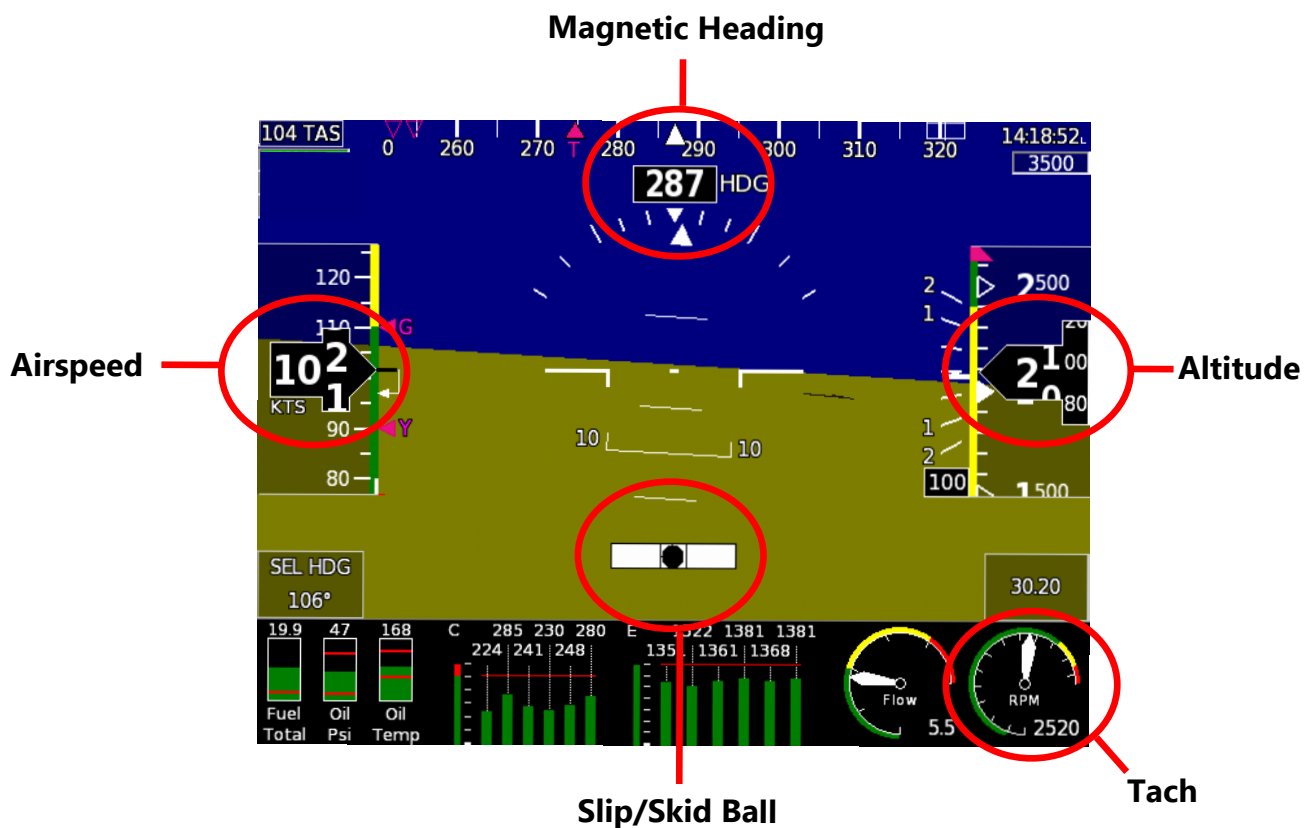
2.3 Tips for Your First Flights

EFIS System Boot-Up

Start the engine with the EFIS power (INST or Avionics switch) off. As soon as the engine starts, apply power to the Sport. Allow the EFIS system a couple of minutes to align the AHRS. You may taxi during alignment, however, this will likely add a minute or two to the alignment procedure. A countdown timer appears during alignment, with the full sky-over-ground picture appearing when it is ready to fly.

The AHRS will realign itself in-flight if power to the system is interrupted. If this happens, take care to hold a level attitude while the AHRS realigns in flight to avoid delays.

Changing the Altimeter Setting

1. If necessary, press any softkey, then press PFD to bring up the default PFD page.

2. Turn the right knob to the current altimeter baro setting.

3. Press the knob to enter OR press EXIT to abandon changes.

Dimming the Screen

1. Press the left knob, highlighting the DIM label in a white box.

2. Turn the knob to dim the screen. There are 10 dim settings, with the current setting displayed in the upper left corner of the screen as you adjust it.

3. Press the knob again to set the desired dim setting.
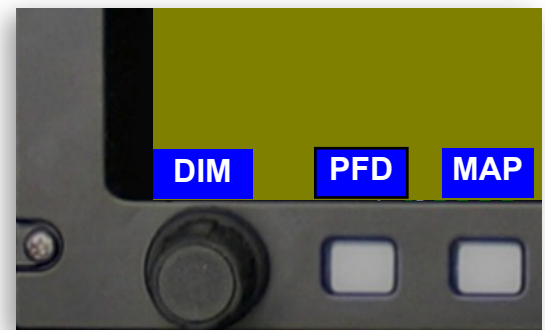
Acknowledging Alerts

The EFIS and EIS can both generate visual alerts that must be acknowledged by the pilot. The alerts flash on-screen and can refer to anything from obstacles to exceeded engine limits.

As soon as an alert flashes, a yellow MSG label appears on the screen. Press that softkey to show the acknowledge softkeys. Press ACK to acknowledge the alert. Several labels may also appear that say INHIBIT. You can choose to inhibit the alert from reappearing for several minutes or the entire flight. If you choose to inhibit an alert for the flight, it should be something that that has no impact on safety of flight. When an alert is acknowledged, if the parameter continues to be out of limits, (such as an engine overtemp or low fuel quantity), the on-screen gauge will stay red, but it will quit flashing.

When the EIS is accessible on the instrument panel face, it will flash a warning as well. Its screen automatically shows the data causing the alert. To acknowledge an alert on the EIS screen, press the NEXT/ACK button on the EIS. Acknowledging an alert on the EIS will automatically acknowledge it on the Sport.

Flying the Tapes

It takes some time to get used to looking at a number rather than a needle position. This can be uncomfortable for pilots who have spent many hours flying by looking at round gauges, but it will pass rather quickly as your brain adjusts to the digital tape-style readout.

Do not try to chase the digits, particularly with airspeed. Your desire to be a precise pilot can make glass transition more difficult if you try to pin the airplane to an exact value. Remember, your old needle was fairly wide and not nearly as precise as an electronic instrument– the needle had 2-3 knots of error just by virtue of its physical width. Pick a block of airspeed and altitude to work with– if your best approach speed is 62 knots, keep the airspeed within 60 and 65 knots, and you will immediately feel less stressed. You will trim the aircraft for a comfortable glide within that range, and let it fly itself, rather than chase the pitch. Many airplanes have an analog backup airspeed indicator. There is no shame in glancing at it on short final to reassure yourself that everything is just right. Fly for an hour or more just focusing on these 4 basic instruments. When you feel good about flying the airplane by the tapes, you can start learning more about your EFIS system.

2.3 Other Basic PFD Features

Groundspeed or TAS- The upper left corner of the PFD has a data box that can be set for either True Airspeed or GPS Groundspeed. This can be set in the Setup Menu by accessing the Primary Flight Display page and scrolling to Upper Left Corner Box, right above the Data Boxes setting. True Airspeed (TAS) and Groundspeed (GS) can be set in any of the Data Boxes as well.

Clock- The clock is shown in the upper right hand corner of the PFD. It can be displayed in either local time or Zulu time. Clock settings are in the General Setup menu. If you prefer local time to Zulu, you'll need to manually set the difference between your time zone and Zulu time (local time offset).

Clock

Ground-speed or True Airspeed

Altimeter Setting