InSight® Familiarization Course

Student Handbook – Fixed Wing Aircraft

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THE INFORMATION PRESENTED IN THIS HANDBOOK IS FOR FAMILIARIZATION PURPOSES ONLY

This handbook is to provide the reader with a basic understanding of the InSight display system.

For detailed and current information regarding the operation of equipment, refer to the appropriate Operator's Manual or Technical Manual.

The information provided in this manual is correct at the time of printing however no field revision service is available.

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01 PREFLIGHT

Course Overview

Welcome to the InSight Operations Familiarization Course.

Before operating your aircraft, you must conduct a preflight. The same is true when taking a course. Though you could just jump in and start watching videos, you risk missing important information that will help you better learn the material, so consider this module the preflight to learning InSight.

This course is designed to familiarize you with the InSight display system through both on-line tutorial videos and a Student Handbook. A pdf copy of the handbook can be downloaded from this site. The videos and handbook are designed to work together to maximize what you get out of this course. We will go into the Student Handbook in just a moment, but for now, let's review the course itself.

Course Syllabus

The course begins with a short overview on how to control the InSight display system. Pilot interface and control is conveniently provided through the Electronic Control Display Unit, or ECDU. The ECDU eliminates the need for external panels that take up valuable cockpit space by integrating with the PFD, MFD, stand-alone radios, and the Flight Management System. You will also learn about the Reference Select Panel and Cursor Control Panel and how they too can control InSight.

Once you know the basics of how to control the displays, you will learn how to interpret all of the data on the Primary Flight Display. The PFD is part of the InSight display system that presents flight critical data such as the navigation display, airspeed, altitude, and much more. The lessons start with a blank PFD and add each feature, one at a time, explaining how to both access and interpret the information available.

Next, we will briefly discuss ILS approach procedures before going into the Multi-Function Display. The MFD presents map data, engine instrument displays, charts, and more.

Both the PFD and MFD have inset displays at the bottom of their screens, so these will be covered, as will how to create and save personalized custom layouts.

Next, you will learn about Reversionary Operations, which is a method of dealing with a component that fails by accessing its functions through another component.

Then we will return to the ECDU to cover additional capabilities. By this time, you will have already learned most of the pages - this section discusses those items not already previously addressed.

Finally, we will learn about ADS-B; its operation and what to do if you encounter problems.

Course Outline

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- *The Student Handbook*

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Not covered in this course

This course focuses on the InSight display system and therefore does not cover FMS operations, UniLink, or TAWS. Those systems are covered under different courses. In fact, it is strongly encouraged that you become familiar with the UNS-1 FMS before beginning this course. Familiarization modules and a Training Manual are available on-line and classroom instruction can easily be scheduled.

Nor will this course cover flight regulations, the Aeronautical Information Manual, or instrument procedures; the student is expected to be already knowledgeable in these areas.

Configuration Differences

The InSight display system is designed as an integrated flight deck solution, and as such retains the ability to interface with a large number of components such as attitude/heading sensors, air data computers, radars, traffic systems, radios, and autopilots. InSight uses an open architecture that allows for flexible integration into new aircraft platforms, future customization, and upgrades on airframes, minimizing financial impact and complexity of integration.

Because there is so much flexibility, these on-line videos will cover many different configurations, some of which may not pertain to your particular aircraft. If your installation is not configured for a particular system, the controls may differ from what is shown. For example, an installation in which UniLink is not installed, the option to select UniLink from the MFD main display will not be available.

The Student Handbook

As you can see, this course covers a lot of information, so we have developed this student handbook to help.

The handbook contains individual lesson modules. Each module contains a Lesson Overview that provides a quick summary of what the lesson covers and is followed by the lesson's Learning Objectives. These objectives may be rather broad in scope, such as "know the components of the PFD Navigation Display", so these are followed by Examples of Behavior. The purpose of the examples is to let you know when you've achieved the Learning Objective. For example, "locate where the digital pitch is displayed". Knowing what you need to get out of a lesson before you begin can be very helpful.

After reviewing the Overview, Objectives, and Examples of Behavior, go ahead and watch the video. The video's transcript is included in the module immediately following the Examples of Behavior.

At the end of each lesson are Self-Assessment Questions designed to test your knowledge of the material just viewed. The answers to the questions are in Appendix A. Many of the answers are very comprehensive; not that you are required to answer them to that level of detail, but rather to provide yet another learning opportunity.

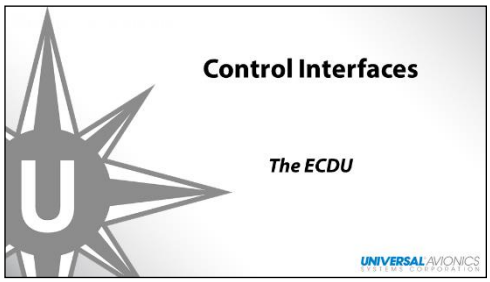
Other appendices include a glossary of abbreviations, quick reference guides, and an ECDU Page Map. Feel free to use them while watching the videos or for review at a later time.

Incidentally, several of the self-assessment questions will ask you to reference the ECDU Page Map to accomplish a specific task. You do not need to memorize what is on each page - these questions are intended only to give you practice navigating the pages. We believe navigating the ECDU pages is very intuitive and will become second nature in no time!

We hope the handbook proves very beneficial to you.

02 THE ECDU

Lesson Overview



This module introduces the primary component that enables the pilot to control the InSight display system; the Electronic Control Display Unit (ECDU). The primary focus for this module is on how to operate the ECDU in general, not to execute specific commands.

Learning Objectives

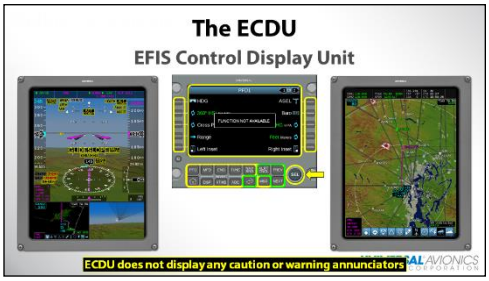
1. Understand the operation of the Line Select Keys (LSK).
2. Know the icon symbology and colors associated with the LSKs.
3. Be able to identify the current page displayed on the ECDU.
4. Be able to navigate the ECDU pages using the PREV, NEXT, and PAGE BACK keys.
5. Understand how to interpret the instructions displayed on an ECDU page.

Examples of Behavior

1. Be able to select the correct LSK to enable a particular option.
2. Be able to identify if an LSK option is on, off, or unavailable
3. Be able to navigate from any ECDU page to another page.
4. Be able to identify which knob (inner vs. outer) changes which value.

Video Script

The ECDU



The primary control device for the InSight display system is the Electronic Control Display Unit, or ECDU.

It consists of a control panel with dedicated function keys and a dual concentric rotary knob with a center key. Above these controls is a five inch active matrix liquid crystal display. On each side of this screen are five Line Select Keys.

Additionally, there is an alphanumeric keyboard through which the pilot can control both the InSight display system and the on-side FMS. The alphanumeric keyboard provides both FMS specific controls and data entry.

The ECDU does not display any caution or warning annunciators; these are displayed on the PFD.

So, how do you operate it?

Selecting any of the FMS specific keys on a connected alphanumeric keyboard will display the appropriate FMS page or function from a connected Universal FMS, just as if it were being controlled by a CDU. Pressing a dedicated function key will always change the ECDU to that function's page or enable that function (as appropriate to the key) regardless of which page the ECDU is on at the moment.

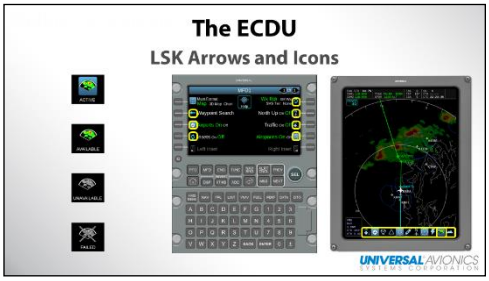
An exception to this is if the function is not enabled in the installation, in which case the ECDU will display a banner stating FUNCTION NOT AVAILABLE or similar message.

Pressing a context sensitive function key may behave differently, according to the current page and control state of the ECDU. For example, the FMS MENU key only works when you are on an FMS page such as FPL, FUEL, or NAV.

The alpha and numeric keys are only used to enter data.

In summary, the FMS is fully integrated into the InSight display system with the ECDU.

LSK Arrows and Icons



You should already be familiar with Line Select Keys from either your experience using the Universal FMS or having completed the FMS Operations Course, so we are just going to address the issues that relate to InSight in general and the ECDU in particular.

On all ECDU pages, the arrows and icons next to the Line Select Keys will change when the Line Select Keys next to it are pressed. This is to provide the pilot with visible feedback that the key was in fact, pressed. There are three types of Line Select Key arrows:

Outward pointing arrows (with respect to the Line Select Key label) generally go to a new ECDU page.

Inward pointing arrows enable a settable parameter on the current ECDU page.

Pressing a Line Select Key next to a toggle arrow will cycle through the list of options.

The Line Select Key label for the currently selected choice will be displayed in enlarged green text.

Available options will be displayed in white. In cases where options may not be selectable, they will be displayed in gray.

Some Line Select Keys have icons; a symbol for the function which in many cases is replicated on the MFD as a clickable item as well.

Highlighted icons represent functions that are activated or selected.

Normally colored icons represent functions that are available, but not currently active or selected.

Gray icons represent unavailable functions.

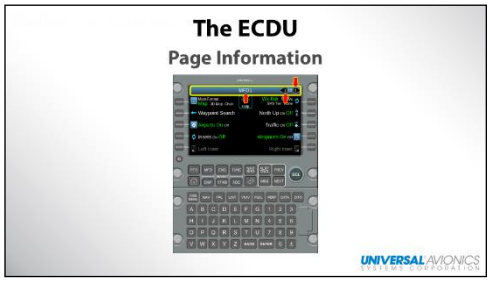
Gray X'd icons (of which there are few) represent functions that have failed.

ECDU Page Information

At the top of every ECDU page you will see a title bar.

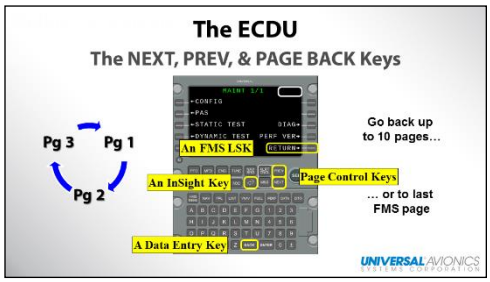
This title bar includes the current page name, page number and total page count.

The title bar enables the pilots to see at all times where they are in the control structure and the nature of the controls they are currently viewing.



NEXT, PREV, & PAGE BACK Keys

Pressing the NEXT key on any ECDU, search, or pop-up menu page will transition to the next page in a given sequence. Pages loop, meaning that if you get to the end of a sequence of pages like we are now, pressing the NEXT key will transition forward to the first page of the sequence loop.



Pressing the PREV key on any ECDU page will transition to the previous page in a given sequence. Since we are already on page 1, pressing the PREV key now will go backwards to the last page of the sequence.

Note that PREV key does not necessarily go back to the page previously displayed, only the previous page in a numbered sequence. However, the PAGE BACK key does allow the pilot to step back through previously viewed InSight display system control pages - up to either 10 pages deep, or the last selected FMS page, whichever comes first.

You may have noticed there are five keys with similar names or functions. Let me summarize each of them.

PAGE BACK is an InSight key and steps backward through previously viewed InSight display system control pages, up to 10 pages deep.

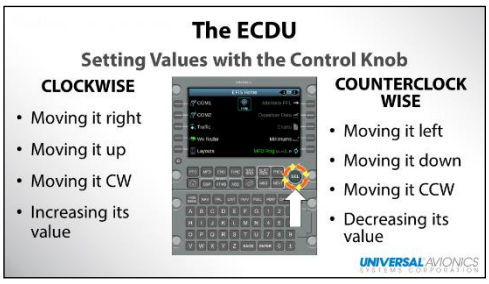
The RETURN Line Select Key is an FMS key and returns to the previous FMS page.

The BACK key is a data entry key and operates like the back space key on a computer keyboard.

The PREV and NEXT keys are page control keys that cycle through the numbered pages in a series.

The Rotary Control Select Knob

The ECDU has a dual concentric rotary control knob with a center key.

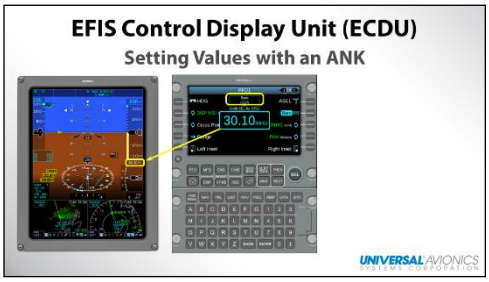


Clockwise motion of the knob will affect a controlled item by one or more of the following means, depending on the type of item controlled.

Counter-clockwise motion of the knob will affect a controlled item in the opposite manner.

Setting Values with the ANK

A connected alphanumeric keyboard may be used to enter letters and numbers into ECDU data fields.

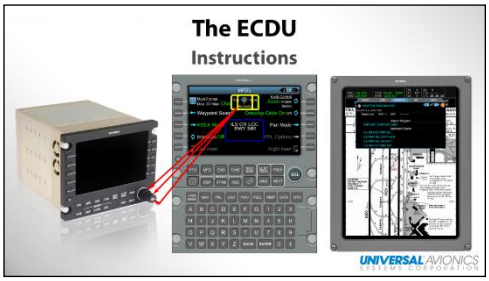


An instruction box will be displayed with the valid available range as soon as you press the first digit.

If the numeric keyboard is used to enter a value for a selected parameter that happens to be out of range, the value will flash for approximately three seconds before returning to the last valid value.

Instructions

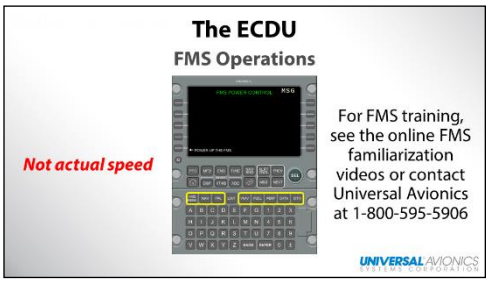
I mentioned an Instructions box just a moment ago. What is that? Instructions are available for controls and symbolically show the functions of the control knob.



On certain ECDU pages, the display of instructions overlaps the Line Select Key labels. In these cases, "**Help**" is displayed until a control is selected or the knob is turned. Pressing the SEL key on the dual concentric knob will also momentarily expand the Help instructions.

The text to the left of the info graphic describes the outer knob function. The text to the right describes the inner knob function. The text below identifies the center push key function.

FMS Operations



The ECDU does not just control the InSight display system; it controls the FMS as well. Like the 5" and 4" FMS Control Display Units, the ECDU, in conjunction with the Alphanumeric Keyboard, provides all of the functionality of the FMS controls.

One major difference though is the ECDU does not have a Power or On/Off key. To turn the FMS on, press any of the FMS function keys on the top row of the ECDU, other than the LIST key. Doing so will bring up the FMS POWER CONTROL page. To power up the FMS, just press the Line Select Key shown. The FMS will initialize and perform its built in self-test. When complete, verify your position, date, and time and then press ACCEPT.

To turn the FMS off, press and hold the FMS MENU key. This page will appear. To power down, press the POWER OFF Line Select Key. It is recommended that you power down the FMS's before turning off your master avionics control switch.

These modules do not cover FMS functionality; for that, please see FMS Familiarization videos on-line or schedule a class with an instructor.

Self-Assessment Questions

1. Does the ECDU display cautions or warnings?

2. What does the icon shown in Figure 1 next to a Line Select Key do?

3. What does it mean when an icon or text is gray?

4. What does a gray X'd icon signify?

5. What does it mean that the ECDU pages loop?

6. What does the key in Figure 2 do?

7. You enter a value into the ECDU using the alphanumeric keyboard. The value flashes for about 3 seconds and then returns to the original value. What happened?

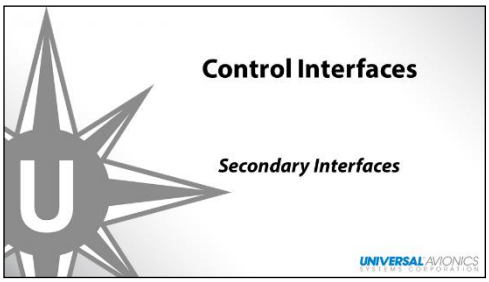
8. How do you turn on the FMS?

Figure 1

Figure 2

03 SECONDARY INTERFACES

Lesson Overview



This module introduces the optional components to the InSight system such as Cursor Control Panel (CCP). Again, the primary focus is on how to operate the equipment in general, not to execute specific commands.

Learning Objectives

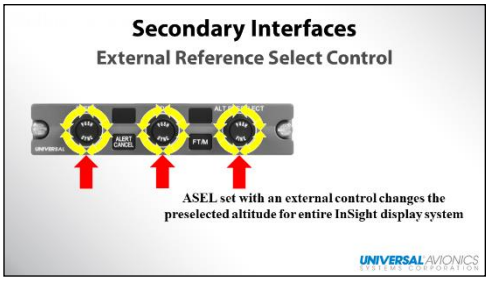
1. Know when to use the different keys on the Cursor Control Panel.
2. Know how to select items on the MFD using the Cursor Control Panel.

Examples of Behavior

1. Given a Cursor Control Panel, explain how to bring up information regarding an object displayed on the Multi-Function Display.

Video Script

External Reference Select Panel



The external Reference Select Panel provides an external interface for setting the selected SPEED, ALTITUDE PRESELECT, and HEADING through rotary control knobs.

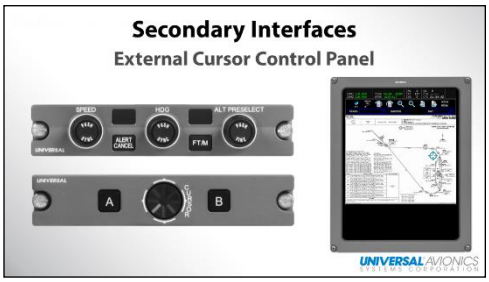
Pressing the center button of the rotary knob for heading and speed will sync the setting to the current actual value.

Pressing the center button of the rotary knob for altitude toggles the knob's scale between changing the altitude in thousands of feet and hundreds.

When the Altitude Preselect is set with an external control, it changes the preselected altitude for the entire InSight display system.

This control panel does not replace the control knob on the ECDU, but rather provides an additional means of setting these values.

External Cursor Control Panel



The InSight display system supports an external Cursor Control Panel to drive the cursor for MFD Map functions.

If two Cursor Control Panels are connected, such as one panel per ECDU, then each will control only the cursor on the MFD for its side of the cockpit.

If a single MFD is installed, the configuration will only allow one Cursor Control Panel.

Cursor Operations

How does the cursor work?

If the cursor has not been moved for thirty seconds, it will be removed from the display, but will reappear when moved again.

Scrolling the cursor over map objects such as airways, airspace boundaries, navaids, or airports will cause these items to momentarily change to bold lines.

You select these items by clicking on the **A** button, which will open up a pop-up menu or dialog box and slew the cursor to the upper left corner of that item.

To close the box, scroll over the **X** in the upper right corner and click the **A** button.

If you were to click in an area with multiple objects, a pop-up menu will enable you to choose which one you intended. Just scroll to the desired item and click the **A** button.

Interrogating navaids will bring up their information and allow you to select the frequency directly from the map and push it into the standby frequency of the appropriate radio. Flight plan operations can also be performed on navaids and fixes, such as adding them to the flight plan, initiating a direct-to steering leg, or selecting a holding pattern - if one is defined for that navaid or fix.

Interrogating an airport will bring up a pop-up menu with all of its available information and enable the pilot to add the airport to the flight plan, initiate a direct-to steering leg, and display an extended runway centerline. Available airport information includes frequencies, charts, weather, and other airport information. Simply scroll over the desired tab and click the **A** button to bring up its data.

Interrogating an airway gives you the option to add it to the flight plan.

Clicking on an airspace will display its pertinent information.

If the cursor is clicked in a map's free space, it will enable a menu for creating a radar waypoint with which you can also perform flight plan operations.

Panning the Map Display

If the **B** button of the Cursor Control Panel is clicked anywhere on a map, it will enable what is called panning mode. To indicate this mode, the cursor shape is changed and the ownship is placed in a cyan circle.

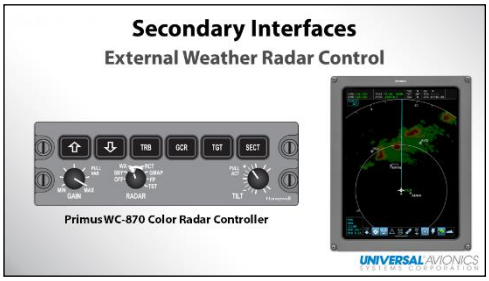
If you need to view an area of the map that is not visible, you can pan to it. In panning mode, the cursor will remain stationary and the map will move behind the cursor.

If the ownship is panned off screen, the filled circle representation will be parked at the edge of the map nearest to the actual location of the aircraft.

Clicking the **B** button again will cancel panning mode and return the cursor to its normal shape.

Placing the cursor on the ownship symbol when it is away from its normal position and clicking the **A** button will return the map to its original location with the map re-centered on the ownship symbol.

External Weather Radar Control



The InSight display system handles weather radars using one of two methods.

Some weather radars are controlled through the ECDU and displayed on the PFD and MFD.

Other radars include their own controls for weather range, tilt, gain, and mode selection. The InSight display system supports the interface of such external controls and will display the returns on the PFD and MFD screens.

Self-Assessment Questions

1. When the Altitude Preselect is set with an external control, which side is affected?

2. When using the cursor to select objects, what indication is given if the object is selectable?

3. How do you select an item using the cursor?

4. How do you use the cursor to select a particular item from among several in a group?

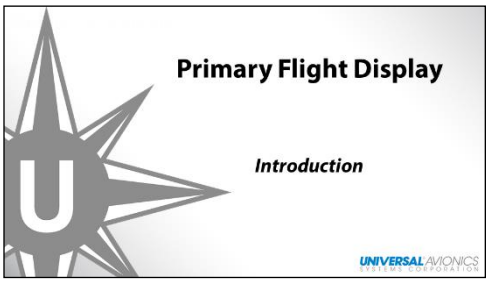
5. When using the cursor to interrogate navaids on the MFD, what options are available?

6. What happens if you click the A button in free space on an MFD map?

7. How do you enable panning mode on a map using the cursor?

04 INTRODUCTION TO THE PFD

Lesson Overview



This module introduces the Primary Flight Display (PFD) and its main components. A brief discussion of how colors are used is also addressed, but for a more comprehensive list of what colors mean, see your Operator's Manual. The lesson also covers the PFD function key on the ECDU.

Learning Objectives

1. Understand that some of the illustrative techniques and displays used in this course are not actually possible in the aircraft.

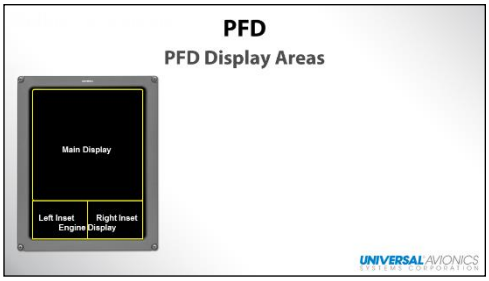
2. Know where on the ECDU most PFD options are located and how to access them.

Examples of Behavior

1. Be able to bring up the page(s) on the ECDU that control the PFD.

Video Script

PFD Display Areas

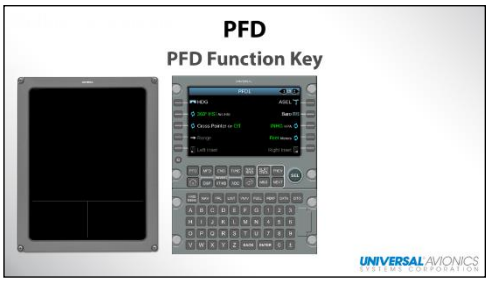


The PFD has two display areas. The top three quarters of the screen is called the main display and uses a fixed format. The bottom quarter can show either the compressed engine display or be split into two insets, both of which can be customized.

We will cover each of these in turn, starting with the main display, which shows the primary flight information.

For both instructional and illustrative purposes, we are going start with a blank display and add each component, one at a time. You cannot do this in the aircraft...it is meant only as an instructional technique that will enable you to focus on the content being discussed at the time. In addition, we will often show information that is not intended to represent realistic values or flight status, but rather to illustrate the type of information displayed.

PFD Function Key

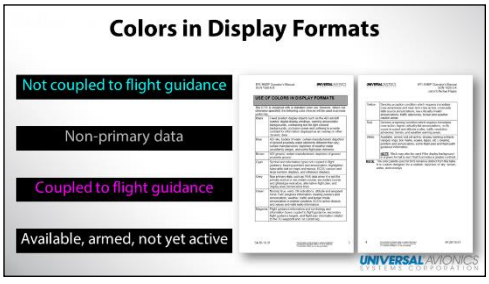


Much of the PFD is controlled through the PFD function key. This page may be accessed from anywhere else in the ECDU control structure by pressing the PFD key. Toggle controls show available options in white text and the currently selected option in larger green text.

Pressing NEXT, or a second press of the PFD function key, will advance to page 2. This page contains PFD display options for numerous functions; all of which we will discuss in these PFD modules.

The sequence of pages are a loop. When you get to the last page, advancing one more will take you back to the first page. Let's do that now by pressing the PFD key.

Colors in Display Formats



The InSight display system is designed with a standard color set in accordance with applicable advisory circulars, TSOs, and other guidance. Your Operators' Manual describes how the various colors are used, but let me point out a few items before we "build" the PFD.

Cyan is used for among other things, symbol and information types not coupled to flight guidance.

Gray depicts options, controls, or features that are unavailable due to the flight state or failure.

Magenta is used for symbology and information that is coupled to flight guidance.

And White is used for flight guidance that is available and armed, but not yet active.

Keep in mind that colors used for weather displays and synthetic vision use their own color formats distinct from this table.

Self-Assessment Questions

1. What does the color cyan usually indicate?

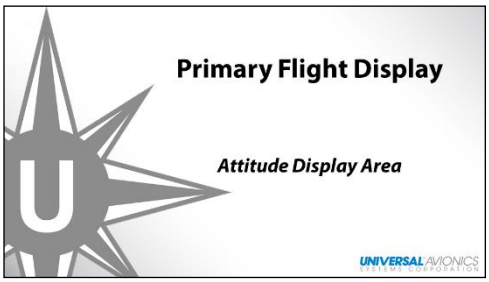
2. What does the color gray usually indicate?

3. What does the color magenta usually indicate?

4. What does the color white usually indicate?

05 Attitude Display Area

Lesson Overview



This module begins building the PFD with the background, aircraft symbol, pitch (including unusual pitch attitudes) and roll displays. Additionally, the lesson covers the Synthetic Vision System (SVS) display including how terrain and obstacles are displayed.

Learning Objectives

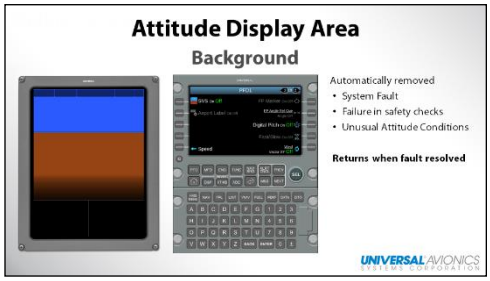
1. Know how to turn the synthetic vision on and off.
2. Know how to change the aircraft symbol from single-cue to dual-cue.
3. Know how to identify the current aircraft pitch.
4. Know the symbology for unusual pitch attitudes.
5. Understand the Roll Index and Sky Pointer symbology.
6. Know how obstacles are displayed on the PFD

Examples of Behavior

1. Given an ECDU page, be able to turn SVS on and off.
2. Given an ECDU page, be able to change the aircraft symbol.
3. Given a picture of the PFD, identify the aircraft's current pitch.
4. Identify the symbols associated with straight up and straight down.
5. Given a picture of the PFD, identify the aircraft's current bank and turn coordination.
6. Given a picture of the PFD, identify and obstacle symbols and explain their meaning.

Video Script

Background



Let's begin with the background.

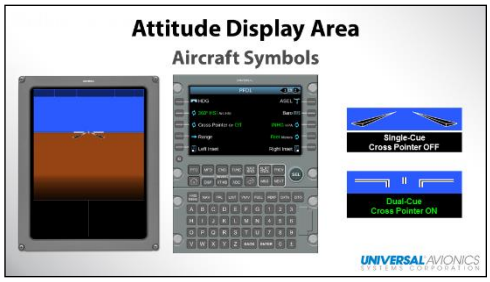
When configured and selected, the Synthetic Vision System, or SVS, gives an egocentric full-color terrain image of the area in front of the aircraft and responds in real time to changes in aircraft attitude. To turn Synthetic Vision on or off, toggle its Line Select Key on PFD page number 2. Now we have the traditional blue/brown depiction.

Synthetic Vision will be automatically removed if any of these events occur: A system fault is generated, the embedded safety pattern is detected to be invalid, or in unusual attitude conditions.

If Synthetic Vision is automatically removed, it will be returned when the fault conditions are resolved; manual re-selection is not required.

For instructional purposes, we will keep Synthetic Vision off for now as we continue to build our PFD display.

Aircraft Symbol



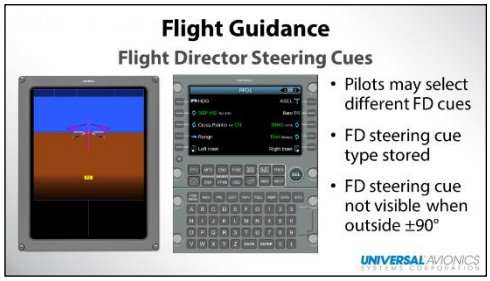
This is the single-cue aircraft symbol. The center tip of the aircraft symbol is fixed on the exact center of the display and indicates the zero pitch position relative to the pitch ladder, which we will learn about in just a moment.

If desired, you can choose a dual-cue aircraft symbol by going to PFD page 1 and toggle Line Select Key 3 Left so that CROSS POINTER is ON.

The aircraft symbol is fixed in the center of the attitude display area of the PFD.

For these lessons, we will be using the single-cue aircraft symbol.

Flight Director Steering Cues



A standard filled magenta, single-cue flight director for pitch and roll is available for flight guidance fly-to information. It appears as an inverted magenta chevron with a tapered and gapped center such that it will rest directly on the aircraft symbol when aligned.

The dual-cue cross pointer flight director is available via pilot selection. It is depicted as a vertical and horizontal pair of magenta lines that, when aligned, bisect each other at the zero point. The horizontal line moves up and down for vertical guidance and the vertical line moves left and right for horizontal guidance. The intersection represents the fly-to point.

Selecting single-cue on one cockpit side and dual-cue on the other side is permitted.

The flight director steering cue type is stored by the InSight display system and retained after shut down.

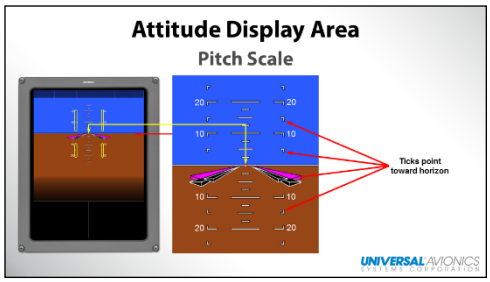
The flight director steering cue will not be visible when the display is outside the normal range.

If the flight director information is not received or is determined to be invalid by the PFD, a flight director failure annunciator, depicted as **FD,** is placed in the attitude display area and the flight director is removed from the display. A single axis of the dual-cue flight director may be displayed if that axis is still valid.

Let's return to the single-cue aircraft symbol and flight director.

Pitch Scale

A dynamic split pitch attitude scale, or pitch ladder, moves up and down such that the current airplane pitch is directly overlapped by the center of the fixed airplane symbol in the center of the display. Let me emphasize this point; the current pitch is not at the projected intersection of the two chevrons, but rather the midpoint between them. The pitch ladder is also rolled about this point by the current airplane roll angle.



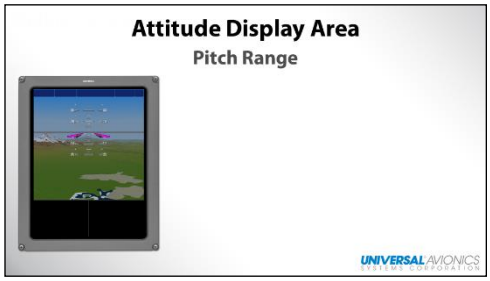
The pitch scale contains a white horizon line corresponding to zero pitch that runs the entire width of the PFD.

The pitch scale is composed of white horizontal tick marks drawn at the left and right edges of the scale, with each mark having a tail that points towards the horizon. In addition, there is a label for every 10° of pitch.

Pitch Range

A minimum displayed pitch range from +25° to -20°, relative to the aircraft symbol, will always be visible when using the blue/brown background.

When synthetic vision is the background, the pitch ladder range will be expanded to maintain conformance with the terrain image.

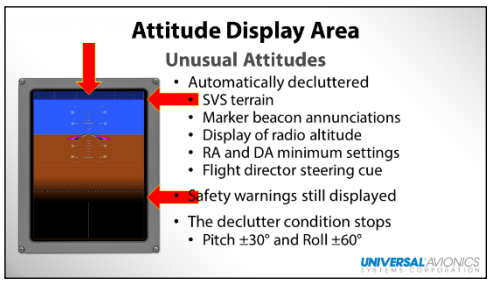


Unusual Attitudes

The PFD displays visual aids in unusual attitude conditions.

To aid the pilot in returning to more level flight when in a dive, large red chevrons pointing to the horizon are positioned at -30, 50, and 70°.

The PFD will always display a small amount of the sky at the top edge of the attitude display area, even when all other indications of the sky are out of view. This area is bounded by a dashed line, also called the "ghost" horizon line.



A white nadir symbol on the pitch scale at -90° indicates straight down.

During excessive positive pitch in a climb, there are only two red chevrons; at +50 and 70°. Also, the PFD will always display a small amount of the ground at the bottom edge of the attitude display area, bounded by the ghost horizon.

Instead of the nadir symbol, there is a white zenith symbol at +90° that indicates straight up.

Pitch values greater than ±90° will be considered invalid attitude information and will be annunciated as an attitude failure.

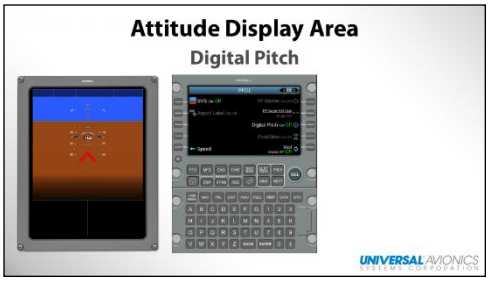
When the "ghost horizon" is enabled, the attitude display area is automatically decluttered of Synthetic Vision terrain, marker beacon annunciations, radio altitude data, RA and DA minimum settings, and the flight director steering cue.

Safety warnings, such as miscompares and terrain warning annunciations, will still be displayed.

The declutter condition is turned off when the attitude comes back within the range of ±30° pitch and ±60° roll.

Digital Pitch

As a configuration option, a digital pitch readout may be displayed to one decimal place just below the aircraft symbol.

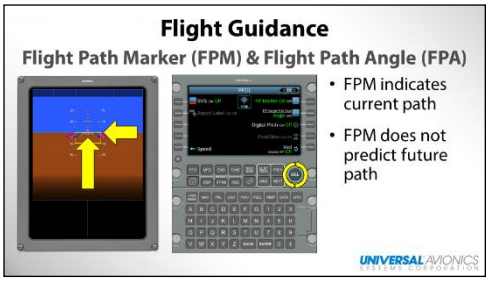


A climb is displayed as plus pitch and a dive is displayed as a minus pitch.

The pilot can turn this display off and on only if it is configured. We will be keeping it off for now.

Flight Path Marker and Flight Path Angle

A flight path marker, showing the real-time linear trajectory of the aircraft in the attitude display area, will be displayed if configured and selected, provided valid flight path, pitch, and GPS track angle information is available.



To select the flight path marker, go to PFD page 2 on the ECDU and toggle Line Select Key 1 Right to ON.

The flight path marker indicates the current path of the aircraft but does not predict the future path.

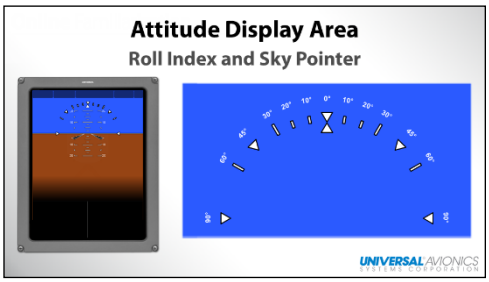
A **flight path angle reference cue** may also be selected for display. It is placed in the vertical centerline of the attitude display area, but it can be manually adjusted below the horizon line from 0° to -10°.

You can also enter a value using the alphanumeric keyboard.

When the reference cue is displayed, the center markings between 0 and -10° are removed from the pitch ladder.

Roll Index and Sky Pointer

The roll index is located at the top of the attitude display area of the PFD and consists of an arc with white roll angle reference tick marks and triangles.

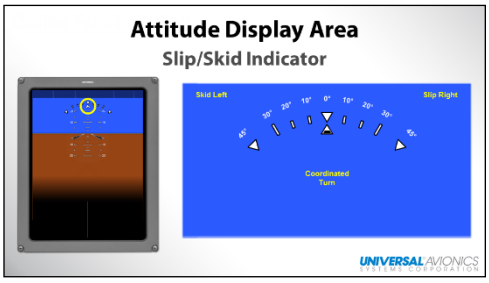


A sky pointer consisting of a white-filled triangle is positioned at the top center of the sky field that aligns with the 0° roll reference marker when the aircraft is wings level. This pointer travels along the inside of the roll index arc and always points toward the sky, regardless of aircraft roll angle.

The 60 and 90° reference marks are not displayed unless the aircraft's roll is ≥ 45°. The reference marks will come into view at that time and not declutter until the aircraft's roll is back to within 40°.

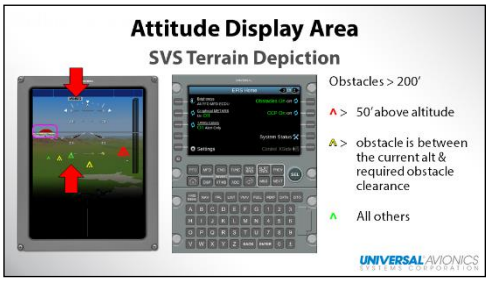
Slip / Skid Indicator

A slip/skid indicator is depicted within the sky pointer as a moving black trapezoidal-shape to indicate which direction the aircraft is slipping or skidding. In the event of a left slip or skid, the bar will deflect to the left, indicating left rudder is needed to coordinate the turn. The logic is opposite for the right condition. If the turn is coordinated, the bar will align within the bounds of the sky pointer.



PFD SVS Terrain Depiction

I mentioned earlier that when selected, the Synthetic Vision System's egocentric terrain view will be depicted. In addition to the full-color terrain image of the area in front of the aircraft, terrain caution and warning colors may also be enabled. Simply go to ECDU Home page 2 and toggle the TAWS Colors Line Select Key to ON.



This will display red warning bands on terrain above the current aircraft altitude and yellow caution bands for terrain near the current altitude. Red will always be displayed even if the Alert Only option for TAWS Colors is selected. If TAWS generates a caution or warning pop-up condition, the color bands will also be enabled for display.

Synthetic Vision also includes terrain coverage data such as ice, water, and urban areas as well as detailed airport mapping data and obstacles, provided you have a subscription to these databases.

When the Obstacles option is toggled on, man-made obstacles are displayed as inverted chevrons at the height and location contained in the obstacle database if they are greater than 200 feet in height. Obstacles shorter than 200 feet are not shown.

An obstacle will be displayed in red if its height is greater than 50 feet above the aircraft's current altitude or in yellow if the obstacle's height is between the aircraft's current altitude and the required obstacle clearance value received from TAWS. Otherwise obstacles are displayed in green.

If the aircraft is 2,000' above an obstacle, not only will that obstacle be green, but it will begin to fade until it becomes completely transparent when the aircraft is 2500' above it.

Be aware that the obstacle database includes tethered aerostat balloons, which can reach altitudes of 15,000 feet.

If the Synthetic Vision System is initializing, an SVS Initialization annunciator will be displayed at the top left of the roll index.

If SVS suffers a loss of reference data such as attitude, heading, or position, an SVS Inhibited annunciator will be displayed.

If the InSight display system detects a corrupt terrain tile in its database, the corrupt terrain elements will be displayed as a black translucent region 50,000 feet high, to obviously depict the region of uncertainty and to not present misleading information. The InSight display system will also push a message to the pilot explaining this condition.

Self-Assessment Questions

1. Using the ECDU Page Map, identify the key presses required to turn Synthetic Vision on or off.

2. Does the SVS lag or delay in responding to changes in pitch or roll?

3. When using the single-cue aircraft symbol, where is the current pitch indicated?

4. Using the ECDU Page Map, identify the key presses required to turn the dual-cue aircraft symbol on.

5. Which view has the larger pitch range, the blue/brown background or SVS?

6. During unusual attitude conditions, what visually aids the pilot in returning to level flight?

7. Using the ECDU Page Map, identify the key presses required to turn obstacles on.

8. When are obstacles displayed on the PFD?

9. What do the obstacle colors mean?

06 ANNUNCIATORS

Lesson Overview

This module focuses on the various annunciators that are displayed on the PFD, where they appear, and what they mean. The FMA Status Bar is also introduced in this lesson, but only the FMS Nav Data Block is covered in detail.

Learning Objectives

1. Understand the how colors are used in terrain and traffic annunciators.
2. Understand what a miscompare annunciator means.
3. Understand what a failure annunciator means.
4. Understand what primary source annunciators mean.
5. Understand what message annunciators mean.
6. Know what information is presented in the FMS Nav Data Block

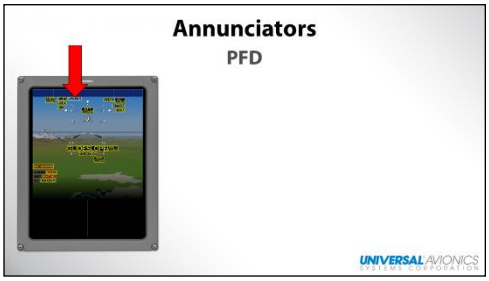
Examples of Behavior

1. Be able to differentiate traffic advisories from traffic warnings.
2. Be able to differentiate terrain cautions from terrain warnings.
3. Given an annunciator on a PFD, identify whether it is a miscompare, failure, or primary source annunciator.
4. Given a message annunciator, know where to go to get more information regarding the message.
5. Given a PFD, identify the current navigation leg information and the active flight director mode.

Video Script

PFD Annunciators

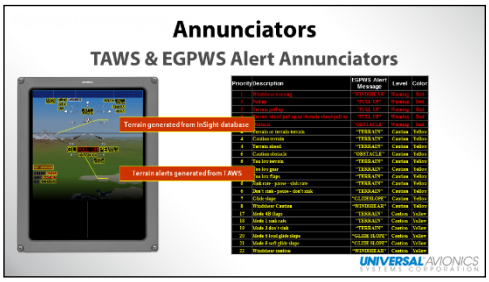
Various annunciators appear within the attitude display area of the PFD to indicate conditions, cautions, and warnings. We will described each in more detail momentarily; however, here is an illustration showing most of them.



Note that many of these annunciators are dependent upon connected and configured external equipment, and in some cases, more than one annunciator is collocated.

TAWS & EGPWS Alert Annunciators

If the PFD is connected to a TAWS or EGPWS system, the alert annunciators will be shown on the attitude display area presentation below the aircraft symbol. All of these annunciators will be displayed in their defined colors.

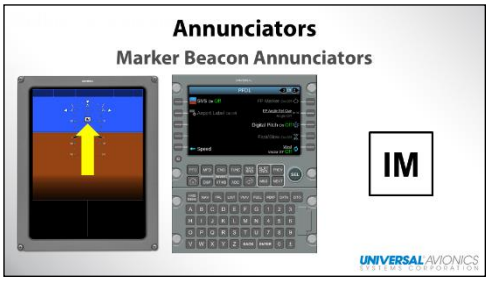


These annunciators are included in the Operator's Manual and the student handbook.

Note that when connected to the Universal Avionics Class A TAWS system, the terrain is internally generated from the terrain database contained in the InSight display system. Alert annunciators and information for point of impact location are calculated by the external TAWS system.

Marker Beacon Annunciators

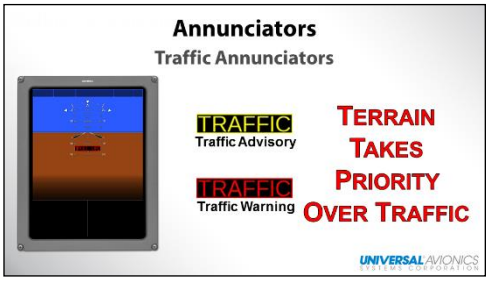
Let's go back to the standard blue/brown background by turning the Synthetic Vision System off.



The PFD will also display outer, middle, and inner marker beacon annunciators if the aircraft intercepts these signals on approach and they are provided to the PFD. The outer marker annunciator is "**OM**" in black text inside a cyan colored box. The middle marker annunciator is "**MM**" in a yellow box. The inner marker annunciator is "**IM**" in a white box.

Traffic Annunciators

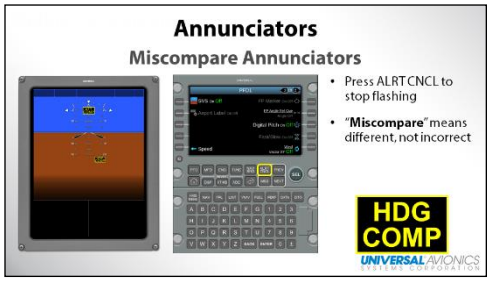
If the PFD is connected to a traffic system such as TCAS and a traffic advisory or resolution advisory is received by the PFD, it will display a "TRAFFIC" annunciator in the same location as the terrain system annunciators described earlier.



Traffic Advisories are depicted in yellow and warnings are displayed in red.

In the event of simultaneous traffic and terrain alert annunciators, the terrain annunciator will take priority.

Miscompare Annunciators



If the PFD determines that its attitude or heading information is outside of the comparator limits, it will annunciate a miscompare to the pilot in the attitude display area.

- If the miscompare is limited to Pitch, the annunciation is "PITCH COMP" in yellow text in a yellow box.
- If the miscompare is limited to Roll, the annunciation is "ROLL COMP".
- If the miscompare is in both axes, the annunciation is "ATT COMP" to indicate that the full attitude display may be incorrect.

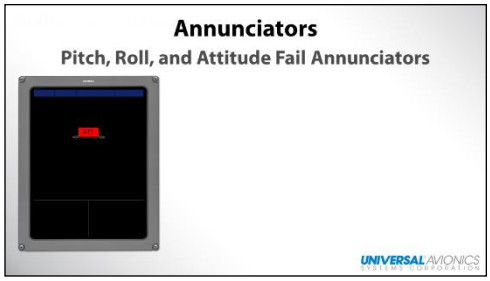
These annunciators will flash when triggered and will continue to flash until the pilot presses the Alert Cancel key, which will cause the annunciator to stop flashing.

An annunciated caution, whether flashing or solid, will only be removed when the miscompare condition resolves for more than 1 second.

Heading miscompares are annunciated "HDG COMP" in yellow next to the current heading window.

Miscompares do not mean that the heading, attitude, pitch, or roll data is incorrect, only that it does not agree with secondarily sensed input data. Additionally, the comparator functions are only enabled if off-side data is valid. Please note that any Pitch or Roll miscompare may be elevated to an Attitude miscompare if the other type is detected before the first type is reset.

Pitch, Roll, and Attitude Fail Annunciators



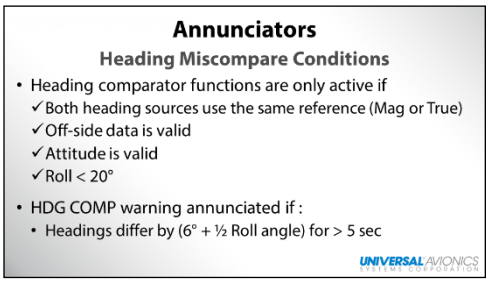
If the PFD stops receiving all pitch data, roll data, or both, it will remove the attitude display entirely from the PFD. The display background, skypointer, and pitch ladder will be removed and the source of the attitude failure will be displayed in black text in a large red block overlaying the aircraft symbol. Pitch failure is annunciated as "PITCH." Roll failure is annunciated as "ROLL." Full Attitude failure, such as losing a digital AHRS or IRS, is annunciated as "ATT".

The modules on Reversionary Operations discuss how to deal with these failures.

Heading Miscompare Annunciators

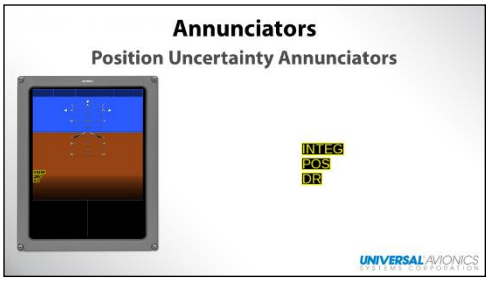
Heading comparator functions are only active if both heading sources are using the same heading reference; either magnetic or true. Also, off-side data must be valid, attitude is valid, and roll is less than 20° bank.

The active comparator will display a HDG COMP annunciation if the on-side and off-side heading difference exceeds parameters for more than 5 seconds.



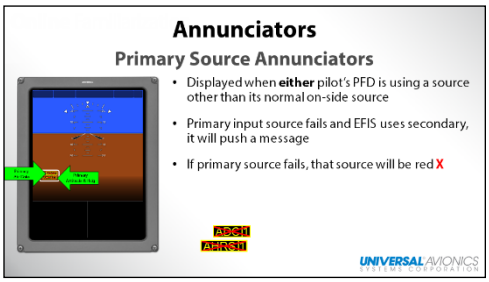
Position Uncertainty Annunciators

If the PFD receives GPS integrity, position uncertain, and/or dead reckoning status from an FMS source, it will display these annunciators in the lower left portion of the display.



Primary Source Annunciators

In the event that **either** pilot's PFD is using a source for air data or attitude other than its normal on-side source, then this condition will be annunciated here. For example, if the pilot's on-side source is ADC1 and the copilot's is ADC2, the copilot switching to ADC1 will annunciate ADC1 on both PFDs to alert the crew that a single air data computer is in use.



The first row contains the annunciator for primary air data source.

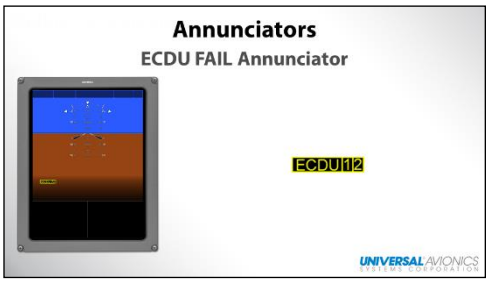
The second row contains the annunciator for the primary attitude and heading source. Distinct ATT/HDG primary source annunciations will be provided for AHRS, IRS, and Directional Gyro/Vertical Gyro type sources.

In some installations, there are multiple inputs for the primary source data. If the primary input fails and the InSight display system uses the secondary input, it will push a message indicating that the primary input has failed.

If all of the inputs for the active primary data source have failed, the display using that source will present a red "X" over it to indicate the failure. Additionally, if no primary annunciator is shown and all of the inputs for the active on-side data source are failed, then the failure annunciator for the normal source will be shown.

ECDU FAIL Annunciator

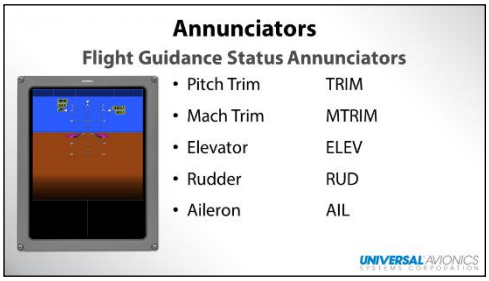
If the InSight display system detects that an ECDU has completely failed, it will annunciate either ECDU1 or ECDU2 in yellow. If both ECDU's have failed, the annunciator will show both 1 and 2. This annunciator does not flash, but will remain displayed until the InSight display system detects that the ECDU is operational.



The modules on Reversionary Operations discuss how to deal with an ECDU failure.

Flight Guidance Status Annunciators

In the top portion of the attitude display area are autopilot warning annunciators for Pitch Trim, Mach Trim, Elevator, Rudder, and Aileron status and failure conditions.



TRIM will be annunciated in yellow if the trim system fails for either pitch or yaw. Annunciators for elevator, aileron, and rudder will be displayed in yellow if the flight director detects that these flight surfaces are excessively out of trim.

AHS-525 Annunciators

If equipped with the Universal AHS-525 Attitude Heading Reference System and it is in the in-flight alignment mode, it will be annunciated here.

If it is in reversionary mode, this annunciation will be displayed. For more information regarding reversionary mode, see the modules on Reversionary Operations.

Self-Assessment Questions

1. How do you distinguish between traffic advisories and warnings?

2. Which takes priority; traffic or terrain alerts?

3. When you get a miscompare annunciator, it will flash. How do you stop the flashing?

4. What does a miscompare mean?

5. Your heading is set to magnetic and the co-pilot's is set to true. Your compasses differ by 20°. Will you get a heading comparator alert?

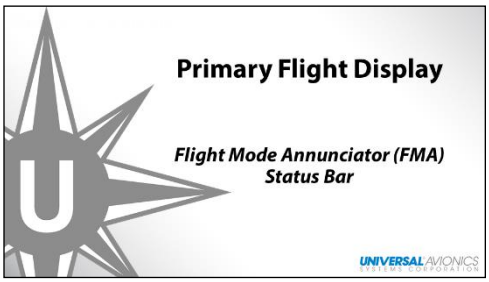
6. Both pilots are using ADC1 for air data. What indications will be shown on the PFD?

7. If ADC2 fails, what will the pilot see indicated on the PFD?

8. If ECDU1 fails, what will be displayed on the co-pilot's PFD?

07 FMA STATUS BAR

Lesson Overview



This module covers the Flight Mode Annunciator (FMA) Status Bar which is displayed at the top of the PFD. The FMA Status Bar is a quick reference source for flight guidance status, lateral and vertical guidance modes, FMS navigation data, and message annunciators.

Learning Objectives

1. Know what information is presented in the FMS Nav Data Block
2. Know what information is presented in the Flight Guidance Status Block
3. Know what information is presented in the Lateral Mode Block
4. Know what information is presented in the FMS Nav Data Block
5. Know what information is presented in the Vertical Mode Block
6. Know the difference between CPDLC messages and FMS messages

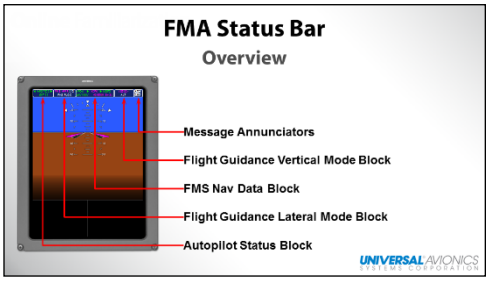
Examples of Behavior

1. Be able to identify current flight guidance settings.
2. Be able to identify the current SBAS Level of Service.
3. Be able to locate message information.

Video Script

FMA Status Bar

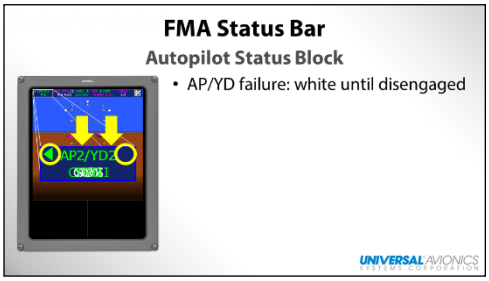
The top portion of the PFD contains a Flight Mode Annunciation Status Bar, which displays the autopilot status block, the flight guidance lateral mode block, an FMS Nav Data Block, the flight guidance vertical mode block, and the message annunciator fields.



Autopilot Status Block

The far left box of the FMA Status Bar contains the autopilot and yaw damper status annunciators. The numbers indicate which systems are active.

If the autopilot and/or the yaw damper enters a failure condition without automatically being disengaged, the appropriate annunciator will change to white until it is manually disengaged.



Which flight director is coupled is indicated by a small green arrow that points to the correct side. In dual channel flight guidance systems that support both channels being coupled, such as when flying precision approaches, both left and right arrows will be displayed.

Directly below the autopilot engaged annunciators is an autopilot status annunciator. It shows AP1 or AP2 in white to indicate which one is active and on-line. This annunciator is just a means of informing the crew of the autopilot state and only appears when it is not engaged.

The autopilot status can also display special modes.

If a control wheel steering discrete is configured and active, CWS will be displayed in place of the AP annunciation.

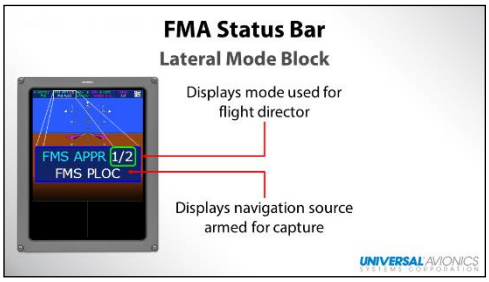
If a synchronization steering discrete is configured and active or a synchronization warning is triggered by the autopilot, SYN will be displayed.

If the touch control steering discrete is configured and active, TCS will be displayed in place of the AP annunciation.

If the flight guidance mode is in turbulence, TRB will be displayed in green.

Lateral Mode Block

The next block to the right contains the Lateral Mode Block.



The first row indicates which mode is being used for the flight director's lateral navigation. This active mode annunciator is shown in **magenta** on the coupled side to indicate that it is coupled to the flight director. It will be displayed in **cyan** on the uncoupled side.

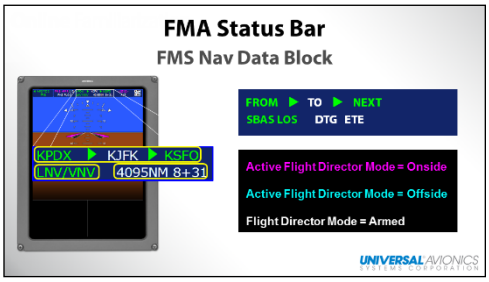
When the flight director half bank mode is active, a white "1/2" symbol will be shown to indicate that the flight director bank command is limited to half the normal bank limitation.

The second row indicates which navigation source is armed for capture to be used for flight director lateral navigation. The armed mode annunciator is shown in **white** to indicate that it has not yet been captured as the active source.

If either an armed or active mode is not selected, then it is not displayed.

FMS Nav Data Block

The FMS Nav Data Block also has two rows. The first row contains the FROM, TO, and NEXT waypoints from the current flight plan if provided by the FMS.



The second row gives the distance and time to go to the Next waypoint, if provided by the FMS.

The second row also contains the SBAS Level of Service status annunciators.

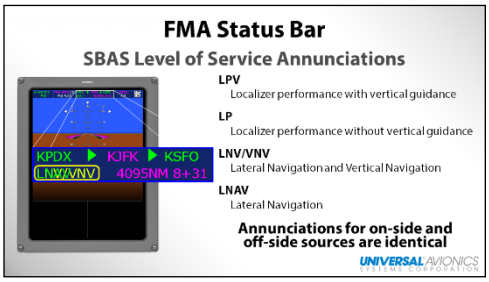
If the active flight director mode is onside, then it will be magenta.

If offside, the FMS mode annunciator will be cyan.

If the flight director is armed, then it will be white.

FMS SBAS LOS Annunciations

The SBAS Level of Service is displayed in green text below the FROM waypoint. The supported modes in order of highest to lowest level of service are:



Localizer performance with vertical guidance.

Localizer performance without vertical guidance.

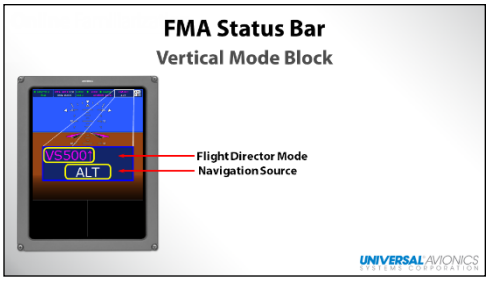
Lateral navigation and vertical navigation, and lateral navigation.

If the LOS changes to a lower level or to none, the annunciator will change to yellow and flash for five seconds before displaying the new LOS in green. Changing to a higher level of service will simply display the new LOS annunciator in green.

Annunciations for the on-side and off-side sources are identical.

Vertical Mode Block

The next section contains the Vertical Mode Block. The first row indicates which mode is being used for flight director vertical navigation. This active mode annunciator is shown in magenta to indicate that it is coupled to the flight director.

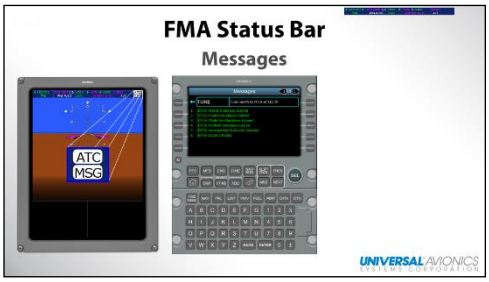


The second row indicates which navigation source is armed for flight director vertical navigation. The armed mode annunciator is shown in white to indicate that it has not yet been captured as the active source.

If either an armed or active mode is not selected, its display field is blank.

The list of available annunciators is dependent upon the source external systems configured upon installation.

Message Annunciators



If an InSight display system or FMS condition generates a message that requires pilot awareness, a white MSG annunciator will flash.

To see the message, the pilot must press the Message key on the ECDU. Once the ECDU message page or pages have been displayed, the MSG annunciator will be removed from the PFD. InSight display system messages are updated dynamically, but FMS messages will not clear until the message page is exited. This is to ensure that FMS messages do not clear until they are viewed.

If we were to leave this page and then return at a later time, new messages will be displayed in white and at the top, whereas old messages will be displayed in green.

Prompt messages will include a Line Select Key to accomplish the prompted action. In this example, pressing Line Select Key 1 Left will tune the number 1 NAV radio to 111.70.

If equipped with UniLink, the “ATC MSG” annunciator will flash whenever you receive a CPDLC message.

Self-Assessment Questions

1. Where in the FMA Status Bar is the Autopilot Status Block?

2. If the autopilot or yaw damper enter a failure condition, what indications are given in the FMA Status Bar?

3. How do you identify which flight director (left or right) is coupled?

4. Where in the FMA Status Bar is the Lateral Mode Block?

5. What does each row in the Lateral Mode Block indicate?

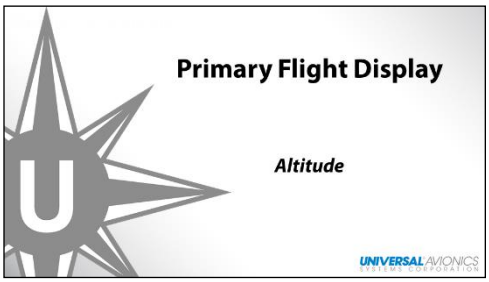
6. What indications are given if the SBAS Level of Service changes to a lower level or to none?

7. What does each row in the Vertical Mode Block indicate?

8. MSG is flashing on the PFD indicating a new message? How do you view the message?

08 ALTITUDE

Lesson Overview



This module covers altitude information, both radio altitude and barometric. Information includes symbology, annunciators, failures, settings, and alerts.

Learning Objectives

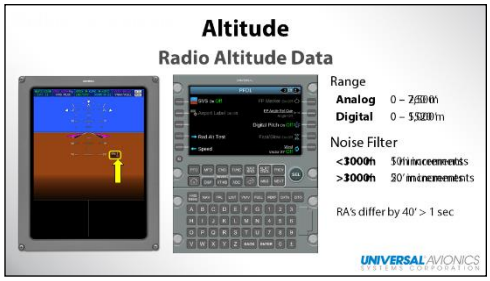
1. Know how to change units from feet to meters.
2. Know how to identify altitude annunciators and what they mean.
3. Know how to initiate a radio altimeter test.
4. Know how to read the altimeter tape.
5. Know how to stop an annunciator from flashing.
6. Know how to set the altimeter setting.
7. Know how to set the Altitude Preselect.

Examples of Behavior

1. Given an ECDU, identify which pages and LSKs to use to change the units displayed, initiate a radio altimeter test, change the altimeter setting, and set the altitude preselect.
2. Given a PFD, identify miscompare and failure annunciators.
3. Given a PFD, determine current altitude.

Video Script

Radio Altitude Data



The PFD displays radio altitude data if valid data is being received.

The valid range for the radio altimeter display is from 0 to 2500 feet, or 0 to 5,000 feet - depending on the radio altimeter installed in your aircraft. Values outside this range will not be displayed.

The PFD filters the radio altimeter value into 10 foot increments for altitudes below 1,000 feet and 50 foot increments for altitudes above 1,000 feet.

If meters is selected, then the displayed radio altitude will have a white letter "**M**" to the right of the numeric value and the ranges will change to the values shown.

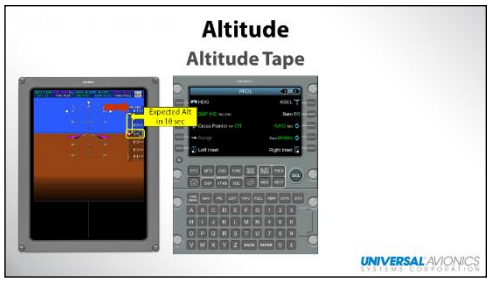
The miscompare caution is annunciated as "RALT COMP" and is displayed above the radio altitude. This annunciator will flash when triggered and will continue to flash until the pilot presses the Alert Cancel key, causing the annunciator to become solid. An annunciated caution, whether flashing or solid, will only be removed when the miscompare condition resolves.

The comparator caution will annunciate if the radio altimeters differ by 40 feet for more than 1 second.

If invalid radio altitude data is being received, this entire data block is replaced with this failure annunciator.

To test the radio altimeter, go to PFD page 2 and press and hold the Radio Altimeter Test Line Select Key. The self-test will remain true as long as the Line Select Key is held or at least one second if the key is pressed and released. The Line Select Key will be green for as long as the self-test is running. If the output is not configured, then this Test Line Select Key will not be available.

Altitude Tape



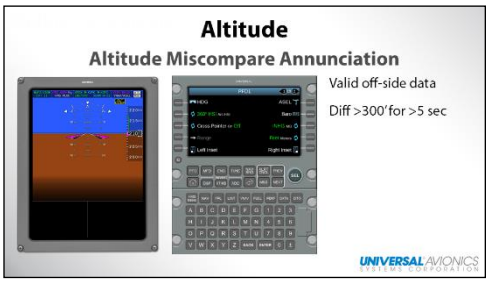
The altitude tape is displayed on the right side of the PFD. Placed in the vertical center of the tape is the current altitude window that points to the left side of the tape. This window displays the current barometric corrected altitude with the first 3 digits slightly larger, enabling the pilot to instantly identify the Flight Level.

An altitude trend vector extends from the current altitude window to the altitude that the aircraft is expected to reach in 10 seconds, based on current vertical speed. The vector is not shown unless the vertical speed is ≥ 200 feet per minute.

When meters is selected on the ECDU, then the word "**METERS**" will be displayed at the top of the altitude tape and the tape scale will change accordingly.

Altitude Miscompare Annunciation

Altitude miscompares are also annunciated on the PFD. These miscompares do not mean that the altitude data is incorrect; only that it does not agree with secondarily sensed input data.

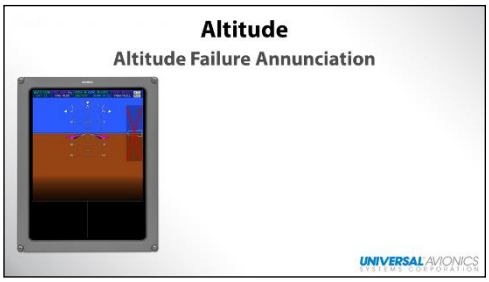


A miscompare can only be triggered if both on-side and off-side data are valid and they differ by more than 300 feet for more than 5 seconds.

This annunciator will flash when triggered and will continue to flash until the pilot presses the Alert Cancel, causing the annunciator to become solid. An annunciated caution, whether flashing or solid, will only be removed when the miscompare condition does not exist for more than 1 second.

Altitude Failure Annunciation

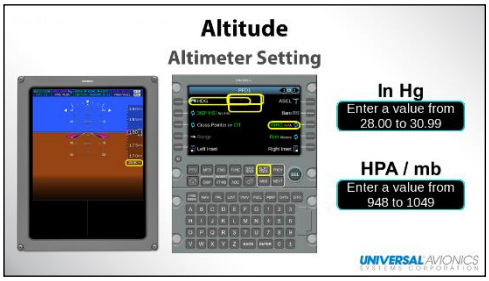
In the event that all means of displaying valid altitude are lost, all indices, numerics, bugs, and colored cues are removed and a red "**X**" is placed over the Altitude Tape.



The Reversionary Operations modules discuss the procedures for dealing with a failed Air Data Computer.

Barometric Altimeter Setting

The data field located directly below the altitude tape indicates the current altimeter setting.



The value can be displayed in either English or metric units. Here you can see that we have toggled to hectopascals as the unit of measurement, but we can change that to millibars if desired on EFIS Settings page 2.

For the remainder of this lesson, we will use inches mercury.

To change the altimeter setting, go to PFD page 1, press the Baro Line Select Key, and either turn the knob to the correct setting, or use the alphanumeric keyboard to enter the value.

Notice that using the keyboard brings up the range of valid entries. Here is the range for hectopascals and millibars.

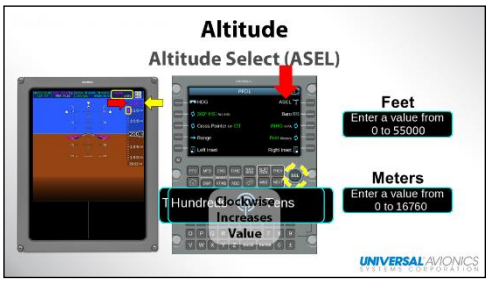
The PFD will issue a BARO alert by flashing when the aircraft transitions FL180. To cancel the alert, either press the alert cancel key, or change the setting through the ECDU.

Notice here in the instructions where it says "Hold SEL for STD". That means that if we press the SEL key in the control knob for two seconds, the standard altimeter setting will automatically be entered in the units selected.

The BARO setting may be configured independently by cockpit side or is synchronized across the cockpit.

ASEL

The data field located directly above the altitude tape indicates the Altitude Preselect as a numeric field with units in feet or meters. The value displays the left three digits in a slightly larger size to make identifying the flight level easier.



If meters is selected, a white letter "**M**" will be displayed to the left of the numeric value. When in meters mode, the value will be set to the nearest equivalent flight level.

Here is the Altitude Preselect range for both feet and meters.

There are three methods to enter your altitude select. You can dial it using your Reference Select panel or you can press the Altitude Preselect key on the ECDU, enabling you to use either the knob or the alphanumeric keyboard.

The Altitude Preselect key label text will change to reverse video and the Altitude Preselect value will be displayed in large cyan numerals in the center of the ECDU.

The inner knob changes the Altitude Preselect value in hundreds of feet and the outer knob changes the value in thousands of feet.

If operating in meters, the inner knob changes the value in tens of meters and the outer knob in hundreds.

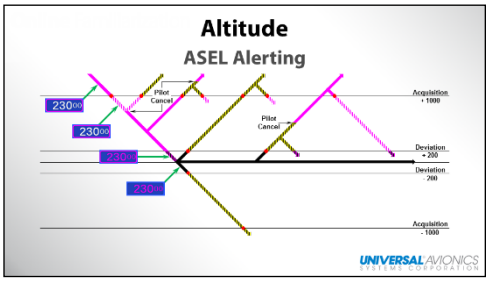
In both feet and meter conditions, clockwise rotation increases the values.

To enter using the alphanumeric keyboard, you need only enter the Flight Level.

When the Altitude Preselect is coupled to the active flight director mode, the altitude bug and numeric value will both be magenta.

ASEL Alerts

If the aircraft is approaching the selected altitude with the flight director active, the Altitude Preselect window will annunciate conditions as described in this figure, which is found in your Operator's Manual and the student handbook. This figure illustrates a descent, but the reverse is true for a climb.



Altitude Preselect alerts will be inhibited when the active vertical mode is glideslope to prevent nuisance alerting. In the inhibited state, the Altitude Preselect will behave as if it is in an altitude hold mode.

This figure includes every scenario. However, if you do not cancel the altitude alerts or deviate from your selected altitude, it is much simpler.

If you deviate more than 200 feet from your preselected altitude, it will flash with a yellow border and sound an alert tone.

Self-Assessment Questions

1. What does “RALT COMP” displayed above the radio altitude indicate?

2. What are the indications of an invalid radio altimeter data?

3. What does the symbol in Figure 1 mean on the altimeter strip?

4. What is an altitude miscompare?

5. What are the indications of loss of valid altitude data?

6. Using the ECDU Page Map, identify the key presses required to change the barometric pressure from inHg to MB.

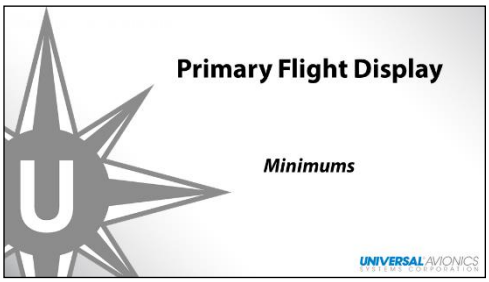
7. What is the easiest method to set a standard altimeter setting such as 29.92 inHg?

8. How do you enter an altitude select?

Figure 1

09 MINIMUMS

Lesson Overview



This module shows how to set both DA and RA minimums.

Learning Objectives

1. Know how to set minimums.
2. Know the symbology associated with minimums

Examples of Behavior

1. Given an ECDU, be able to enter the minimums for an approach.
2. Given a PFD, identify and interpret the different symbols associated with minimums.

Video Script

Minimums

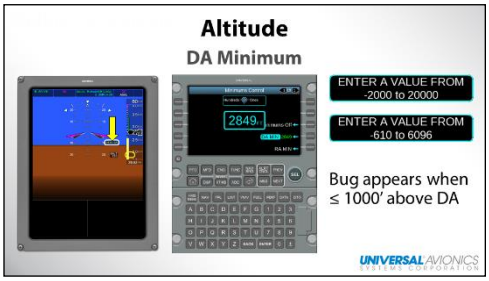
Pressing the Minimums Line Select Key from HOME page 1 will bring up this page, from which you can set Decision Altitude minimums or Radio Altitude minimums, or turn them off entirely.

Only one minimum, either the DA or RA, can be set at a time.

Let's discuss the DA minimum first.

DA Minimums

The DA has a range of -2,000 to +20,000 feet, and may be changed in 1 foot increments.



When you select DA MIN, you can set the minimums using either the alphanumeric keyboard or the ECDU knob.

The DA value will appear here, but only when DA has been enabled or selected for display.

If meters is selected, the value range is from -610 to +6,096 meters and may be changed in 1 meter increments. To aid the pilot in recognizing that meters is the selected unit of measurement, the letter "**M**" will be displayed to the right of the numeric value.

Let's go back to using feet.

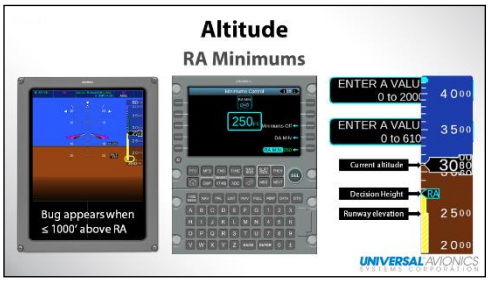
In addition to the digital value, a DA bug is displayed on the altitude tape. The DA bug comes into view when the current barometric altitude is within 1,000 feet of the DA.

The DA numeric and annunciator will change to yellow when the aircraft's current barometric altitude is ≤ the set value, triggering the TAWS to give the MINIMUMS alert.

The alert will automatically cancel and the DA value will change back to white when the aircraft lands. Initiating the go-around mode will also cancel the alert, but the DA value won't change back to white until climbing above the DA setting.

RA Minimums

The radio altitude minimum may be also used.



RA minimum has a settable range of 0 to 2,000 feet and may be changed in 1 foot increments. If meters is the selected unit, the range is as shown and may be changed in 1 meter increments.

In addition to the digital value, an RA bug is displayed on the altitude tape. The RA bug comes into view when within 1,000 feet of the RA.

When the Radio Altimeter becomes active, the radio altitude is shown graphically on the Altitude Tape as a yellow and white barber pole that runs from the bottom of the tape scale to the ground elevation. When the RA bug is shown, a yellow band is drawn from the bug to the ground elevation.

The RA numeric value and annunciator will change to yellow when the aircraft is below minimums, triggering the TAWS to give the MINIMUMS alert.

The alert will automatically cancel and the RA value will change back to white when the aircraft lands. Initiating the go-around mode will also cancel the alert, but the RA value won't change back to white until climbing above the RA setting.

Self-Assessment Questions

1. How do you enter approach minimums for InSight?

2. What are the indications you will see as you descend toward your Decision Altitude?

3. What are the indications you will see as you descend toward your RA?

4. In Figure 1, what is the altitude associated with A, B, and C? (not the numerical value)

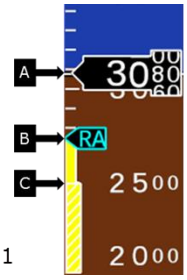
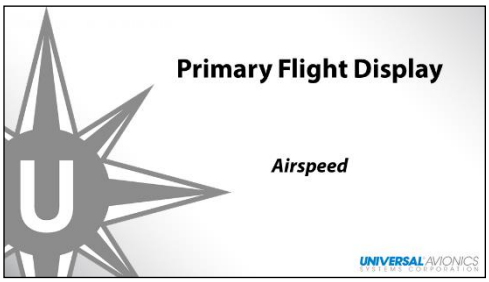


Figure 1

10 AIRSPEED FOR PART 23 AIRCRAFT

Lesson Overview



This module covers the Airspeed Tape including its symbology, supported markings, and setting the selected airspeed. Other airspeed indications such as miscompares, failures, and low airspeed indications are presented.

Learning Objectives

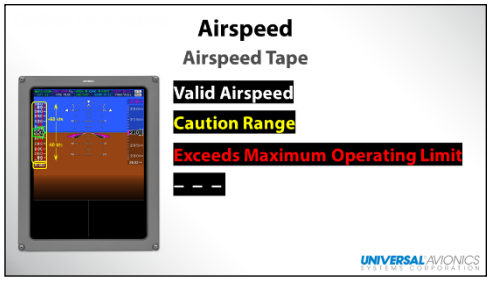
1. Know how to read the airspeed tape.
2. Know how to set a selected airspeed.
3. Understand how to interpret airspeed color bands and markings.
4. Know the airspeed annunciators.
5. Know how to interpret the low airspeed indications.

Examples of Behavior

1. Given a PFD, identify current and future airspeed.
2. Given a PFD, identify appropriate V_{SPEEDS}
3. Given a PFD, identify an airspeed miscompare.
4. Given a PFD, interpret the low speed indications.
5. Given an ECDU, set the Selected Airspeed.

Video Script

Airspeed Tape



The speed tape is located on the left side of the PFD and depicts present airspeed and related data to the pilot. It also provides low-speed and high-speed awareness markings.

Placed in the vertical center of the tape is the indicated airspeed window, which displays the current airspeed to the nearest knot, mile per hour, or kilometer per hour; depending on your configuration.

All of the digits are white when airspeed data is valid.

The window's border and digits will change to yellow when the speed is within a caution range.

They will change to red when the speed exceeds the maximum operating limit or falls below the low speed warning limit.

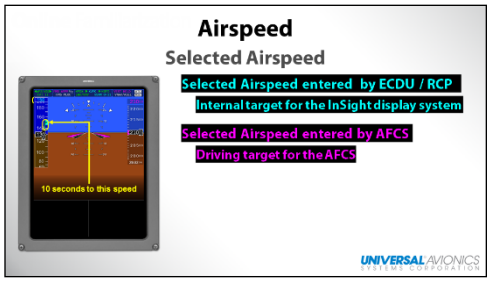
The digits will be removed if the data is invalid or if the current airspeed is below the configurable lower limit of the airspeed tape.

The scale of the tape extends from the configurable lower limit up to 900 knots. The tape shows 60 knots either side of the current airspeed with tick marks at every 10 knots.

If the airspeed input data fails, the airspeed tape window will be empty and overlaid with a red "**X**".

As a configuration option, the current true Mach value may be displayed at the bottom of the airspeed tape when ≥ 0.3 Mach the configured threshold value. Otherwise, this field is not displayed.

Selected Airspeed



Selected airspeed is displayed digitally in cyan text in a box above the airspeed tape. The selected airspeed value can be either an indicated airspeed or Mach.

When Mach is selected, an "**M**" is annunciated prior to the value.

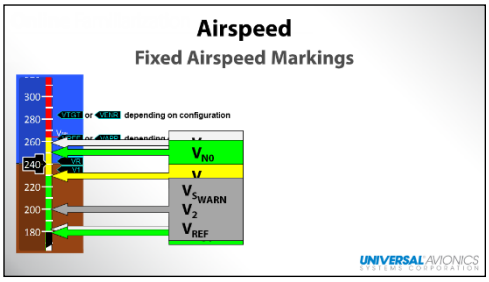
When an indicated airspeed is set, the value is not preceded by any unit annunciator. This digital display is full-time unless specifically disabled by a controlling air data computer.

The selected airspeed is an internally held target value for the InSight display system and is also indicated by a cyan bug on the right side of the tape. If the speed bug is not within the current speed tape range, it will be parked at the end of the tape as a half bug unless decluttered.

If the selected airspeed value comes from the aircraft flight control system instead of the ECDU or Reference Select Panel, then it is the target airspeed to which the AFCS is coupled and will be colored magenta.

If configured, a speed trend vector extends from the airspeed window to the airspeed expected to be reached in 10 seconds.

Fixed Airspeed Markings



The InSight display system uses three different types of markings on the airspeed tape to serve as aid for safe flight; bands, ticks, and speed bugs.

The Maximum Operating Limit is indicated by a red tick at V_{NE}, above which is a solid red band.

For additional high speed awareness, the PFD supports an audible over-speed warning whenever the aircraft exceeds V_{NE}.

The yellow Caution Range extends from V_{NE} to V_{NO}.

The green band indicates the normal operating range, the top of which is V_{NO} and the bottom of which is V_{S1}, both of which must be configured for the band to appear.

The white band indicates the flap operating range, bounded on the top by V_{FE} and the bottom by V_{S0}, both of which must be configured for the band to appear.

The speed for best rate of climb, V_Y or V_{YSE} - depending on your configuration, is indicated by a light blue tick mark. Tick marks are static values set within the configuration module.

V_{MC}, the minimum control speed with the critical engine inoperative, is indicated by a red tick mark.

Reference markings configured to be received from an external source will be removed from the display if the data is invalid.

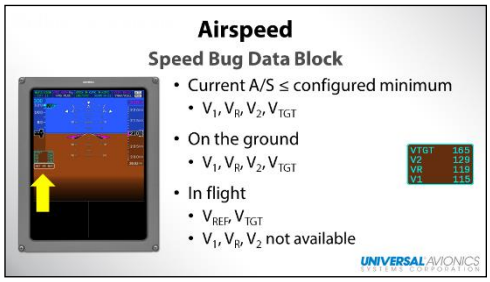
The InSight display system also supports several different speed bugs. If you have purchased an Advanced Performance Database, the bug values and colors are determined by data received from the FMS. If you are not equipped with an Advanced Performance Database, you can manually enter the values on the ECDU.

The low-speed band, represented as a black and white striped barber pole, appears when configured for landing. Its maximum value is $V_{S\text{-}WARN}$, or by V_2 (when V_2 speed bug is active), or by V_{REF} (when V_{REF} speed bug is active). The lower limit is the bottom of the airspeed tape.

The black and white striped barber pole low-speed warning conditions will not be enabled until the aircraft is airborne and the current airspeed has surpassed the top of this band. Once enabled, the low-speed warning band will remain active until the aircraft lands, once again disabling the band.

Speed Bug Data Block

The speed bug data block is located in the lower-left side of the PFD below the airspeed tape. It contains the label and value for the speed bug being set.



This data block is only active when a speed bug is being set; otherwise it is not displayed except in the following special circumstance.

If the current airspeed is ≤ the configured minimum, V1, VR, V2, and VTGT settings will be enabled for display.

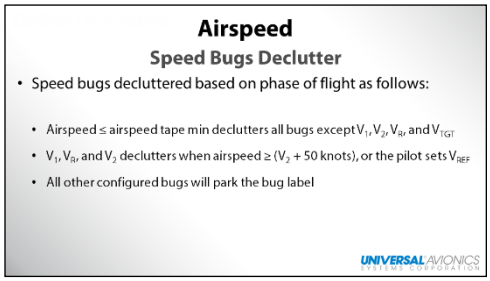
If the aircraft is on the ground, the available bugs will be the same.

If the aircraft is airborne, the available bugs will be VREF, and VTGT. Other speed bugs may also be available, but V1, VR, and V2 will not be when in flight.

Once the V1, VR, and V2 speeds are initially set, if you change one speed, the others may need to be reset as well.

Speed Bugs Declutter

Speed bugs are also decluttered based on phase of flight as follows:

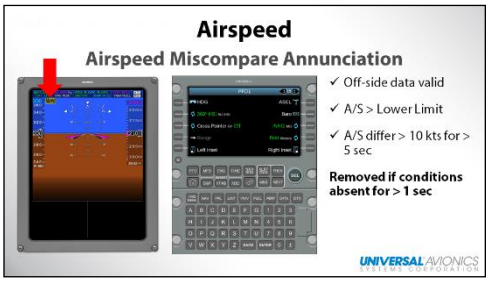


Current airspeed ≤ the configured airspeed tape minimum declutters all bugs from the airspeed tape except V1, V2, VR, and VTGT

V1, VR, and V2 will declutter and be set to OFF when the current airspeed is ≥ (V_2 +50 knots), or if the aircraft airspeed has not exceeded V_2 +50 knots and the pilot sets VREF to any valid value.

All other configured bugs will park the bug label off the edge of the tape when they transition off scale.

Airspeed Miscompare Annunciation



Additionally, indicated airspeed miscompares are annunciated on the PFD. These miscompares do not mean that the airspeed data is incorrect; only that it does not agree with secondary input data. This annunciator will flash when triggered and will continue to flash until the pilot presses the alert cancel key, causing the annunciator to become solid.

Airspeed comparator functions are only active if off-side data is valid, the current airspeed is above the configured lower limit of the airspeed tape, and if the airspeeds differ by more than 10 knots for greater than 5 seconds.

A miscompare annunciator, whether flashing or solid, will only be removed when the miscompare condition does not exist for more than 1 second.

Airspeed Failure Annunciation

In the event that all means of displaying valid airspeed are lost, all indices, numerics, bugs, and colored cues are removed and a red "**X**" is placed over the Airspeed Tape.

See the modules on Reversionary Operations to learn how to deal with an Air Data Computer failure.

Self-Assessment Questions

1. What does the symbol in Figure 1 mean on the airspeed strip?

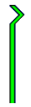


Figure 1

2. What are the indications that the InSight display system is not receiving valid Fast/Slow data?

3. What is an Airspeed Miscompare?

4. What are the indications of an airspeed failure?

5. What does the red band on the airspeed tape indicate?

6. What does the yellow band on the airspeed tape indicate?

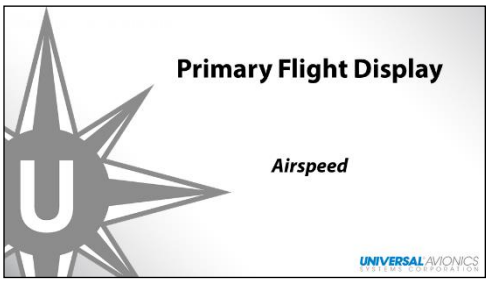
7. What does the green band on the airspeed tape indicate?

8. What does the white band on the airspeed tape indicate?

9. What does the black and white striped barber pole on the airspeed tape indicate?

10 AIRSPEED FOR PART 25 AIRCRAFT

Lesson Overview



This module covers the Airspeed Tape including its symbology, supported markings, and setting the selected airspeed. Other airspeed indications such as miscompares, failures, and low airspeed indications are presented.

Learning Objectives

1. Know how to read the airspeed tape.
2. Know how to set a selected airspeed.
3. Understand how to interpret airspeed color bands and markings.
4. Know the airspeed annunciators.
5. Know how to interpret the low airspeed indications.

Examples of Behavior

1. Given a PFD, identify current and future airspeed.
2. Given a PFD, identify appropriate V_{SPEEDS}
3. Given a PFD, identify an airspeed miscompare.
4. Given a PFD, interpret the low speed indications.
5. Given an ECDU, set the Selected Airspeed.

Video Script

Airspeed Tape

The speed tape is located on the left side of the PFD and depicts present airspeed and related data to the pilot. It also provides low-speed and high-speed awareness markings.

Placed in the vertical center of the tape is the indicated airspeed window, which displays the current airspeed to the nearest knot, mile per hour, or kilometer per hour; depending on your configuration.

All of the digits are white when airspeed data is valid. The window's border and digits will change to yellow when the speed is within a caution range. They will change to red when the speed exceeds the maximum operating limit or falls below the low speed warning limit.

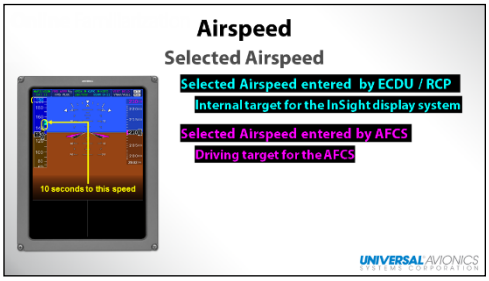
The digits will be removed if the data is invalid or if the current airspeed is below the configurable lower limit of the airspeed tape of 60 knots.

The scale of the tape extends from the lower limit up to 900 knots. The tape shows 60 knots either side of the current airspeed with tick marks at every 10 knots.

If the airspeed input data fails, the airspeed tape window will be empty and overlaid with a red "**X**".

As a configuration option, the current true Mach value may be displayed at the bottom of the airspeed tape when ≥ the configured threshold value. Otherwise, this field is not displayed.

Selected Airspeed



Selected airspeed is displayed digitally in cyan text in a box above the airspeed tape. The selected airspeed value can be either an indicated airspeed or Mach.

When Mach is selected, an "**M**" is annunciated prior to the value.

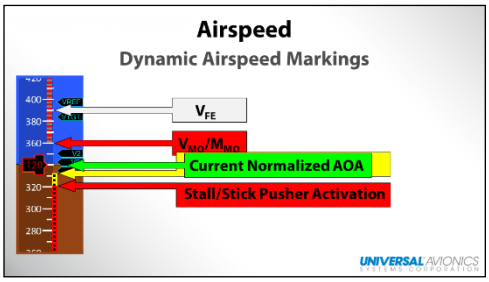
When an indicated airspeed is set, the value is not preceded by any unit annunciator. This digital display is full-time unless specifically disabled by a controlling air data computer.

The selected airspeed is an internally held target value for the InSight display system and is also indicated by a cyan bug on the right side of the tape. If the speed bug is not within the current speed tape range, it will be parked at the end of the tape as a half bug unless decluttered.

If the selected airspeed value comes from the aircraft flight control system instead of the ECDU or Reference Select Panel, then it is the target airspeed to which the AFCS is coupled and will be colored magenta.

If configured, a speed trend vector extends from the airspeed window to the airspeed expected to be reached in 10 seconds.

Dynamic Airspeed Markings



The InSight display system uses three different types of markings on the airspeed tape to serve as aid for safe flight; bands, ticks, and speed bugs.

The Maximum Operating Limit is indicated by a red and gray band above the V_{MO}/M_{MO} value, which is either a configured fixed value, or a value received from the Air Data Computer.

For additional high speed awareness, the PFD supports an audible over-speed warning whenever the aircraft exceeds V_{MO}/M_{MO}.

V_{LE}, the maximum speed with landing gear extended, is indicated by a dark magenta tick mark. Tick marks are static values set within the configuration module.

V_{FE1}, the approach speed with flaps extended, is indicated by a white tick mark.

Reference markings configured to be received from an external source will be removed from the display if the data is invalid.

The white band indicates the full flap operating range, bounded on the top by V_{FE}.

The InSight display system also supports several different speed bugs. If you have purchased an Advanced Performance Database, the bug values and colors are determined by data received from the FMS. If you are not equipped with an Advanced Performance Database, you can manually enter the values on the ECDU.

In addition to the airspeed markings, the InSight display system also exhibits an AOA indicator on the right side of the airspeed tape. These Caution and Warning bars scroll up and down as the normalized AOA changes to provide the crew situational awareness when flying in the low speed environment.

The AOA Caution band, depicted by a yellow and black dashed bar, ranges from the configured Stall Warning/Stick Shaker value to the configured Stall/Stick Pusher Activation value.

The AOA Warning band, depicted by a red and black dashed bar, is bounded on the top by the configured Stall/Stick Pusher Activation value and extends to the bottom of the tape.

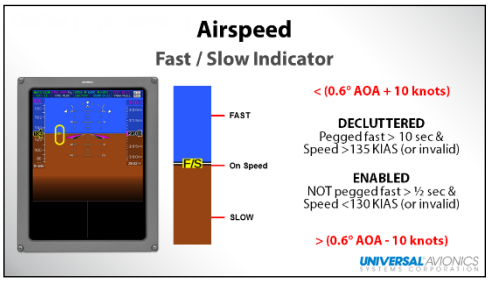
Both the AOA Caution and Warning bands are dynamic and positioned such that the current airspeed pointer also points to the current normalized AOA.

The airspeed window and digital value will match the current AOA band's color.

If the InSight display system detects an AOA failure, the AOA indicator will be removed from the display.

The AOA indicator will also be decluttered when the aircraft on the ground.

Fast / Slow Indicator



If configured, the PFD will display a Fast/Slow indicator to provide additional low and high-speed awareness in relation to the reference speed. Turn on the indicator from PFD page 2.

The Fast/Slow indicator is centered vertically at 0.6° AOA.

The upper diamond is marked with a white letter **F** to indicate the limit of the fast side of the scale, and the lower diamond is conversely marked with a white letter **S** for the slow side. The center of the large diamond is the on-speed value. No scale value is shown, and the full scale deflection depends on the source of the Fast/Slow data.

The Fast/Slow deviation pointer moves up and down the scale relative to the deviation from the reference AOA (which takes into account the flaps configuration) such that the deviation pointer will deflect to the fast side of the scale when the aircraft is below 0.6° AOA + 10 knots and will deflect to the slow side when above 0.6° AOA - 10 knots.

If the pointer remains pegged on the fast end of the scale for more than ten seconds and the current airspeed is > 135 knots, the entire Fast/Slow indicator will be decluttered from the display.

The Fast/Slow indicator will also be decluttered when the aircraft is on the ground.

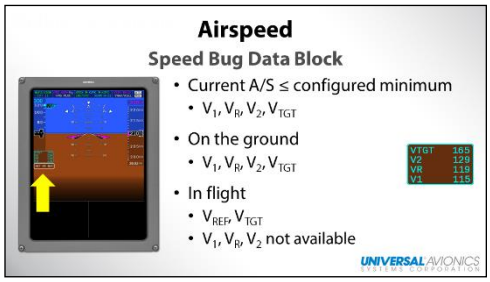
Conversely, if the pointer is not pegged at the fast end of the scale for more than a half second, the current airspeed is less than 130 knots, or the airspeed is invalid, then the indicator will enable automatically. This enable/declutter behavior should remove the indicator during most normal flight conditions but is intended to automatically enable it during approach when the stall warning computer indicates that Fast/Slow is approaching an on-speed condition or when below 130 knots, regardless of the current Fast/Slow value.

If the Fast/Slow pointer is indicating one dot slow or slower, the Fast/Slow pointer, current airspeed window and digital value will be displayed in yellow to indicate a caution condition.

If the InSight display system is not receiving valid Fast/Slow data or its associated signal is invalid, the deviation pointer and scale will be removed and a failure annunciator is placed on the attitude display area. The indicator will automatically resume normal operation once valid data is restored.

Speed Bug Data Block

The speed bug data block is located in the lower-left side of the PFD below the airspeed tape. It contains the label and value for the speed bug being set.



This data block is only active when a speed bug is being set; otherwise it is not displayed except in the following special circumstance.

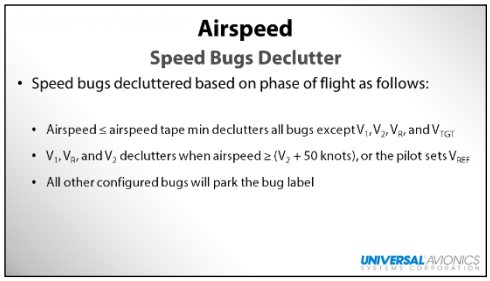
If the current airspeed is ≤ the configured minimum, V1, VR, V2, and VTGT settings will be enabled for display.

If the aircraft is on the ground, the available bugs will be the same.

If the aircraft is airborne, the available bugs will be VREF, and VTGT. Other speed bugs may also be available, but V1, VR, and V2 will not be when in flight.

Once the V1, VR, and V2 speeds are initially set, if you change one speed, the others may need to be reset as well.

Speed Bugs Declutter



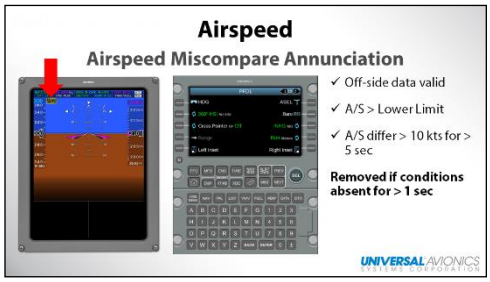
Speed bugs are also decluttered based on phase of flight as follows:

Current airspeed ≤ the configured airspeed tape minimum declutters all bugs from the airspeed tape except V1, V2, VR, and VTGT

V1, VR, and V2 will declutter and be set to OFF when the current airspeed is ≥ (V_2 +50 knots), or if the aircraft airspeed has not exceeded V_2 +50 knots and the pilot sets VREF to any valid value.

All other configured bugs will park the bug label off the edge of the tape when they transition off scale.

Airspeed Miscompare Annunciation



Additionally, indicated airspeed miscompares are annunciated on the PFD. These miscompares do not mean that the airspeed data is incorrect; only that it does not agree with secondary input data. This annunciator will flash when triggered and will continue to flash until the pilot presses the alert cancel key, causing the annunciator to become solid.

Airspeed comparator functions are only active if off-side data is valid, the current airspeed is above the configured lower limit of the airspeed tape, and if the airspeeds differ by more than 10 knots for greater than 5 seconds.

A miscompare annunciator, whether flashing or solid, will only be removed when the miscompare condition does not exist for more than 1 second.

Airspeed Failure Annunciation

In the event that all means of displaying valid airspeed are lost, all indices, numerics, bugs, and colored cues are removed and a red "**X**" is placed over the Airspeed Tape.

See the modules on Reversionary Operations to learn how to deal with an Air Data Computer failure.

Self-Assessment Questions

10. What does the symbol in Figure 1 mean on the airspeed strip?

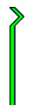


Figure 1

11. What are the indications that the InSight display system is not receiving valid Fast/Slow data?

12. What is an Airspeed Miscompare?

13. What are the indications of an airspeed failure?

14. What does the red band on the airspeed tape indicate?

15. What does the yellow band on the airspeed tape indicate?

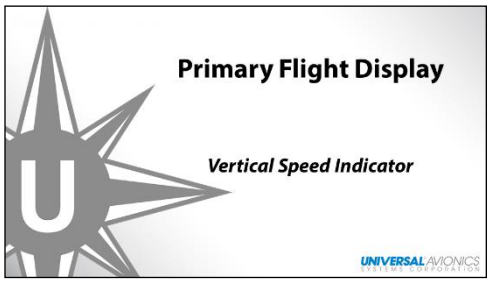
16. What does the green band on the airspeed tape indicate?

17. What does the white band on the airspeed tape indicate?

18. What does the black and white striped barber pole on the airspeed tape indicate?

12 VERTICAL SPEED INDICATOR

Lesson Overview



This module covers vertical speed indicator (VSI).

Learning Objectives

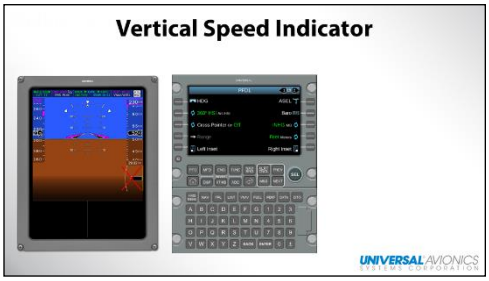
1. Know the symbology of the Vertical Speed Indicator.

Examples of Behavior

1. Know how to interpret the Vertical Speed Indicator.

Video Script

Vertical Speed Indicator



The VSI is located in the bottom-right corner of the PFD's main display. A needle points to the current vertical speed. Tick marks are every 500 feet with a label every 1,000.

The scale ranges from -6,000 to +6,000 feet per minute. Note that the entire VSI scale is not visible at one time in normal operation. It is a morphing arc that shows the data relevant to the pilot for a given flight condition.

There is also a digital readout of the actual vertical speed value, with descents using a negative sign.

If the vertical speed exceeds ±6,000 feet per minute, the needle will park at the edge of the scale on the 6 indices, but the digital display will continue to show the actual vertical speed up to ±9,900 feet per minute.

As a configuration option, a selected vertical speed bug may be activated and set along the inside edge of the scale using either the ECDU control knob or the alphanumeric keyboard. When selected, it appears as a cyan pointing chevron at the selected vertical speed with the digital value above or below the current vertical speed.

In installations in which the InSight display system controls the selected vertical speed, the digital value may be changed in steps of fifty feet and contains either an up or down arrow as a visual cue for selecting the vertical speed value. Setting this cyan bug is unavailable if there is any active vertical mode.

The VSI is also used for fly-to commands in the event of a TCAS traffic or resolution advisory condition. If a resolution advisory alert occurs, the VSI will display a full scale non-morphing arc with a black background and increase in size to immediately draw the pilot’s attention to it. This will obscure the bottom of the Altitude Tape.

The TCAS **no-fly** segment is depicted as a red arc along the outside of the VSI scale in the direction of the traffic target. The TCAS **fly-to** segment is depicted as a green arc.

Once the conflict is clear, the VSI resumes its normal shape and behavior.

In the event that all means of displaying valid vertical speed are lost, all indices, numerics, bugs, and colored cues are removed and a red “**X**” is placed over the VSI.

Self-Assessment Questions

1. According Figure 1, what is the current vertical speed?

2. According to Figure 2, what is the TCAS RA "fly to" zone?

3. What are the indications of lost or invalid vertical speed?

Figure 1

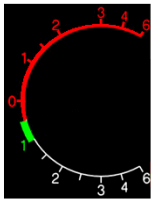
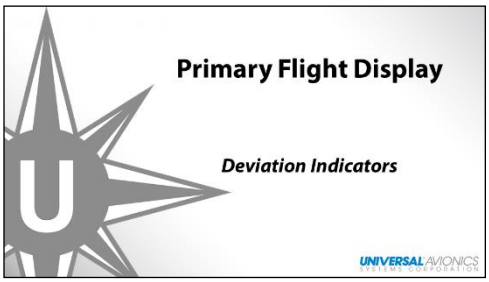


Figure 2

13 DEVIATION INDICATORS

Lesson Overview



This module explains the Vertical and Lateral deviation indicators. Both indicators use similar symbology and colors to indicate source of navigation (long range vs. short range) and flight director status. InSight offers two different scales for lateral navigation; the traditional standard scale and a new ANP/RNP scale.

Learning Objectives

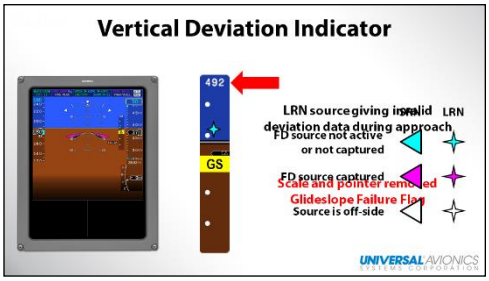
1. Know how to read the Vertical Deviation scale.
2. Know how to read the standard Lateral Deviation scale.
3. Know how to read the ANP/RNP Lateral Deviation scale.

Examples of Behavior

1. Given a PFD, identify current deviation, navigation source, source side, and flight director status.
2. Given a PFD, identify the symbology that indicates loss of vertical deviation data.
3. Given a PFD, identify the symbology that indicates loss of valid data.
4. Given a PFD, identify lateral deviation.
5. Given a PFD, identify deviation failure indications.

Video Script

Vertical Deviation Indicator



The Vertical Deviation Scale is displayed on the right side of the PFD.

The scale of the dots and shape of the pointer depend upon what source is being used for vertical deviation. Short range navigation sources, such as an ILS, are depicted by a triangular-shaped pointer. Long range navigation sources, such as an FMS, are depicted by a star-shaped pointer.

If the FMS is the data source and it computes the VNAV full-scale deviation value, it will be displayed here in feet.

When a valid on-side data source for vertical deviation is selected and the Flight Director is either not active, or is armed but has not yet captured the source, the pointer is cyan.

Once the Flight Director captures the source, the pointer changes to magenta.

In all cases, if the vertical deviation is coming from an off-side source, the pointer is white.

If the deviation pointer reaches full scale, it will be parked at the end of the scale. The deviation pointer will remain in full view at all times.

If the deviation was being driven from an FMS and valid scale or deviation data is lost, the scale and pointer will be removed from the display.

If valid scale or deviation data is lost and the PFD detects that the aircraft is in approach mode, the pointer and scale value are removed and a yellow “VNV” failure flag will be displayed over the zero reference mark.

Scale value is not sent by short range navigation sources, so none will be displayed. However, if invalid deviation data is received in this case, the pointer and scale value are removed and a yellow glideslope failure flag will be placed over the zero reference mark.

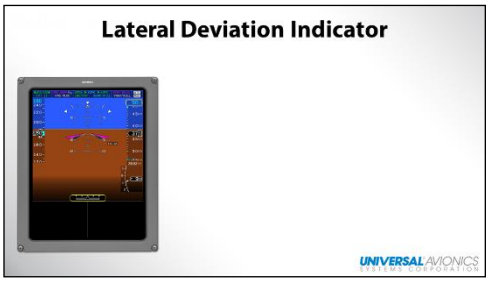
The scale and pointer will also be removed if the aircraft is flying a Back Course approach.

A secondary glideslope pointer will be displayed on the vertical deviation scale whenever the secondary navigation source is supplying valid glideslope data. This second pointer will not display VNAV, only glideslope.

This pointer will occupy the same scale space as a pointer driven by the primary navigation source.

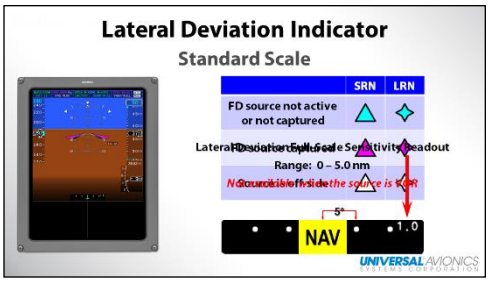
Lateral Deviation Indicator

There are two types of lateral deviation indicators, a standard lateral deviation scale and a lateral ANP/RNP indicator. We will begin with the standard scale.



Standard Scale

The standard lateral deviation scale is depicted as two white dots on each side of a white centerline. A deviation pointer moves to the left and right of center to show the lateral deviation value. The white line in the center represents zero deviation.



The shape and color of the pointer depends on the source being used for lateral deviation and follows the same logic as the vertical deviation indicator. Long range navigation sources are depicted by a star-shaped pointer. Short range navigation sources use a triangular-shaped pointer.

As with any typical lateral deviation indicator, 2-dot deflection equals the required navigation performance for the current phase of flight and 1-dot deviation is half of that.

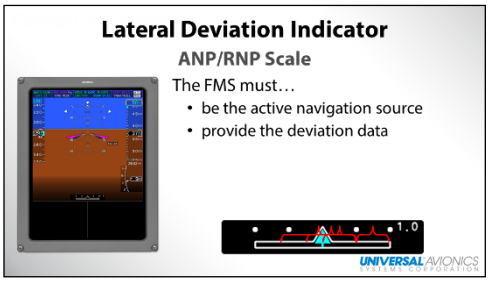
If the source is a VOR, the triangle points up if flying TO the station or down if flying FROM the station. Also for a VOR source, each dot represents 5° deviation from centerline, where 100% deviation equates to a full-scale, 2 dot deflection.

The deviation scale also depicts a lateral deviation full-scale sensitivity readout located just above the far right dot. This feature is not available when the source is VOR.

If the deviation source fails, the pointer and scale value are removed and a yellow NAV failure flag will be placed over the center.

ANP/RNP

An ANP/RNP scale will be displayed when flying an RNP segment or procedure. In order for this to be available, the FMS must be the active navigation source and be providing deviation data to the PFD.



A composite symbol representing the deviation pointer and ANP, depicted as a growing and shrinking band, is displayed with a size relative to the RNP value.

The deviation pointer and ANP band move left or right with the lateral deviation. The scaling is the same as before with the full-scale value displayed to the far right. You could think of the two-dot scale as your Required Navigation Performance.

The width of the bar, as measured from its center, is your actual navigation performance. See how the width of the ANP bar goes out to 1 dot on each side. This means that your ANP is one half of your RNP.

This is easy to see when you are on centerline, but when you are off centerline, one might get confused. Remember, it is the width of the bar, not its location.

What if our ANP was even greater? The bar is equidistant on both sides, so we can measure it from either one.

When our ANP grows to equal or exceed our RNP, then the bar turns yellow if the flight director is coupled in any mode other than heading. Regardless of FMS coupling, whenever the FMS detects the ANP exceeds the RNP, the FMS will push a message to alert the crew.

The bar is intended to give the pilot a quick visual perspective of the ANP as it relates to RNP. The values for both RNP and ANP are displayed on FMS NAV page 1.

If invalid ANP/RNP data and invalid lateral deviation are being received, the ANP and deviation pointer will be removed and a red X placed over the indicator.

Self-Assessment Questions

1. The shape of the vertical and lateral deviation pointers are dependent upon what source is being used for deviation. Short range navigation sources such as an ILS are depicted by a _____-shaped pointer. Long range navigation sources such as an FMS are depicted by a _____-shaped pointer.

2. What do the cyan, magenta, and white colors mean for the deviation pointers?

3. What are the indications that vertical deviation data is lost?

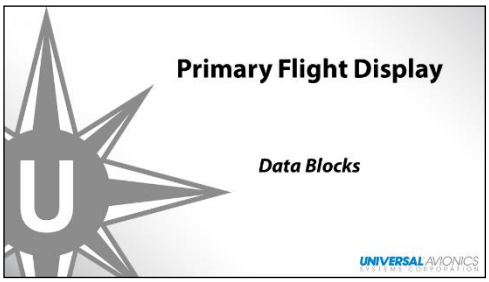
4. If the source for lateral deviation is a VOR, each dot represents _____ deviation from centerline.

5. What are the indications that the deviation source has failed?

6. An ANP/RNP scale may be displayed when FMS operation indicates a Required Navigation Performance segment or procedure is being flown and is represented by a composite symbol consisting of a vertical pointer and horizontal band. How is this symbol interpreted?

14 DATA BLOCKS

Lesson Overview



This module covers what information is contained in the Navigation Data blocks and the Bearing Data blocks, as well as how to select primary and secondary navigation sources.

Learning Objectives

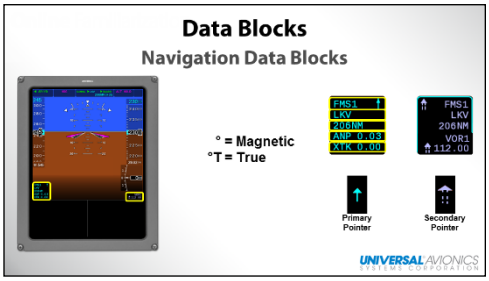
1. Know the symbology and colors associated with the data blocks.
2. Know how to change a navigation or bearing source.

Examples of Behavior

1. Given a Navigation Data Block, identify the navigation source, waypoint identifier, distance to waypoint, ANP, desired track, and cross-track.
2. Given a Navigation Data Block, identify whether a course is magnetic or true.
3. Given an ECDU, identify the pages and LSKs required to change a navigation or bearing source.

Video Script

Nav Data Block



The primary navigation source data block is located in the bottom-left corner of the PFD main display. The data in this block is magenta when coupled to the flight director. Otherwise, it will be displayed in cyan.

There is a secondary data block located in the lower-right corner of the PFD main display. The color of this information is always lavender and does not change based on source side. In addition, all associated data such as course pointers will also be lavender.

The first row indicates the navigation source identifier by name, such as FMS. If more than one source is available, its number is shown after the name. Single sources are not shown with a source number and are never considered to be off-side.

When the selected navigation source is an FMS in independent mode, an "**I**" is displayed to the right.

A representation of the course pointer is displayed to the far right.

When the primary navigation source is an LRN, the second row is the first seven characters of the next waypoint identifier.

If the FMS is flying a vector heading instead of flying to a waypoint, then the word VECTOR will be shown.

The third row indicates distance in nautical miles to the next waypoint on the flight plan. If the current leg is a vector, then a constant distance of 20 nautical miles will be shown until exiting the vector leg.

The fourth row indicates the ANP value if provided by the LRN.

If an ANP is not provided by the LRN, then the fourth row indicates the desired track in ° when in magnetic or °**T** when in true.

The fifth row indicates the cross-track in nautical miles.

To change the source, press the NAV/BRG function key.

Page 1 of 2 displays the active primary and secondary navigation sources in the same format as they appear on the PFD.

Pressing the top Line Select Key next to either source data block will enable a cyan box around the source data, indicating that a source selection can be made.

Notice the toggle symbol. Successive presses of the top Line Select Key will scroll though the available sources.

If you use the ECDU control knob after activating either Line Select Key, then the outer knob will move the selection box between primary and secondary and back and the inner knob will cycle through the available navigation sources.

The cyan box will be removed when the new source is selected and has not changed for five seconds or if five seconds elapses with no selection made.

In the case of an SRN source, the second row indicates the station frequency and the third row the station identifier.

If the active source is a navaid, Line Select Keys will appear for setting the frequency and selected course without having to go to a TUNE page.

Selecting the second Line Select Key will enable you to set the desired frequency. The outer knob sets the integer and the inner knob sets the decimal.

Pressing the SEL key or the frequency Line Select Key will set the new frequency as active and update the station identifier if it is defined. If the SEL key or the frequency Line Select Key are not pressed within ten seconds of entering a value, then that value will not be accepted.

The fourth row indicates the selected course.

The fifth row indicates the DME to the identified station.

A white "**H**" will be displayed if the DME is in hold mode.

Selecting the third Line Select Key will enable the pilot to enter the desired course using either the keyboard or the control knob. You must either press the SEL key or the Line Select Key within five seconds to activate the value.

Pressing and holding the SEL key will set the course direct to the tuned station.

Additionally, frequency and course values may be entered using the alphanumeric keyboard. Remember to press the ENTER key to activate the entered value.

When the secondary navigation source is selected by the pilot, data is displayed in the exact same format as the data block on the PFD. The full navigation source details will be displayed when the selection box is active, but will declutter on the PFD when the selection box times out after five seconds or if the same navigation source is selected.

Invalid data in the primary navigation block will be replaced by dashes, except as follows for an SRN source:

- Yellow dashes in place of digits and text if radio feedback is invalid or stale; meaning it is more than two seconds old.

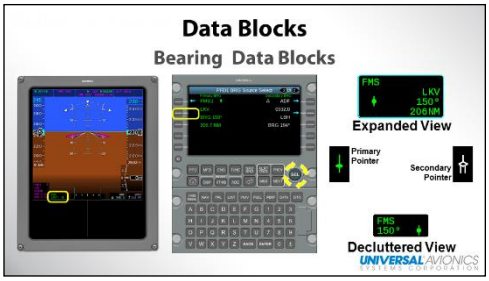
- Yellow digits and text if radio feedback is not stale, but does not match the commanded frequency.

- If lateral deviation from the primary navigation source is invalid, the source identifier will change to yellow and deviation information for the primary course is removed from the display.

Pressing the Source Transfer key will swap the currently selected primary and secondary sources. All data associated with the new source priority, such as colors, pointer shapes, and behavior of the heading bugs will also switch automatically.

You also have the ability to remove the secondary Nav Data Block if desired.

Bearing Data Blocks



Going to the second page of the NAV Bearing function will enable you to choose the primary and secondary bearing sources. Both primary and secondary Bearing Data Blocks can be deselected, which is the current state shown.

Pressing the indicated Line Select Key next to either source data block will cause a cyan box to surround it, indicating that a source selection can be made.

Turning the outer knob will move the selection box between primary and secondary and back.

Turning the inner knob, or successive presses of the top Line Select Key, will scroll though the available sources. Selection is dynamic; so once you dial in the desired source, it is selected.

Frequencies for short range bearing sources may also be tuned here using the ECDU control knob or a connected alphanumeric keyboard, just as described previously.

The primary Bearing Data Block is located on the PFD here.

The format is the same for both the ECDU and the PFD and is similar to the NAV Data Block, though cross-track and course information is not included in the bearing blocks.

This is the format for a Short Range Navigation source and this is the primary bearing pointer.

If the DME is in hold mode, then the format will look like this.

If the SRN source is an ADF in antenna mode with the Beat Frequency Oscillation mode off, the format will look like this.

With Beat Frequency Oscillation mode on and the data block is minimized, there is space for only one annunciation, so if ANT and BFO are both true, only ANT will be displayed. If either mode is selected, digital bearing data and the bearing pointer will also be removed.

The color of the primary bearing source data block matches the color of its associated pointer. Invalid bearing source indications follow the same convention described for navigation sources. Additionally, all pointers associated with an invalid source will be removed.

This is the format for a Long Range Navigation source.

The secondary Bearing Data Block is located just to the left of the secondary Nav Data Block. Its behavior and format are the same as the primary Bearing Data Block.

Self-Assessment Questions

1. According to Figure 1, label each of the data blocks.

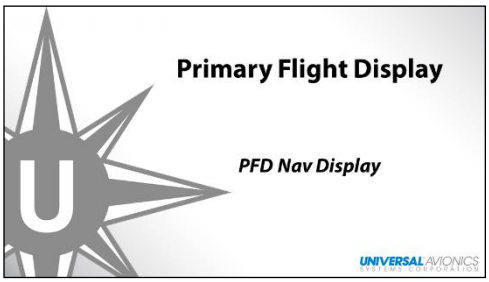
2. What data is contained in each row of the Navigation Data Blocks?

3. Using the ECDU page map, change the secondary bearing source to ADF.

Figure 1

15 PFD NAVIGATION DISPLAY

Lesson Overview



This module covers the Horizontal Situation Indicator including the compass rose, heading information, course and deviation pointers, and the wind vector.

Learning Objectives

1. Know how to switch between the 360° and the arc compass roses.
2. Know when a heading is magnetic, true, or directional gyro.
3. Know the symbology of the PFD Navigation Display.
4. Identify the two different types of heading bugs, when they are used, and what their colors mean.

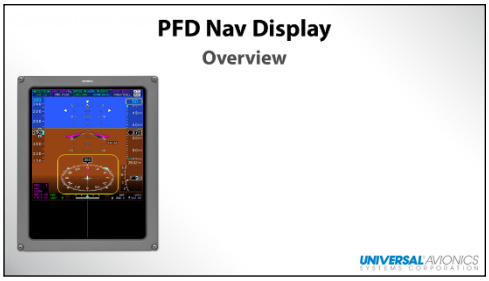
Examples of Behavior

1. Given an ECDU, identify which pages and LSKs change the compass rose configuration.
2. Given a PFD, identify the current heading, set heading, and FMS commanded heading.
3. Given a PFD, identify the primary navigation source and the current deviation.
4. Given a PFD, identify which symbols are associated with which data block.

Video Script

Overview

The purpose of the PFD's Navigation Display is to provide all the normal features and symbology as a traditional HSI. The fundamental difference with the InSight display is its alignment with a three-dimensional view of the terrain.

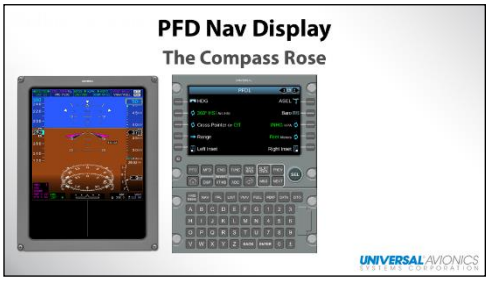


This is the display on the standard blue/brown background.

Let's look at each part.

The Compass Rose

The compass is a white 360° compass rose oriented in the "heading-up" direction. The compass rotates about its center such that the current heading is always at the top showing the forward direction.



A selectable arc compass format is also available. It presents only the forward half of the compass and is moved downward on the PFD.

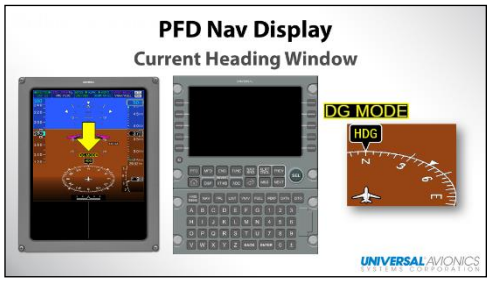
For the remainder of this lesson, we will stay with the 360° compass rose.

Aircraft Symbol

A white aircraft symbol is fixed in the center of the compass rose. The nose of the aircraft symbol always points to the current heading.

Current Heading Window

The current aircraft heading is digitally displayed at the top of the compass rose.



North is indicated as 360° rather than 0°.

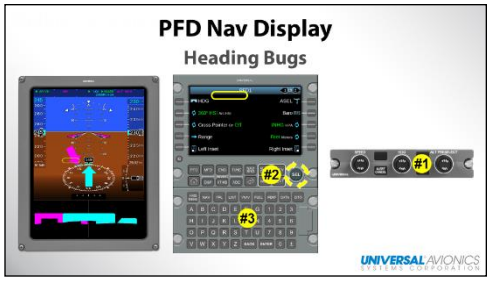
If True Heading is selected, a cyan "**T**" is displayed after the digits.

If all sources of valid heading are lost, the current heading window will display HDG in yellow text to indicate invalid heading and the numerals on the compass rose will be removed.

If all sources of valid heading are lost while in directional gyro mode, the current heading will still be flagged as invalid, but the numerals on the compass rose will remain to allow for compass slewing and a yellow DG MODE annunciator will be displayed.

Heading Bugs

With an FMS, you can press the heading option from either NAV page 1 or 2 and then enter the desired heading into the COMMAND HEADING window. As long as the FMS is flying the commanded heading, it will display HEADING SELECT as the mode indication on the FMS and FMS HDG in the Flight Guidance Lateral Mode Block of your PFD. Recall from your FMS training that since the FMS is commanding the heading, your AFCS will need to be in NAV mode.



FMS COMMAND HEADING has its own heading bug displayed on the outer edge of the compass rose with three legs pointing downward, giving it the nickname "the staple". It is only present when the FMS is in HEADING SELECT mode.

The color of the staple depends on whether or not the flight director is following the staple. That means that the FMS must be the primary source of navigation **and** the flight director must be in NAV mode. If both of these conditions are met when the FMS is in heading select mode, then the flight director is following the FMS COMMAND HEADING, so the staple will be magenta. If either condition is not met, then the flight director is not following the FMS heading, so the staple will be cyan.

Of course, if the FMS is not in heading select mode, then the staple will not even be present.

This is the other bug - the selected heading bug. It too is displayed on the outer edge of the compass rose, but is shorter than the staple.

There are three methods to setting your heading. The first is by dialing it in with the reference select panel. You can also go to PFD page 1 and press the heading option. This will enable you to set the desired heading using either the ECDU control knob or the alphanumeric keyboard.

To the left of the current heading window on the PFD is the digital value of the selected heading. This value is the same color as the bug and ranges from 001 to 360°. The value will be displayed while the heading bug is being set and will declutter five seconds after the value stops changing.

Pressing and holding the SEL key when HEADING is the active control will synchronize the heading bug and digital value to the current aircraft heading.

The select heading bug is always present, but again, its color depends on the flight director mode. If it is in heading mode, the bug will be magenta; otherwise, it will be cyan.

Some aircraft are configured to support what is called interactive heading. When interactive heading is enabled, your FMS COMMAND HEADING and the heading from your heading knob become synced, resulting in both heading bugs being overlaid. Because we set the flight director to heading mode, this is what you will see.

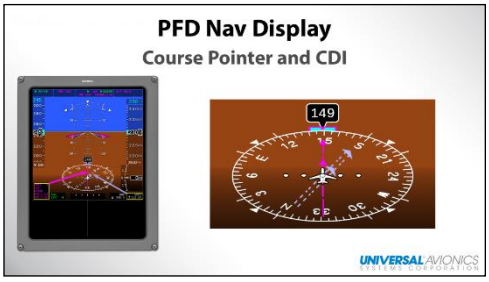
However, if we were to switch to NAV mode while in FMS COMMAND HEADING, the staple will become magenta and the select heading bug cyan. This is because the flight director is now following the FMS heading.

If the flight director were in neither NAV nor HEADING modes, both bugs would be cyan.

For more information on FMS command heading and interactive heading, see the on-line FMS familiarization modules.

Course Pointer and CDI

The PFD's navigation display may also show a selected course that is dialed in by the pilot. For LRN sources, this needle represents the desired track.



The middle section of the pointer is movable to depict left or right course deviation across an associated scale of white dots perpendicular to the deviation bar.

The center dot signifies zero deviation. The deviation scale is fixed and rotates with the course pointer and deviation bar.

Approximately one third of the length back from the head of the primary course pointer is another triangle of the same color. This is the TO/FROM pointer and indicates that the aircraft is flying toward or away from the navigation source when it points toward or away from the head of the course needle.

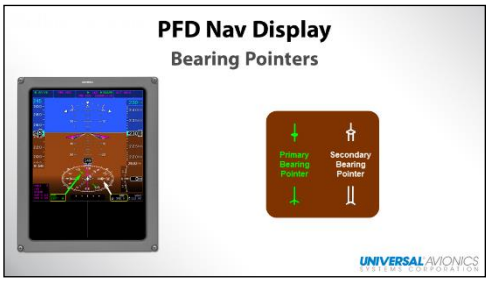
The secondary course is depicted by a pointer with a double dashed line. The center portion is still movable according to its own scale and the TO/FROM pointer functions the same as the primary.

Both primary and secondary course pointers, deviation bars, and TO/FROM pointers will match the colors of their associated navigation source data blocks.

Bearing Pointers

The PFD's navigation display may also show bearing pointers on the compass rose. Two may be displayed simultaneously, depicting one each of a primary and secondary bearing source.

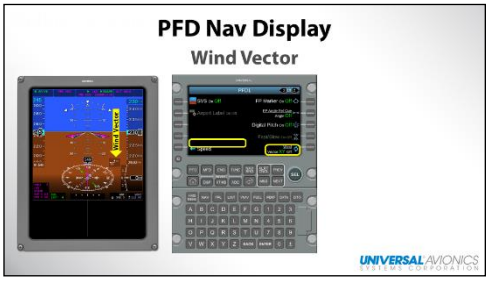
Additionally, the shapes and colors for primary and secondary bearing pointers differ as shown.



Wind Vector

Notice here on NAV page 1 we have winds of 102° true at 24 knots. If we go to PFD page 2, we have the option of seeing our wind information displayed on the PFD in either a resultant vector format or in an X/Y component format.

In vector format, the wind is shown as an arrow with its direction relative to the aircraft nose. Below the arrow is the wind speed in knots. In this depiction, the arrow does not change size; only direction.



In XY format, the lateral and longitudinal wind components are displayed as arrows that change size relative to their magnitude with the actual wind speed displayed in knots.

If wind data is not available, this symbol will not be displayed. If the wind data is valid and equal to 0 knots, no indicator will be displayed in the wind box.

Self-Assessment Questions

1. What does the symbol in Figure 1 mean?

2. Identify each of the pointers in Figure 2.

3. Using the ECDU map, how do you display the winds on the PFD in component format?

Figure 1

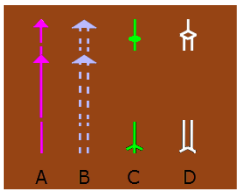


Figure 2

16 MANUAL NAV SOURCE TRANSFER

Lesson Overview

This lesson covers how to transfer navigation from your FMS to radios, such as when transitioning to flying an ILS approach. This process, known as Navigation Source Transfer, can be done either manually or automatic – depending on your aircraft's autopilot and flight director. This lesson covers the manual method.

Learning Objectives

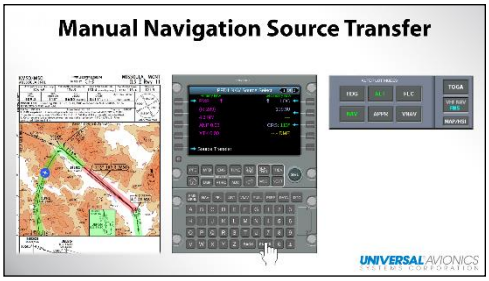
1. Understand the purpose of Navigation Source Transfer.
2. Know how to transfer navigation sources for an approach.

Examples of Behavior

1. Be able to transfer navigation to the appropriate source when required.

Video Script

Manual Transfer



Your Universal FMS is a very capable system. There are times however when you will need the aircraft's flight control system to use a navigation source other than the FMS, such as when flying an ILS approach. But even though the FMS does not process ILS signals, it can still be very helpful.

Take for example this ILS approach into Missoula, Montana. The transition includes an arc procedure and the missed approach includes a holding pattern, both of which the FMS can easily perform, so you will want to have the approach loaded into your flight plan. However, to fly the actual approach, you will need to transition from FMS to the ILS. If you need to go missed approach, you will need to transition back to the FMS. How do you switch your navigation source from FMS to ILS and back in as seamless a manner as possible? The answer is Navigation Source Transfer.

First, we need to tune the ILS, so press the NAV/BRG key. Set the secondary nav source to the VOR. Press Line Select Key 2 Right to tune the localizer frequency to 109.3. Finally, press Line Select Key 3 Right to set the approach course of 113°. Let's return to the NAV page.

After turning inbound to the final course, press the Nav Bearing key. Next, press Line Select Key 5 Left - Source Transfer. Notice how our localizer frequency is now the primary nav source and the FMS is secondary. Also, notice how our flight director is in VHF NAV. Next, we select approach on the flight director to arm it. Once the flight director captures the localizer, it will go active. You are now flying the approach based on the ILS signals through the flight director - not the FMS.

What if you were flying radar vectors rather than the approach transition? To do so, you would use one of two methods: set the flight director to NAV and enter the assigned heading into the FMS Command Heading field on Nav page 1 or set the flight director to heading and dial in the assigned vector.

With the first method, be sure to press the Intercept Line Select Key. After the FMS turns to intercept, then press the Source Transfer Line Select Key and then change the flight director to approach mode.

With the second method, the FMS is no longer navigating the aircraft, so you can then press the Source Transfer Line Select Key once commencing vectors. When appropriate, change your flight director to approach mode. When the flight director intercepts the course, it will activate.

For all three examples, executing a missed approach uses the same procedure.

From Nav page 1, press Line Select Key 3 Right - Missed Approach - to have the FMS provide guidance for the missed approach procedure.

Press the Source Transfer Line Select Key to make the FMS the primary navigation source.

Place the flight director into NAV mode so that it will follow the FMS's guidance to JEPSN for holding.

Missed Approach, Source Transfer, NAV mode.

Self-Assessment Questions

1. List the steps to execute a source transfer when flying an approach.

2. List the steps to execute a source transfer when flying a missed approach.

3. What is the function of the Source Transfer Line Select Key?

17 AUTO NAV SOURCE TRANSFER

Lesson Overview

This lesson covers how to transfer navigation from your FMS to radios, such as when transitioning to flying an ILS approach. This process, known as Navigation Source Transfer, can be done either manually or automatic – depending on your aircraft's autopilot and flight director. This lesson covers the manual method.

Learning Objectives

1. Understand the purpose of Navigation Source Transfer.
2. Know how to transfer navigation sources for an approach.

Examples of Behavior

1. Be able to transfer navigation to the appropriate source when required.

Video Script

Automatic Transfer

Although manual Navigation Source Transfer is relatively simple, automatic transfer is even more so.

All armed, active, primary, secondary, and off-side color encoding is still consistent with normal operation when in Nav-to-Nav mode.

The pilot has selected FMS as the primary navigation source, the FMS is not approach active, and the flight director mode is set to NAV.

The pilot selects an ILS approach and tunes the navigation radio on the FMS. The FMS will select and prioritize the sources and signal the PFD, which will enable the navigation radio as the secondary navigation source with the selected course automatically set to that provided from the FMS.

The PFD secondary navigation source block will display the selected navigation source as FLOC instead of the normal LOC because it is being controlled by the FMS.

In this mode, the pilot may not change the secondary navigation source or its selected course. (Of course, the pilot can change the primary navigation source on the PFD at any time, in which case, the PFD will automatically disable the secondary navigation source if it was previously enabled as FLOC.) The Source Transfer ECDU function is also disabled (as indicated by the gray text) whenever the PFD is in this automatic NAV-to-NAV mode.

When the pilot activates the approach manually, the FMS will transition into FMS heading mode.

The flight director will arm the localizer and the PFD will show FMS LOC as the armed lateral flight director mode.

When the flight director captures the localizer, the PFD will indicate FLOC1 as the primary navigation source and automatically switch FMS1 to the secondary navigation source. For all practical purposes, LOC1 is now the primary navigation source.

Please note that manually selecting LOC1 as the primary navigation source would take the PFD out of Nav-to-Nav mode.

The station identifier and DME are both displayed, provided the DME is valid and available.

If you attempt to change the primary navigation source, the PFD will list LOC1 and FLOC1 (not LOC1 and FMS1) as selectable navigation sources in the navigation source menu.

With FLOC1 as the primary navigation source, the lateral and vertical deviation scales and pointers follow the appearance and rules for a normal SRN display, with the data sourced directly from the NAV1 radio.

At this point, the PFD will show FMS LOC as the active lateral mode instead of LOC. Vertical modes will follow the same logic. If the flight director input to the PFD indicates that glideslope is armed or captured, the PFD will show FGS as the vertical mode instead of GS.

If, at any time after the conditions required to start Nav-to-Nav mode, the pilot selects missed approach or cancels the approach on the FMS, the PFD will return to normal navigation source processing (automatically disabling the secondary navigation source, if any) and indicate FMS, FMS heading, etc. as the active lateral flight director mode, assuming the FMS is still the primary navigation source.

The crew could also have sequenced this example with FMS2 and NAV2, but not with FMS3. The FMS selected automatically determines which navigation radio is used.

Self-Assessment Questions

4. List the steps to execute a source transfer when flying an approach.

5. List the steps to execute a source transfer when flying a missed approach.

6. What is the function of the Source Transfer Line Select Key?

18 CAT II OPERATIONS

Lesson Overview

This module covers the visual annunciators used when deviating from limits for CAT II approaches. The lesson covers lateral, vertical, and speed deviations.

Learning Objectives

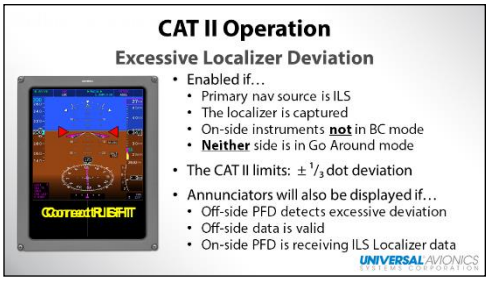
1. Know the CAT II deviation limits.
2. Know the annunciators for deviating from CAT II approach limits.

Examples of Behavior

1. Given visual annunciators for CAT II approaches, be able to state the corrective action required when deviating.

Video Script

Excessive Localizer Deviation



The InSight display system will automatically display CAT II excessive deviation annunciators when appropriate.

This function and its miscompare annunciations are enabled if the primary navigation source is ILS with the localizer captured, the on-side instruments are not in Back Course, and neither side's instruments are in Go Around mode.

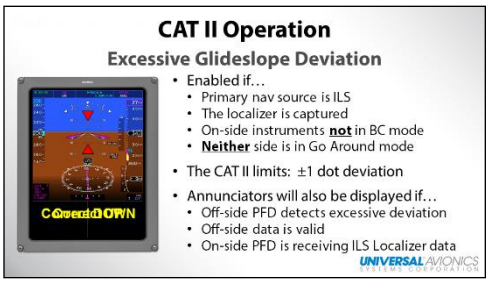
The CAT II limits for localizer deviation are ±1/3 dot.

Visual cues are provided in the attitude display area during CAT II approaches to annunciate excessive ILS Localizer deviation.

During excessive lateral deviation, a red pointer will be displayed to point which direction the pilot needs to correct to stay within CAT II limits.

These annunciators will also be displayed if the off-side PFD detects excessive deviation, off-side data is valid, and the on-side PFD is receiving ILS Localizer data.

Excessive Glideslope Deviation



Excessive Glideslope Deviation and its miscompare annunciations follow the same rules as for Excessive Localizer Deviation

The CAT II limits for glideslope deviation are defined as ±1 dot deviation.

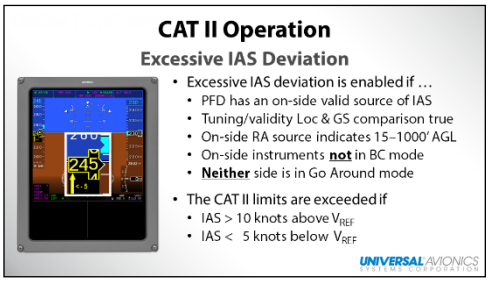
Again, visual cues are provided on the attitude display area to annunciate excessive ILS Glideslope deviation to the pilot. FMS directed glide slope is also a valid source for this information.

If the PFD calculates that aircraft is exhibiting excessive vertical deviation, a red pointer will point which direction the pilot needs to correct to stay within CAT II limits.

Again, these annunciators will also be displayed if the off-side PFD detects excessive deviation, off-side data is valid, and the on-side PFD is receiving ILS Localizer and Glideslope data.

Excessive IAS Deviation

Excessive indicated airspeed deviation is enabled when the on-side indicated airspeed is valid, all the tuning and validity conditions for localizer and glideslope comparison are true, and the aircraft's on-side radio altitude is between 15 and 1,000' AGL. Also, the on-side instruments cannot be in Back Course mode and neither side's instruments can be in Go Around mode.



The CAT II limits are exceeded if the indicated airspeed is greater than 10 knots above or 5 knots below V_{REF}.

This excessive deviation is annunciated by a yellow arrow on a black field, labeled with either "greater than +10" or "less than -5," and placed on the top or bottom of the current airspeed window within the Airspeed Tape.

The arrow points in the direction of airspeed correction needed. In this example, the pilot needs to increase the airspeed.

When the airspeed comes to within the +10 or -5 knot limit, the arrow is removed.

Self-Assessment Questions

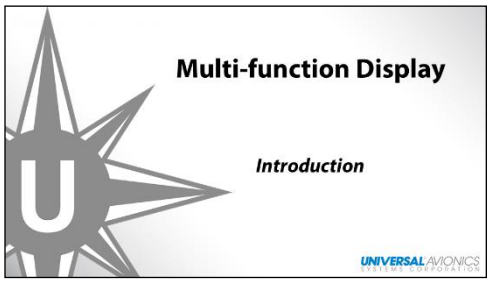
1. What are the CAT II excessive deviation limits?

2. You see the indications shown in Figure 1 on your airspeed indicator. What does it mean?

Figure 1

19 INTRODUCTION TO THE MFD

Lesson Overview



This module introduces the Multi-Function Display and covers the System Status pages and the MFD Status Bar.

Learning Objectives

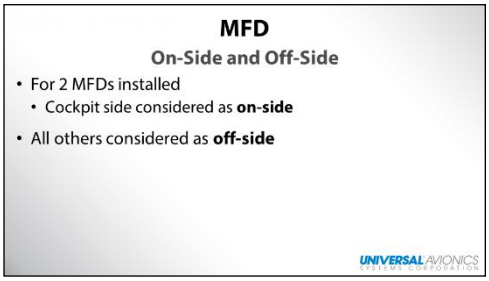
1. Know what to do when the MFD is first powered on.
2. Know how to access the System Status pages.
3. Know what information is included in the MFD Status Bar.

Examples of Behavior

1. Given an MFD and ECDU, execute the first required steps after power-on.
2. Given an MFD, identify database that are out of date.
3. Given MFD Status Bar, identify various indications, such as the TAS, UTC, and Comm1 frequency.

Video Script

On-Side and Off-Side



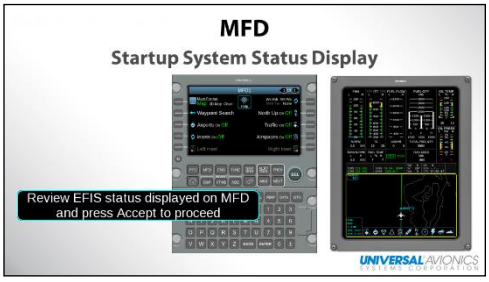
Let's move over to the Multi-Function Display.

For color and placement of on-side and off-side information, the MFD considers systems on the cockpit side on which it is installed to be on-side systems.

If the MFD is installed as a center display, it considers systems on the pilot's side as on-side.

All other systems are colored and placed as off-side information.

Startup System Status Display

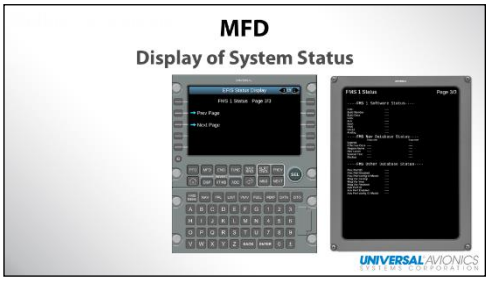


Upon initial startup, the MFD will default to showing the EFI Database Status display. Other information, such as engine data or charts may also be displayed. The EFI Database Status provides the database names, revision numbers, and important operational dates used by the InSight display system.

Databases that are current are shown in green and those that are out of date are shown in red.

If the MFD has just powered up and is displaying the Database Status page, no other MFD controls will be available until the Accept Line Select Key is pressed to acknowledge the system status. After reviewing and accepting, you will have access to the rest of the MFD capabilities

Display of System Status



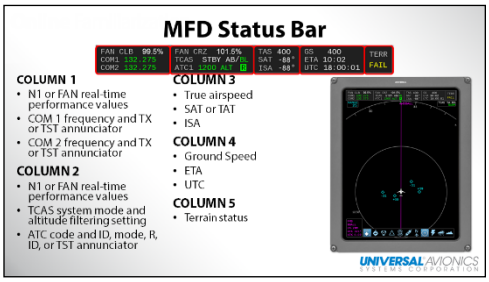
To display the System Status pages from the ECDU, first go to Home page 2 and press the SYSTEM STATUS Line Select Key, and then press the Display EFIS Status Line Select Key.

Status page 1, called Software/Database Overview, is what you saw during startup. It displays an overview of software and database components. If there are software mismatches or expired cycles, they will be shown on this page.

Status page 2 is the XM Radio Status page which displays the status of XM Weather products including subscription type, signal strength, product ages, and legends for NEXRAD and graphical METAR data.

Page 3 is the FMS1 Status page which displays the software and database information for FMS1. If your aircraft is equipped and configured with additional FMSs, they will each have their own status page.

Display of Status Bar



The MFD also displays a full-time status bar that provides a "dashboard" indication of several common values that the pilot monitors throughout the flight. It is arranged in five columns:

Column 1 displays the power setting targets if supplied by a performance database, plus both COM 1 and COM 2 frequencies, as well as any transmit or test annunciators.

Column 2 displays the power setting targets if supplied by a performance database, the TCAS system mode and altitude filtering setting, and the ATC code and mode.

Column 3 displays the true airspeed, static and total air temperatures, and the temperature deviation from standard.

Column 4 displays the ground speed, ETA, and UTC.

Column 5 displays the TAWS status.

The status bar will always appear at the bottom of the selected engine depiction on the MFD displaying engine data. If a singly installed MFD is not displaying engine data, the status bar will be displayed full time at the top of the MFD.

Self-Assessment Questions

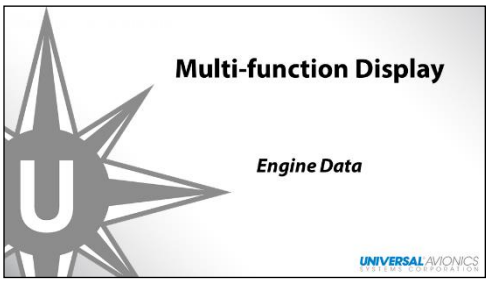
1. After turning the MFD on, what must you first do?

2. Where is the TAWS status displayed on the MFD Status Bar?

3. Where is the TCAS data displayed on the MFD Status Bar?

20 ENGINE DATA

Lesson Overview



This module covers the engine displays (compressed and full scale), the ENG function key, and the Engine Interface Unit (EIU).

Learning Objectives

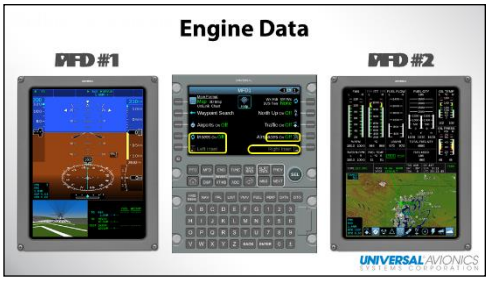
1. Know how to control the engine displays on both the PFD and MFD.
2. Know how to interpret engine data.
3. Know how to set the fan bug.
4. Know EIU miscompares and failures.

Examples of Behavior

1. Given an ECDU, know which pages and LSKs to use to display engine data.
2. Given an engine display, determine specific engine readings, such as the oil temp.
3. Given an ECDU and engine display, set the fan bug.
4. Given an engine display, identify EIU miscompares and failures.

Video Script

Display of Engine Data



The InSight display system receives data from two engine interface units, or EIUs, that each collect data from the engine sensors. The installation includes a switch to select which EIU provides its source data to the InSight display system.

Pressing the ENG key will access the Engine Display page.

Here we are showing both PFDs; PFD1 on the left and PFD2 on the right.

PFD1 and PFD2 toggle Line Select Keys enable and disable the compressed engine display on the selected PFD's single inset. If enabled, it takes the place of any other inset on the PFD. Turning this toggle off will return the display to its previous state.

Let's take a look at how engine data is displayed on the MFDs. On the left we have MFD1 with engine data, and on the right, MFD2 with no engine data.

This toggle Line Select Key chooses which MFD will display the engine data. Toggling this key will display the engine data on the other MFD and return the original MFD display to its state prior to enabling the engine display.

Now we have PFD1 on the left and MFD1 on the right.

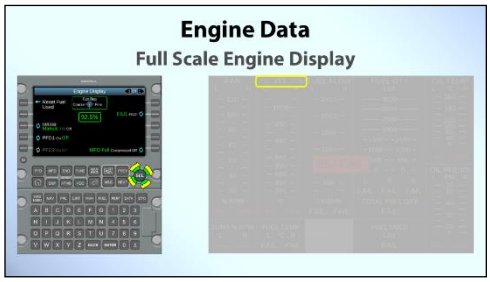
This Line Select Key toggles the MFD between displaying Engine data in the FULL or COMPRESSED format.

When equipped with two MFDs, engine data cannot be forced off an MFD by other format selections; they must be manually switched from the ENG page. However, in a three display installation, such as 2 PFDs and 1 MFD, or if an MFD fails, the ENG page will allow manually deselecting engines from the MFD by an additional OFF option on the bottom right Line Select Key.

Let's go back to our full engine display. If a chart is selected on the same MFD on which engines are displayed, the compressed engine format will be selected if it was not already. Removing the plate will re-enable the full engine depiction if it was previously displayed.

Full Engine Depiction

This format is the default display.



The actual format will vary among aircraft. This example is from the configuration for a Cessna Citation VII.

The display will include typical data such as engine performance, fuel quantity and flow rates, and oil temps and pressures.

Every parameter except fuel flow is also assigned normal, caution, and warning ranges (color coded as green, yellow, and red respectively). The tape and numerical value will color match the caution or warning region providing an annunciator to the pilot. All tape and numerical values within normal parameters are displayed in white.

An ignition symbol for each engine is annunciated when the engine igniter is on.

If we go to ENGINE page 1, you will see an option for a FAN BUG. If we toggle it ON, we have the ability to set the reference bug in terms of a percentage. Rotate the outer knob to change the value, with each click being 1%. You can fine tune your setting with the inner knob, which changes the value by .1%.

The EIU selected and its status is displayed at the bottom.

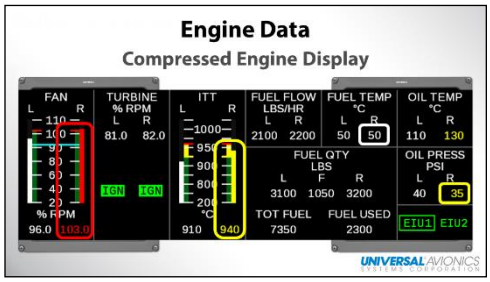
In the event of losing the selected EIU, all digital values, cues, and the tape levels are removed. In addition, the numerical data will be replaced with the word FAIL in yellow (for fuel parameters) or red (for non-fuel parameters).

If the EIU itself fails, it will be annunciated in the center of the engine display. If this were to happen, select the other EIU.

Compressed Engine Display

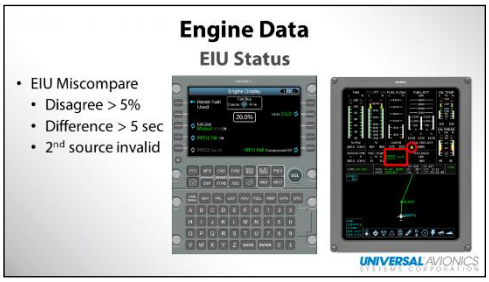
The compressed format allows for a larger moving map display.

Like the full size display, the color of the tape and numerical values will indicate normal, caution, and warning conditions.



EIU Status

The Engine Interface Unit annunciators are shown on the engine display. They are displayed in green if the data is valid or yellow if invalid.



If the selected EIU is providing invalid or no data and the other EIU is valid, you will get an annunciator telling you to select the other EIU. To do so, either go to the Engine page and toggle Line Select Key 2 Right or press the EIU switch in your aircraft.

If the InSight display system loses communication with its secondary EIU source, the PFD will display a fail message.

If the InSight display system is unable to communicate with any EIUs upon power-up of the display, the message "NO CONFIGURED EIU AVAILABLE" will be displayed on the MFD.

If the engine configuration data or ID for EIU 1 and 2 differ from each other, the message "EIU CONFIGURATION MISMATCH" will be displayed.

This is the EIU Miscompare annunciator, showing a miscompare condition exists for the fuel quantity.

Data miscompares between the Engine Interface Units are annunciated on the Engine Display when the data from EIU1 and EIU2 disagree by 5% or more for greater than 5 seconds or whenever the secondary EIU becomes invalid.

Self-Assessment Questions

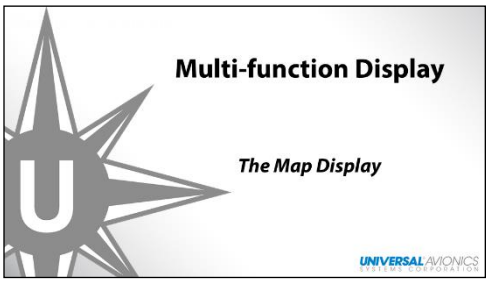
1. What do the colors red, yellow, green, and white mean on the engine display?

2. Using the ECDU page map, how would you set the Fan Bug to 97.5%

3. Using the ECDU page map, what steps would you take if your EIU failed?

21 THE MAP DISPLAY

Lesson Overview



This lesson coves the MFD map display and its options. It includes how to turn on and off various options such as Airports, Navaids, and Fixes. The pilot can configure the display for North up or Heading up. This lesson does not include traffic, weather, or terrain overlays; they are covered in follow-on lessons. After learning about each layer, the lesson goes on to discuss decluttering the display, searching for specific waypoints, and degraded map states.

Learning Objectives

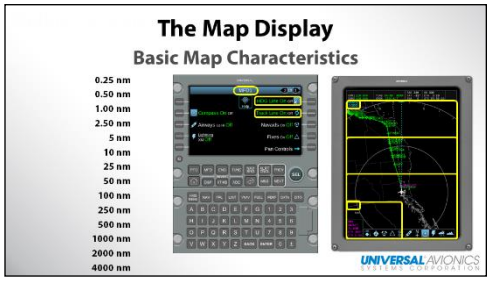
1. Know the various icons, symbols, and colors associated with the map overlay options.
2. Know how to select and deselect various overlay options.
3. Know how to set the declutter parameters for airports, navaids, airspaces, airways, and fixes.
4. Know how to search for and interrogate waypoints.
5. Know the various limitations to the map displays.

Examples of Behavior

1. Given an ECDU and MFD, select and deselect map options.
2. Given a CCP and MFD, select and deselect map options.
3. Given an MFD, identify and interpret the icons and symbols displayed.
4. Given an ECDU or CCP and an MFD, locate a specific waypoint and extract required data.
5. Identify what conditions preclude specific options from being displayed.

Video Script

Basic Map Characteristics



The MFD may display map depictions as a full screen, three-quarter, one-half, and one-eighth formats on the display. These map depictions may include flight plan, navaids, and more; all of which is selectable by the pilot using either the ECDU or the Cursor Control Panel.

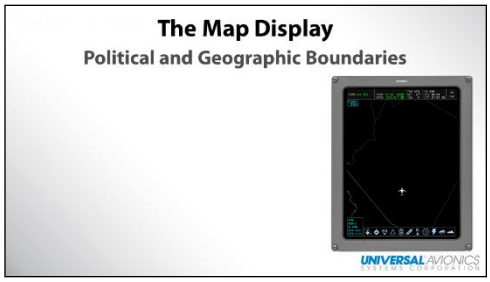
The range for any map is indicated in nautical miles and is displayed in the upper left corner.

Here are the available map ranges. Map range is selectable on an individual map basis, meaning each displayed map may have its own range. Remember, to change the range of the map on your MFD or PFD, you have to be on the appropriate ECDU page.

A line showing the Selected Heading may also be displayed on the map if inputs for that information are valid.

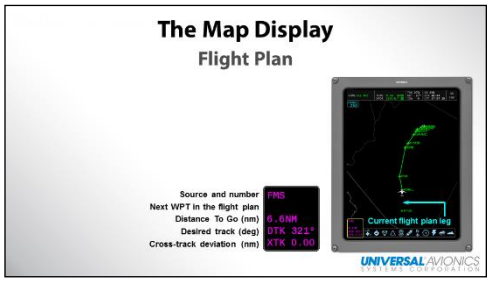
The aircraft's track line can also be displayed when valid information is available.

Political and Geographic Boundaries



The MAP function will automatically include any political boundaries. Here you can see the borders surrounding the state of Arizona. The aircraft symbol is always included in the map display.

Flight Plan



When you enter a flight plan, it will automatically overlay the map with flight plan waypoints and legs including arcs.

It will also show holding patterns that are used as course reversals. Other holding patterns will also be shown, but only after entering the pattern.

The primary flight plan current leg is depicted in cyan and all remaining legs are depicted in green, unless coupled to the lateral mode of the flight guidance system, in which case the current leg and TO waypoint will be magenta.

A five row, flight plan source data block will be displayed in the bottom left corner of the map.

The first row indicates the navigation source and number, such as FMS1, and the **I** annunciation when in FMS independent mode, if applicable.

The second row indicates the next waypoint in the flight plan.

The third row indicates the distance to go to that waypoint

The fourth row indicates the desired track in degrees.

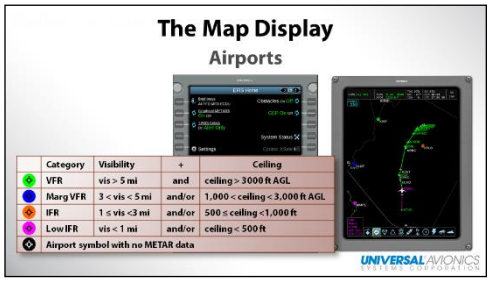
And the fifth row indicates the cross-track deviation in nautical miles.

If any of the data for the second, third, and fourth rows is not received from an LRN, the rows will be blank.

The flight plan source data block will be displayed in the same color as the primary flight plan leg.

When the aircraft transitions to within an LRN defined range of the TO waypoint, the LRN issues a waypoint alert to the display. This causes the current leg and TO waypoint of the flight plan to flash, normally until the waypoint is reached. Additionally, the TO waypoint information displayed on the PFD will flash as well.

Airports



To include airports as an overlay to the map, go to MFD page 1 and toggle the Airports Line Select Key to ON, or use the cursor to click on the Airport icon. The airport symbol shown is used for all airports not on the flight plan, while the waypoint symbol is used for airports that are on the flight plan.

The pilot has the option of displaying graphical METARs symbology. To enable this capability, go to HOME page 2 and toggle the Graphical METARS Line Select Key to ON. All airports receiving METAR data will then be displayed with the following color code.

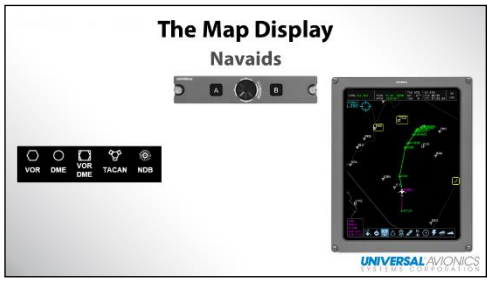
Graphical METAR data is stored for the first 3,000 airports processed from the database. If no new data is received within 36 minutes, an airport's METAR information will be automatically removed.

Navaids

To turn on the Navaids overlay, we could go to MFD page 2 and press this Line Select Key. Or we could use our cursor to toggle the desired icons on or off.

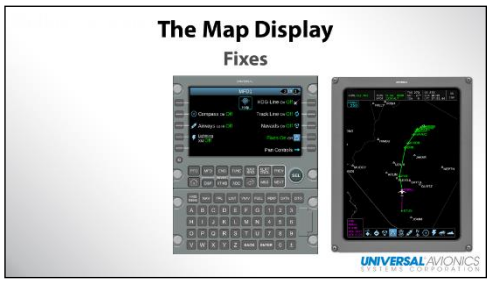
When Navaids are toggled on, various navigation aids will be shown using the indicated symbology.

The map will automatically remove labels and duplicate navaids to prevent clutter when these elements are co-located.



Fixes

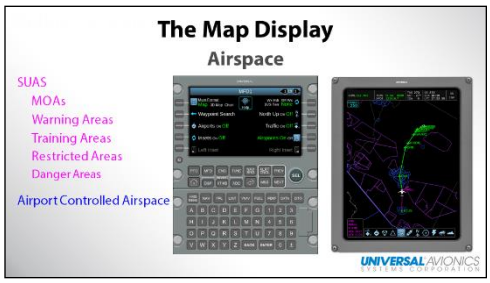
Turning on Fixes will display ATC waypoints. Not all fixes will necessarily be displayed; they are filtered based on your aircraft's location, altitude, speed and other factors in order to show only the more relevant fixes.



Airspaces

Selecting airspace will show Military Operating Areas, Warning Areas, Training Areas, Restricted Airspace, and Danger Areas; all in magenta.

Controlled airspace boundaries around airports are displayed in blue.

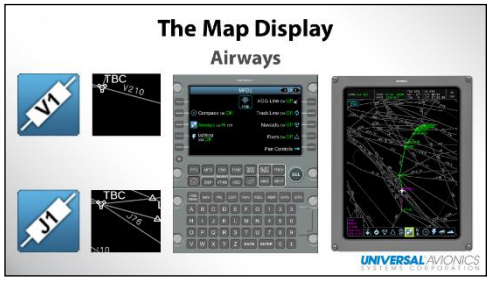


Airways

Airways may be displayed on any Map if selected from the ECDU or by using the cursor.

When low airways are selected, the icon at the bottom will show a **V1**.

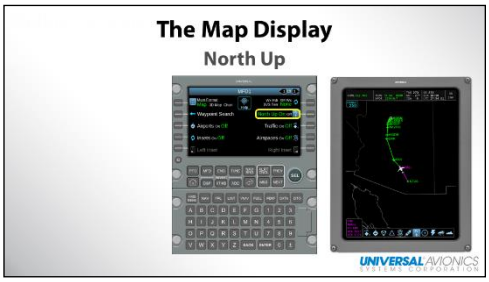
Airways will be labeled on the map.



To display High airways, toggle the Line Select Key until **Hi** is green. Notice the icon is now showing **J1**.

North Up

The map display can be depicted as either north-up or heading-up.

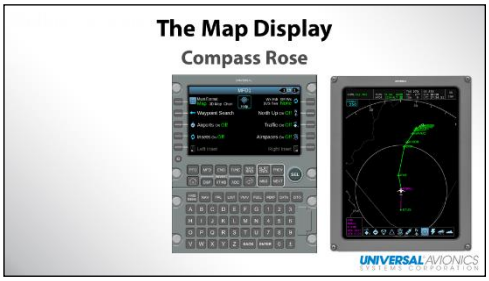


A heading-up depiction using the full MFD screen, which is the orientation we have been using, will truncate the left and right boundaries to show maximum distance ahead of the aircraft. The aircraft symbol will be approximately one third down the screen.

North-up map is a **true** north-up depiction with the aircraft in the center of the map. The aircraft symbol will change orientation based on current heading, but the map itself will remain oriented to true north and the north-up icon will be shown highlighted.

Compass Rose

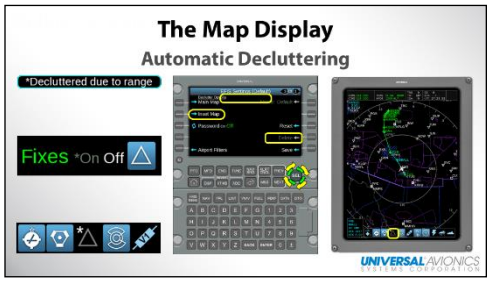
A compass rose and range rings may be turned on and off, if desired.



When the compass rose option is selected while in north-up, then a range ring is displayed at the half range distance with this value displayed just below the bottom center of the ring.

If we go back to heading up orientation, it will again truncate the sides, place the aircraft symbol approximately one third down the screen, and the half range value is no longer displayed.

Automatic Decluttering



We have shown each overlay one at a time for demonstration purposes, but you can have several overlays at the same time. However, the screen could become very crowded, so you have the ability to filter out content based on range.

Go to HOME page 2. From there, press the SETTINGS Line Select Key, and then go to page 3

The complexity of the map content is filtered by range. The greater the map range, the fewer map objects will be displayed. Conversely, low ranges allow much more detail without cluttering up the depiction. You have the ability to declutter your main map and the inset maps independently. We will use the main map to demonstrate.

When you select the map to be decluttered, it bring up this scrolling option list. Here you can set the declutter ranges for airports based on their type.

To pick an option, press the SEL key to go back to the options, rotate the outer knob, and then press the SEL key again.

Here you can set the declutter ranges for both low and high navaids.

Airspaces are divided into classes, Military Operating Areas, and Restricted Airspace.

You can set different range filters for both low and high airways.

Fixes are divided into terminal, enroute, and off-route. Let's declutter our enroute fixes so that they only appear on the map when our range is 50 nautical miles or less.

First, we rotate the outer knob until there is a white border around the range bar for enroute fixes. Then, we rotate the inner knob until the desired declutter range is set. When done, press the SEL key.

You could scroll down to RETURN and then press the SEL key, or you could just press your desired function key.

There are three visual indications that let us know that FIXES are decluttered.

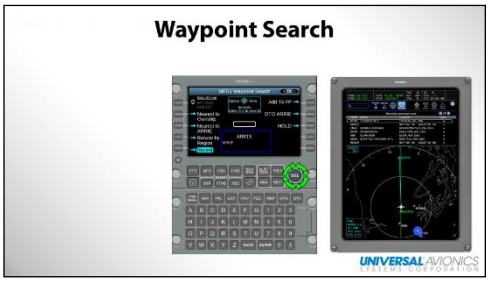
Notice our FIX icon at the bottom of the MFD. The asterisk means that this overlay has been selected, but is currently decluttered due to the current map range.

If we were to go to MFD page 2, you will see that the Fixes label is ON, but is now gray and preceded by an asterisk, meaning this option is decluttered.

Let me demonstrate the third indication. I am going to remove FIXES as a map overlay for a moment. If I were to reselect it, this banner will appear for a few seconds, letting me know that this particular option is decluttered due to range.

If you were to set the declutter ranges for the INSET MAP, those settings will apply to all displays - PFD and MFD - on the cockpit side being controlled by that ECDU.

Waypoint Search



Pressing the Waypoint Search key enables the ECDU and the Cursor Control Panel to conduct waypoint searches.

You can filter your search by the type of waypoint you are looking for: Airports, VORs, NDBs, and Fixes.

The search places the nearest 7 waypoints on page 1 and then sorts them by distance. Then next closest 7 waypoints are on page 2.

If you are looking for a particular waypoint, you can type in its name.

The list is dynamic, meaning as you type, the list is narrowed down accordingly.

This type of search is sorted alphabetically. If two waypoints share the same name, the closer waypoint is listed first.

If you see your desired waypoint on the list, you can scroll down to it, or continue typing.

When the desired waypoint is highlighted, press either the SEL key or the ENTER key, which will bring up an information box about the waypoint.

You can use either the cursor or the ECDU to add the waypoint to your flight plan. You have the option to make it either a flyby or an overfly waypoint. You will also need to determine where in the flight plan the waypoint is to be inserted. Use either your cursor or the ECDU knob to make your choices.

If you make no entries, this screen will time out.

You can also proceed direct to the waypoint. After pressing Line Select Key 2 Right, use your cursor or the knob to select CONFIRM and then press the SEL key or the ENTER key.

If we go to NAV page 1, you will see we are now flying from our present position direct to ARRIE.

Let's return to our waypoint search.

Our third option is to HOLD. If the waypoint has a holding pattern associated with it, pressing the HOLD Line Select Key will enter that information into the FMS. If the waypoint does not have a holding pattern associated with it, none will be entered.

After pressing this option, you will be prompted to either cancel or confirm that you want to hold at the waypoint.

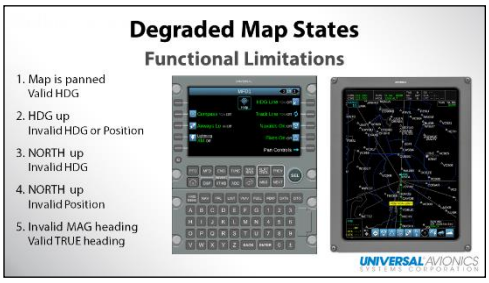
If we go to NAV page 1, press the MANEUVER Line Select Key, and then the HOLDING DEFINITION option, we will see the holding pattern associated with ARRIE. Although we are currently heading direct to ARRIE, we have not entered the holding pattern into our flight plan; we have merely loaded the holding pattern information. If we want to hold at ARRIE, we need to select the DTO HOLD option. Now you can see that we are proceeding direct to ARRIE followed by its holding pattern.

Let's go back to the MFD waypoint search page.

All of the search examples done so far were based on looking for waypoints that were the nearest to our aircraft.

We could also search for waypoints nearest another waypoint, browse by a region, or by recent searches.

Degraded Map States



When the map is panned while heading is valid, heading adjustment for the map depiction based on the current aircraft heading will be temporarily disabled. The compass rose, heading line, heading bug, and track line will be removed because the map is no longer oriented to the aircraft's heading. Range and bearing based data, such as TCAS information and weather radar, will still be displayed relative to the aircraft symbol, but weather and terrain data that requires a heading up orientation will not be.

Let's get out of pan mode and select a heading-up orientation.

When in heading-up orientation with an invalid heading or FMS position, all Lat/Long referenced map items will be removed. This includes all overlay data except range and bearing items such as weather radar, TCAS, and Stormscope. A yellow HDG or POS flag, as applicable, will be placed on the aircraft symbol. In this state, panning will be inhibited as map data is not displayed.

When in north-up orientation with an invalid heading, all heading and range/bearing referenced map items will be removed. This includes compass rose, heading line, heading bug, track line, TCAS, and Stormscope. A yellow HDG flag will be also placed on the aircraft symbol. When valid heading is restored to a north-up map depiction, the data will be restored.

When in north-up orientation with an invalid position, the map will be in pan mode with a yellow POSITION LOST annunciator. Most overlay data normally available for north-up pan mode will remain except for the aircraft symbol, TCAS, and Stormscope. When position data once again becomes valid, the map will re-center on the aircraft even if it had been panned earlier when the position was invalid.

There is a degraded heading state as well. If true heading is valid but mag heading and/or mag var is invalid, the heading flag on the map will be white instead of yellow if the HSI is in showing mag heading. The map will still be able to show lat/long and range/bearing referenced data because true heading is available.

If equipped with a True Heading capability, selecting the True Heading mode will re-enable the compass rose, heading line, heading bug, and track line on the map display and remove the heading flag.

Self-Assessment Questions

1. Using the ECDU page map, display airports with METAR symbology.

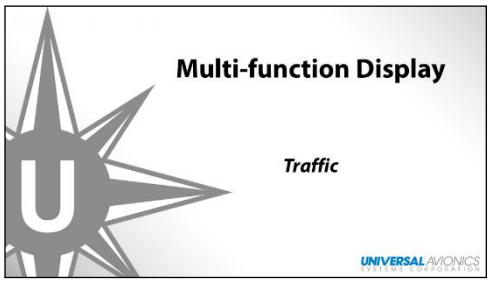
2. How would you use the cursor to turn high airways on?

3. You notice on your MFD map that you are approach airspace boundaries. How do you determine its altitude range?

4. How do you locate a fix using the Waypoint Search function?

22 TRAFFIC

Lesson Overview



This lesson covers how the Universal Traffic Awareness and Warning System (TAWS) is displayed on the MFD Map. Topics include controlling the display, symbology, annunciators, and traffic filtering based on altitude.

Learning Objectives

1. Know how to display traffic on the map display.
2. Know the various symbols associated with the Traffic map display.
3. Know the four types of targets displayed.
4. Know what the different traffic pop-ups mean and how to acknowledge them.
5. Know where traffic information is contained in the MFD Status Bar.
6. Know what the four different altitude filters are and how to set them.

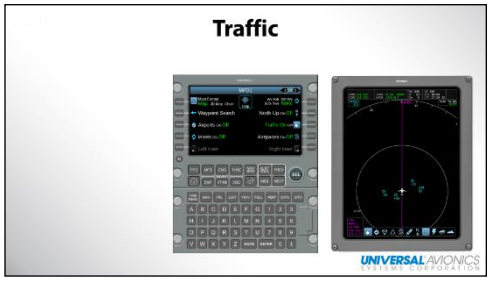
Examples of Behavior

1. Given an ECDU or CCP, turn the Traffic option on or off.
2. Given an MFD, explain the various traffic symbols.
3. Given an MFD, identify traffic advisories (TA) and resolution advisories (RA).
4. Identify the parameters of the different altitude filters.
5. Given an MFD Status Bar, identify the current filtering system and the current TCAS state.

Video Script

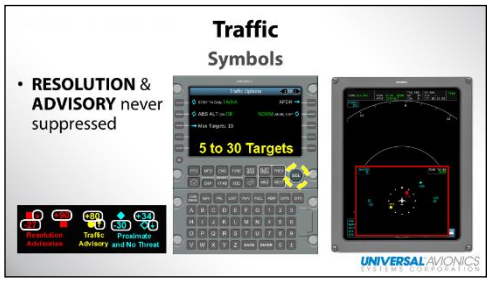
Traffic

Traffic information is also shown on the InSight display system, if a supported traffic system is installed and configured in the aircraft.



To display traffic, toggle the appropriate Line Select Key on MFD page 1, or use the cursor to select the traffic icon at the bottom of the map.

Traffic Symbols



Traffic is displayed by dynamic target symbols received from the traffic system. The symbol is determined by its relative distance and altitude from the aircraft, thereby assigning a threat level to the traffic target.

Each target is assigned a relative or absolute altitude (as selected by the TCAS controls) in hundreds of feet, which is displayed with a + sign and a numeric above the symbol if the target is higher than your aircraft or a – sign and a numeric below the symbol if it is lower than your aircraft. This format is not applicable for absolute altitudes. If the target's vertical trend is known, an up or down arrow will also be displayed.

At a minimum, the 5 most proximate targets will be displayed. The maximum number of targets is set by the pilot and can range from 5 to 30.

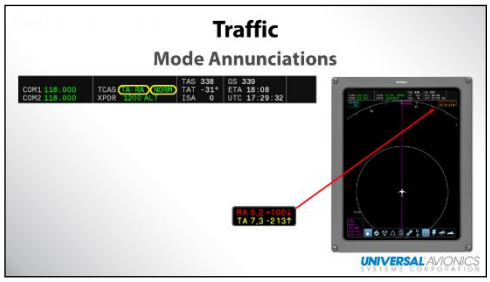
The InSight display system will retain the number of TCAS targets last selected through a power cycle. The InSight display system will also power up with the TCAS altitude limit mode set to "NORMAL" as the default unless otherwise controlled by the TCAS system.

There are four types of targets displayed on the map in descending order of criticality and threat level: Resolution Advisory, depicted by a red square, Traffic Advisory, shown as a yellow circle, Proximate Threat, indicated by a cyan diamond, and No Threat, represented by a cyan outlined diamond.

Note that display of resolution and traffic advisories cannot be suppressed by reducing the minimum number of displayed targets. If present, these advisory targets are always displayed, regardless of the max target value.

When a traffic pop-up occurs, it will look like this. The border of the pop up will match the alert criticality; yellow for cautions and red for warnings. The pop-up will remain until the condition no longer exists, or the pilot presses the ALERT CANCEL key. Please note that pressing the ALERT CANCEL key will remove the pop-up, but not the Resolution Advisory.

Traffic Mode Annunciations

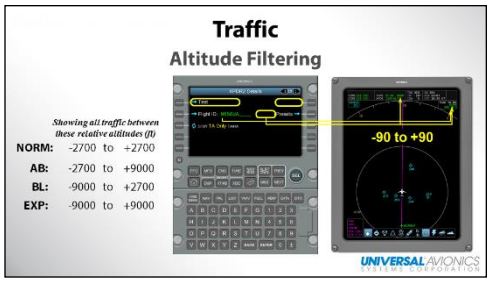


The TCAS mode is displayed in the MFD status bar in two fields. The left field shows TCAS in green if the data received is valid, or other TCAS states as appropriate.

The right field contains an annunciator that describes the current altitude filtering mode of the TCAS system, which we will discuss shortly. If TCAS is not a configured system, these fields are empty.

If proximate targets are reported without bearing information to accurately draw them on the display, they will be depicted according to the TCAS rules for format as "TCAS no-bearing targets" in the upper right corner of the map.

Traffic Altitude Filtering



There are four different altitude filters for traffic. To select one of the filters, first press the TRAFFIC Line Select Key on Home page 1.

We are currently in the NORMAL mode. In this mode, the filter will show all traffic between 2,700 feet below to 2,700 feet above your aircraft's altitude.

In the Above mode, all traffic between -2,700 and +9,000 feet relative altitude will be shown.

The Below mode will show all traffic between -9,000 and+2,700 feet relative.

The Expanded mode shows all traffic between ±9,000 feet relative.

Additionally, an absolute altitude mode may be selected. In this mode, the value next to a target is its actual barometric altitude. There is a fifteen second timeout on this display mode, meaning after 15 seconds, the display will revert to relative altitude again, but it may be re-triggered at any time by the pilot.

A toggle for setting the TCAS transponder traffic mode among Standby, TA only, and TA/RA is also provided, as well as a shortcut key to the transponder tune page.

If TCAS is turned off or is not otherwise operational, the transponder traffic mode controls will be unavailable.

To test the TCAS, press this shortcut key to the transponder details page, and then press the Test Line Select Key.

Self-Assessment Questions

1. Using the ECDU page map, display traffic on the MFD map.

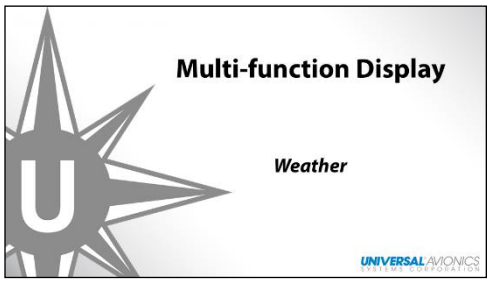
2. Using the ECDU page map, set the altitude filtering so that all traffic between 2,700 feet below to 9,000 feet above your aircraft is displayed.

3. What does the symbol in Figure 1 mean?

Figure 1

23 WEATHER

Lesson Overview



This module covers adding weather information as a map overlay. Weather data can be from radar, satellite, and other sources.

Learning Objectives

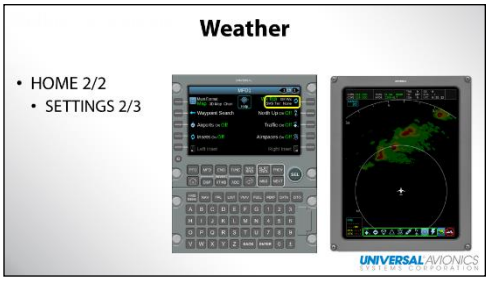
1. Know how to select weather as a map overlay.
2. Know how to adjust the display brightness for weather data.
3. Know how to select the various satellite weather products available.
4. Know how to select lightning as a map overlay.

Examples of Behavior

1. Given an ECDU or CCP and an MFD, select weather and lightning for display as a map overlay.
2. Given an ECDU and an MFD, select various weather products for display.
3. Given an ECDU, adjust the weather display brightness.

Video Script

Weather



Weather radar information may be displayed on the MFD if a supported system is installed and configured in the aircraft.

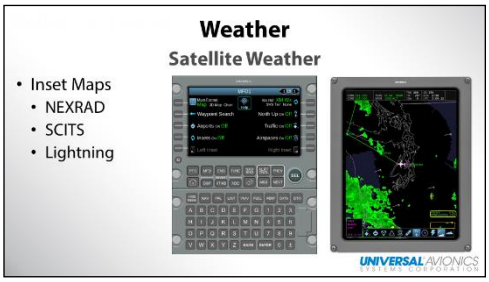
Weather radar data may be displayed concurrently with all Map depictions including display of flight plan information, background waypoints and other overlays. However, we will keep most of the overlays off during our discussion of weather.

Concurrent display with terrain depiction is mutually exclusive.

If you go to HOME page 2 and then to Settings page 2, you will have an option to adjust the weather brightness.

Selecting this option will allow the pilot to adjust the brightness of weather radar and satellite weather on the maps so that information displayed underneath the weather data can be seen. This control defaults to 50, which is suitable for most conditions.

Satellite Weather



The MFD may be used to display satellite weather from a connected weather uplink system such as XM.

If the selected source is invalid, the MFD will annunciate “XM Unavailable” in white.

If the source is valid and data is available for display, the MFD will annunciate "XM" in green. Only Next-Generation Radar, Storm Cell Identification Tracking, and Lightning products are available on inset maps, due to size limitations; however, other products will be available on the MFD main map if the satellite weather subscription provides them.

If NEXRAD and/or Lightning products are displayed, the Satellite WX annunciation will be shown in a box with the NEXRAD and/or Lightning status annunciations below it along with the UTC age for each product. This feature is restricted to the MFD main map due to size limitations on inset maps.

Other selectable satellite weather products include Coverage, Winds Aloft, SIGMETs, and AIRMETs. Each product may be toggled ON and OFF from the ECDU.

NEXRAD, Lightning, and Surface Winds will be shown with their UTC ages. SCITs, SIGMETs, and AIRMETs are shown by individual occurrence and can be queried by clicking the item with the cursor directly on the map.

A connected satellite weather system also supplies the METAR information that is cursor selectable on the MAP as previously described.

If XM weather is unavailable, these controls will be grayed out. If XM weather is not enabled, this page will not be displayed.

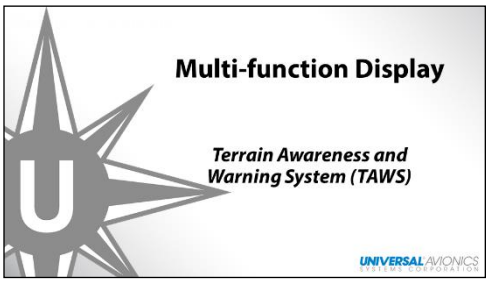
If the Winds Aloft shortcut Line Select Key is pressed, a setting window will enable the pilot to select winds for a particular flight level.

Self-Assessment Questions

1. Most map overlays can be displayed with weather. Which one cannot?

24 UNIVERSAL TAWS TERRAIN

Lesson Overview



This module covers how the Universal TAWS data is displayed on the MFD. Topics include color coding, alert display settings, pop-up alerts and mode annunciations.

Learning Objectives

1. Know what the TAWS colors, alerts, and annunciations mean.
2. Know how to change the TAWS settings.

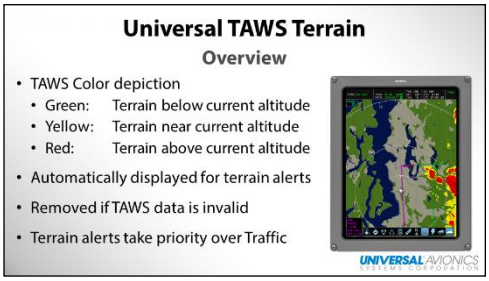
Examples of Behavior

1. Be able to identify terrain cautions and warnings.
2. Be able to determine the TAWS data state in the MFD Status Bar.
3. Be able to identify if simultaneous traffic and terrain alerts.
4. Be able to resolve and cancel terrain threats.

Video Script

Universal TAWS Terrain

The MFD may be used to display TAWS data. Color depiction for TAWS is consistent with normal display methodology for terrain: green for terrain below your current altitude, yellow for terrain elevation near your altitude, and red for terrain above your altitude that could cause a collision.



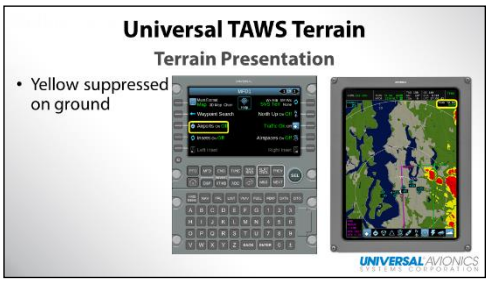
The TAWS presentation will automatically be displayed in the event of a terrain alert.

The TAWS presentation will automatically be removed if the TAWS data is invalid.

In the event of simultaneous traffic and terrain alerts, the terrain alerts take priority.

Terrain Presentation

TAWS colors may be displayed on all maps and is selectable by the ECDU. The TAWS Colors On / Alert Only toggle on Home page 2 determines whether the red and yellow alert colors are shown full time or only when TAWS triggers an alert.



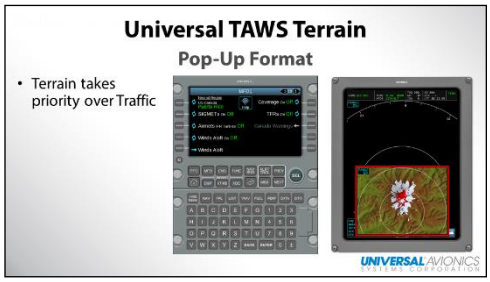
When the toggle is set to ON and the aircraft is on the ground, the display of yellow for terrain level with the aircraft is suppressed. Display of red for terrain above the aircraft's elevation is still displayed.

When the aircraft is airborne, both yellow and red are shown as determined by the TAWS system for the aircraft's current phase of flight.

Flight plan data, display of all map data, and traffic information may be overlaid on the terrain image. If traffic is overlaid, the TCAS annunciator block will be depicted in the upper right corner of the TAWS image.

Terrain Alerts

A terrain alert will initiate a pop-up, which consists of a single inset window displayed over any other MFD format.



The border will match the alert criticality; yellow for cautions and red for warnings.

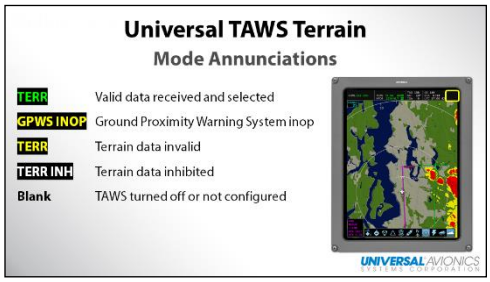
Resolving the terrain alert by climbing or turning away from the terrain may resolve the issue, but it will not eliminate the alert. To do so, you will need to press the alert cancel key to acknowledge the alert and remove the inset window.

If simultaneous terrain and traffic pop-ups occur, the terrain pop-up will take priority. Likewise if both pop-up conditions are true, the alert cancel will remove the alerts one at a time.

If the alert condition is still present or re-triggers, the window will reactivate.

Mode Annunciations

The right side of the MFD STATUS BAR contains the TAWS mode annunciator, which will display this annunciator in green if valid data is being received and is selected to be displayed.



This annunciator will be shown if the Ground Proximity Warning System is inoperative. GPWS INOP does not prevent the selection or display of synthetic vision terrain.

This annunciator will be displayed if the data received is invalid.

If terrain data is inhibited, then the field will show this indication.

The field will be blank if not enabled.

Self-Assessment Questions

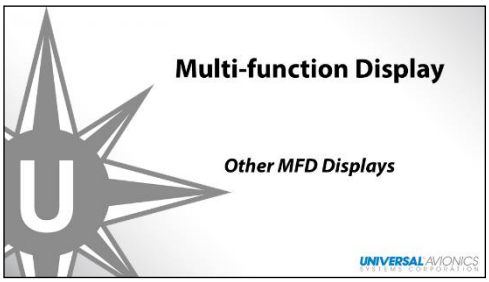
1. If the TAWS colors is not toggled ON, will you still get terrain alerts?

2. Will turning away from terrain eliminate a terrain alert?

3. Using the ECDU page map, set the TAWS colors to Alert Only.

25 OTHER MFD DISPLAYS

Lesson Overview



This lesson covers the available MFD displays other than Map mode. Options include 3D Map, Charts, Video, and UniLink. The last two options are not part of the InSight system, though they can be displayed on the MFD, and therefore may not be installed and configured on all aircraft.

Learning Objectives

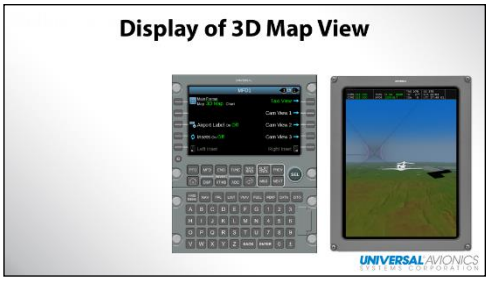
1. Know the different options available in the 3D Map view
2. Know how to access video and UniLink images.
3. Know how to access, select, view, and manipulate charts.

Examples of Behavior

1. Given an ECDU and MFD, select a specific display mode and view.
2. Given an ECDU or CCP and an MFD, select, view, and manipulate charts as required.
3. Given a chart displayed on an MFD, modify a flight plan to include the charted procedure.

Video Script

Display of 3D Map View



The MFD may be used to display a synthetic vision 3-dimensional map for increased situational awareness. The terrain and sky shown in the depiction are a real time presentation of the actual terrain relative to the aircraft.

The ECDU supports two predefined “camera view” perspectives. Camera View 1 uses an "above left" perspective and Camera View 2 uses "above right".

Camera View 3 is a pilot selectable view and is adjustable in lateral and vertical rotation around the aircraft using the rotary control knob.

Flight plan, airport labels, and airspaces may be selected for display within the image as well.

Here are some other views when you are not exactly on course. Be aware that due to parallax error, you may appear off course in this view when in fact you are not. This display is intended to provide situational awareness, not course deviation data.

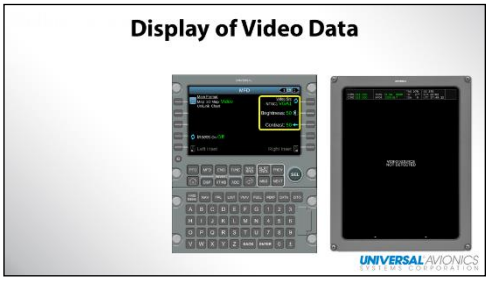
Like the Terrain Plan view, the TAWS Colors may be toggled on or off. When off, TAWS information will appear only for alerts.

If the aircraft is on the ground, a fourth depiction, Taxi View, is also available, which shows a top-down view for ground operations.

If synthetic vision is initializing, or is inhibited due to a loss of reference data such as attitude, heading, or position, an SVS INIT or SVS INH annunciator will be displayed in place of the 3D Map format.

If the InSight display system detects a corrupt terrain tile in the database, the corrupt elements will not be displayed, so as not to present misleading information. The InSight display system will also push a message to the pilot explaining the condition.

Display of Video Data

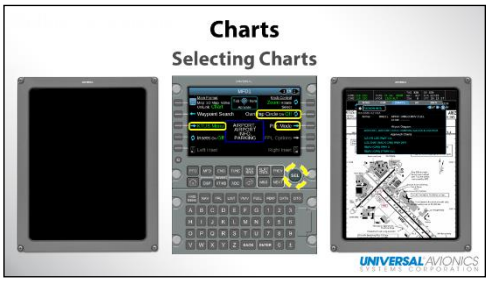


The MFD may display video depictions as a main or inset format on the display. If your aircraft is not configured to display video, then the option will not appear. These video depictions may include moving map displays and cameras, such as this infrared camera used on an approach.

The InSight display system only shows the video inputs without any interpretation of what the video is. Controls to select the video source as well as adjust contrast and brightness are available on MFD page 1.

If the selected video source is invalid, the MFD will state that the video source is not detected.

Selecting Charts



The MFD can also display diagrams, plates, and procedures, collectively labeled Chart.

The chart defaults to the last chart selected. You could do a waypoint search for your desired airport. When you select the airport, this chart menu will pop-up on the MFD. More about that in a moment.

Use your control knob to go to the CHARTS tab, and then select the desired chart. I will select the airport diagram and then press the SEL key to load it.

There is another way to bring up the charts page. Let's go back to the MAP format for just a moment. Now, let's go to HOME page 1.

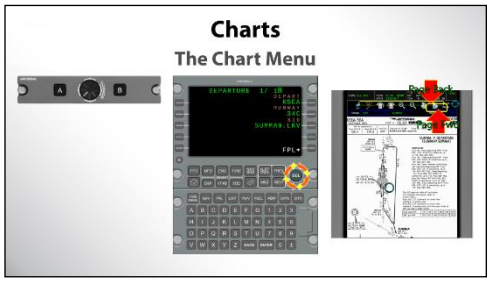
From here, you can press this Charts Line Select Key, and it will take you back to this page in the chart format, even though we had switched back to the MAP format before leaving.

Let's go to HOME page 1 again.

When you are still on the ground, this Departure Data Line Select Key will be displayed. If you press this key, it will take you back to the MFD page with CHART as your main format Notice the airport is now our departure airport; KSEA. Also, Line Select Key 3 Left - KSEA MENU - has already been selected for us, with the airport menu appearing on the MFD. From here, we can use our cursor or the control knob to choose a chart.

After we have departed, this option will change to Arrival Data and pressing this key will do the same thing as before except it will bring up our arrival airport data rather than the departure.

The Chart Menu



This Line Select Key brings up the menu for the airport listed as an overlay on the MFD, giving you information or chart selection on the display. You have five tabs of information for the airport. You can access the tabs and select items with the cursor or the control knob. I will use both for demonstration purposes.

The far left tab with the airport identifier gives runway and airspace information. Notice we have two pages. To scroll between the pages, you can use the NEXT or PREV keys on the ECDU or use the cursor to click on the page arrows.

On page 2 is information regarding the other runways.

The next tab provides airport communications data over 6 pages.

The fourth tab provides airport weather information, if available, and the last tab is general airport information.

Let's go to the center tab; charts. For this airport, we have 11 pages of options. You can select a chart with your cursor or the control knob. If the chart is flight phase appropriate, such as a departure procedure for the departure airport, pressing the FPL Options key will allow the chart's information to be added or modified to the flight plan.

For example, we now have the ability to change our departure from KMORE4 to SUMMA9.

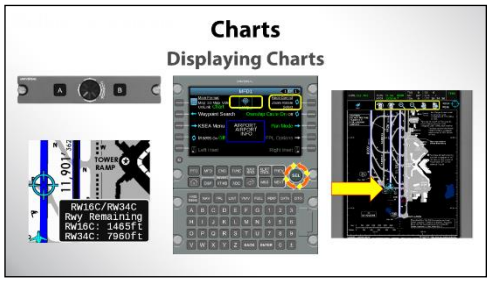
To change the runway, press the Runway Line Select Key. Notice the drop down menu on our MFD. We could select a runway with our cursor or use the control knob to scroll through our options. This is a dynamic change. Notice how runway 34 Center is already a part of our pending change.

Next, let's add the Lakeview transition by pressing the Line Select Key and then scrolling through our options.

If we are satisfied with the pending change, we can incorporate it into our flight plan here. Notice our current active departure is now the SUMMA9.

Let's go to our flight plan pages. If we press the FMS Menu key and select departure, you can see it is now a part of our flight plan.

Displaying Charts



We can do more than just select a chart. Controls include a toggle for changing the knob function between zoom, rotate, and selection of the next or previous available chart.

To zoom in on a chart, toggle the Line Select Key to the appropriate option and then use the ECDU control knob to zoom in or out.

To rotate a chart, toggle the Line Select Key again. Turning the knob will rotate the chart in 90° increments.

To select the next or previous chart, toggle the Line Select Key again to Select. Then use the PREVIOUS and NEXT keys to select the desired chart.

These three same tasks can be accomplished by the cursor here.

To move the chart up, down, left, or right, toggle the PAN MODE on. Use the outer knob to move the chart up and down and the inner knob to move it left or right.

You can also move the chart with your cursor.

Geo-referenced airport diagrams can show the ownship position on the chart. If seeing the ownship position is difficult, the OWNSHIP CIRCLE can help you visually acquire the aircraft. Simply toggle the OWNSHIP CIRCLE Line Select Key to on. You will see a pulsing circle around the ownship symbol if the aircraft position is within the plate boundaries.

All geo-referenced airport diagrams can be queried for runway distance from the cursor position to both ends of the runway. Simply highlight a runway with the cursor and then click the **A** button. This is especially useful if you need to know the runway distance remaining from a particular taxiway intersection.

A night display mode is also available for the display of plates. Night mode will be selectable via a day/night switch or if the display brightness of the InSight display system is set at or below 70.

Self-Assessment Questions

1. Should the 3D Map view be used for course guidance?

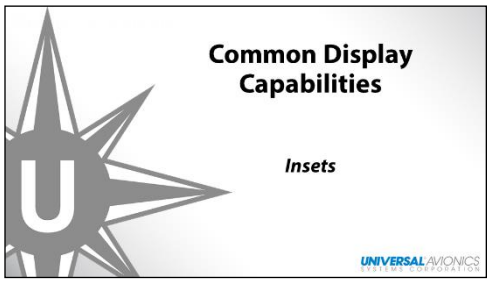
2. Using the ECDU page map, how do you display a 3D display with a below/directly behind perspective?

3. Using the Waypoint Search function, you locate a potential divert airport. How do you get the weather?

4. How do you determine the remaining runway length using the MFD chart display?

26 INSETS

Lesson Overview



This module builds on the MFD display lessons. Many of the displays already covered can be shown on the PFD and MFD inset displays as well. This lesson covers how to do that, as well as display the Flight Plan Status display.

Learning Objectives

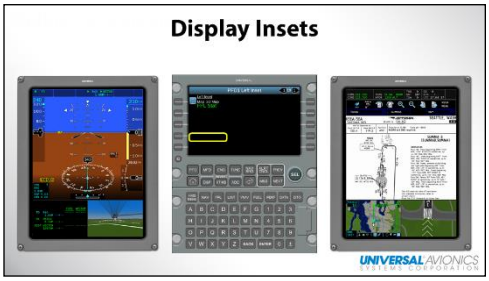
1. Know how to configure and interpret the inset displays on both the PFD and MFD.

Examples of Behavior

1. Given an ECDU and PFD or MFD, select a particular display with the appropriate options.
2. Given a FPL Stat display, identify the available data.

Video Script

Insets



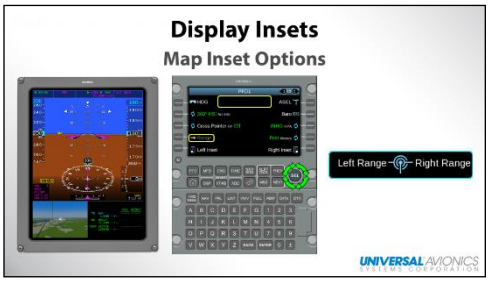
Many of the displays on the MFD can also be shown on either the PFD or MFD as an inset, only in a smaller format. For a full description of each display, refer to the appropriate MFD module. This module will primarily review the operation and functionality of the insets themselves.

The display inset keys control the display format of the PFD insets, which cannot be turned off; one of the choices must always be selected unless replaced by the compressed engine format.

Inset can be turned on or off for the MFD using Line Select Key 4 Left. If toggled OFF, it will remove both left and right insets from the MFD as shown. If toggled ON, it will enable both insets in their last known state, or to a default determined by a saved layout. The MFD inset option pages and controls are exactly the same as for the PFD, so I will use just the PFD to demonstrate the various options in this module.

Depending on what display feature is selected for either inset, that control page will appear when the Inset Line Select Key is pressed. For example, these are the options available when MAP is selected, but if we change the inset to 3D Map, our options become these. The FPL Stat page contains no additional options.

Map Inset Options



Let's return to the MAP option.

Note that there is no Range Line Select Key on any of the PFD Map Inset pages. All of the map option controls are either toggles or shortcut keys to other pages, so the control knob's only function on this page is to set the map range.

The PFD Map Inset page 1 contains toggle controls for weather and the other options shown.

Page 2 contains toggles for displaying several more options and may vary depending on aircraft configuration.

Page 3 contains toggle controls for supported satellite weather products.

Let's go back to PFD page 1 again. Another way to change the range of your inset map or maps is by pressing the Range Line Select Key.

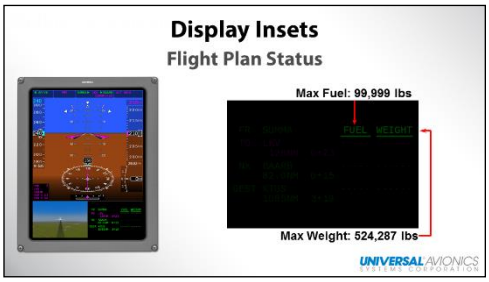
The RANGE key label text will change to inverse video indicating that it is the current operation. The range value will be displayed in large cyan numerals. Range values must be changed using the knob; the alphanumeric keyboard will not work for this method.

When only one map is displayed on the PFD, then you can use either the outer or inner knob to change the range.

If two maps are displayed on the PFD, the outer knob will control the left map range and the inner knob will control the right map range.

If no maps are displayed on the PFD, the RANGE Line Select Key will be grayed out, indicating it is not an option.

Display of Flight Plan Status



The flight plan status block displays long range navigation flight plan status and performance data in four rows.

The first data row indicates the FROM waypoint which is always displayed in green. If this data is not provided, the InSight display system will not display it.

The second row indicates the current TO waypoint, distance to go and time to go. If the long range navigation source has a performance database, the fuel and weight are also displayed.

The TO waypoint row is displayed in cyan if it is not coupled to flight guidance and is being driven by an on-side long range navigation source. If the LRN is coupled to flight guidance, this row will be in magenta. In this regard, it will match the primary flight plan source data block and active flight plan leg color.

The third and fourth data rows contain identical information for the next and destination waypoints for the current flight plan. These rows are displayed in green.

If any of the flight plan data is invalid, it is displayed as dashes. If the performance data is not received, it is not displayed.

Fuel is limited to a maximum of 99,999 pounds and weight is limited to 524,287 pounds. Values exceeding these limits will be displayed as asterisks.

Self-Assessment Questions

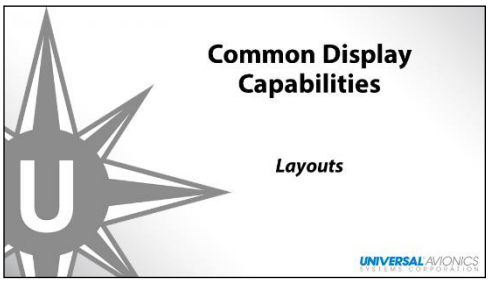
1. Can you turn the Inset displays off on the PFD and MFD?

2. What is required in order for the FPL Stat to display fuel and weight?

3. Using the ECDU map, set the left inset to map with both Weather Radar and Traffic on.

27 LAYOUTS

Lesson Overview



This course has numerous ways information can be displayed. Displays settings can vary based on phase of flight, weather, or pilot preferences. This lesson covers how to save display settings so that the PFD and MFD layouts are configured at the press of a button.

Learning Objectives

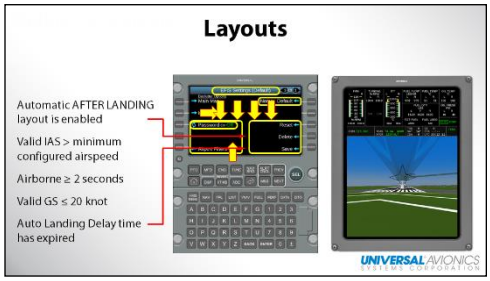
1. Understand the concept of pilot profiles and saved layouts.
2. Know how to create, load, modify, and delete a pilot profile.
3. Know how to create, load, modify, and delete a saved layout.

Examples of Behavior

1. Given an ECDU, identify which pages and LSKs are required to create/modify pilot profiles.
2. Given an ECDU, PFD, and MFD, explain how to create/modify a saved layout.

Video Script

Layouts



Throughout this course, you have seen countless ways to configure your displays; from the map overlay options to configuring your insets, from engine display formats to traffic altitude filters. Pilots will differ in how they want information displayed. In fact, a pilot's own preferences can change depending on the phase of flight. You may want the full engine display format for takeoff and landing, but prefer the compressed format for enroute cruise.

Rather than constantly reconfiguring your display layouts, InSight enables you to save five different layouts for each pilot. Selecting a layout will set the PFDs and MFDs to the saved format with only one button push. In fact, the START UP and AFTER LANDING layouts can be initiated automatically if desired, eliminating all button pushing.

First, go to HOME page 2, press the Settings Line Select Key, and then go to page 3 of the EFIS Settings.

On the right side, you have 4 options. Line Select Key 1 Right lists the current pilot profile. If no pilot profiles have yet been saved, this line will be Default and grayed out.

If there are any stored pilot profiles from which to choose, this option will be white. Pressing the Line Select Key will display them. Note that the default profile will not be listed. Use the ECDU control knob to scroll to your name and then press the SEL key to load it.

If your name is not included as a Pilot Profile, then close the pop up window and press Line Select Key 5 Right. Enter your name using the ± key to enter spaces and the Back key to make corrections. When done, press ENTER to advance to the SAVE field. Press ENTER again to save it or use the knob to CANCEL. After saving your Pilot Profile, your name will be in parenthesis in the title bar for all of the EFIS Settings pages. We are now ready to configure our layouts.

For this example, we are going to create a layout for enroute cruise, so let's go to PFD page 1 and configure the options accordingly. I am going to select the Arc compass rose and leave the rest of the settings as they are.

We can also customize the insets, so I select the Left Inset, where I will use Map in weather radar mode, Airports On, and Traffic Off. There are many other options we could make to the PFD and its insets, but this is enough to demonstrate.

From MFD page 1, I select MAP with weather radar, Traffic On, and the range set to 160 nm.

From the Engine page, I set the display to compressed format on the MFD. There are still many other choices I could make, but this is sufficient to demonstrate.

Now I go to HOME page 1 and press Line Select Key 5 Left: Layouts.

The InSight system has Start Up and After Landing predefined layouts, which may be modified, but not deleted. The other three Line Select Keys on the left side may be assigned to pilot defined and named

layouts. Having just created my profile, these will of course, be blank. So let's save our current settings by pressing Line Select Key 1 Right: Save Layout and then enter the name of our layout; CRUISE.

A layout may be saved for the entire cockpit or any subset of the displays, by selecting the option buttons on the Save Layout pop-up shown. I did not make any changes to MFD2 or PFD2, so I will deselect them. Then I select SAVE and press either the ENTER key or the SEL key. We now have our preferred settings for enroute cruise saved as a layout.

Let's select our START UP layout. Notice the changes to the PFD and MFD. Although the START UP profile is a predefined layout, you are able to modify it.

For demonstration purposes, I'm going to change the MFD1 camera view to TAXI. I return to HOME, LAYOUTS, and again select Save Layout. I type in the name START UP using the ± key to enter the space. Notice the layout name is modified. This annotation only occurs for the START UP and AFTER LANDING layouts.

Let's select the AFTER LANDING layout.

If your aircraft is configured, you will have additional toggle controls for enabling the automatic display of the Start Up and After Landing layouts, as well as the ability to set the Auto Landing Delay time.

For the After Landing layout to display automatically, all of the following conditions must be true:

- The auto startup and landing layouts are configured.
- Automatic after landing layout is enabled.
- The indicated airspeed is valid, has been greater than the minimum configured airspeed tic mark for at least 2 seconds after auto landing is enabled, and has been airborne for at least 2 seconds.
- The ground speed is valid and is $\leq$ 20 knots.
- The Auto Landing Delay time has expired after reaching the 20 knot ground speed.

You can save up to 3 additional layouts per pilot profile.

A saved layout may be deleted by selecting the Delete Layout Line Select Key and choosing the layout to be deleted from a scrolling list. Though you cannot delete the first two layouts, you can delete one that has been modified which will restore it to its default settings.

When done, there is one more crucial step you must take. Go to HOME page 2 and press Settings. Notice the title bar with our pilot profile name in parenthesis. It is now preceded by an asterisk. The asterisk indicates that settings have changed that have not been saved to the named profile. We saved the layouts, but we have not yet saved our updated pilot profile.

Go to page 3 and press Line Select Key 5 Right to save your profile. You will have the option to keep the same name or to change it. If you happen to like another profile that only requires minor changes, it may be easier to start with that profile rather than the default. We will keep the same name and save it.

To delete a pilot profile, press Line Select Key 4 Right to choose the profile to be deleted.

It would be unfortunate if someone deleted all of your work, so we have another option here; password. If you want to add a password to your profile name, toggle this Line Select Key to ON. When you save your profile, it will ask you to enter your password.

Now if you or someone else were to try to delete your profile, it will ask for the password. Entering the wrong one will not allow that profile to be deleted.

If you want to return all of your InSight display system settings back to the default settings, simply press the RESET Line Select Key.

Self-Assessment Questions

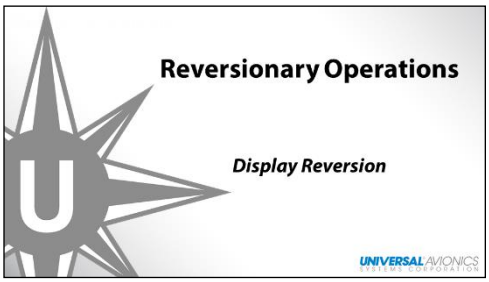
1. How many layouts can be created?

2. Can the Takeoff layout be deleted?

3. Using the ECDU page map, enter your name as a pilot profile.

28 DISPLAY REVERSION

Lesson Overview



This module explains how to deal with a PFD failure using Reversionary Operations.

Learning Objectives

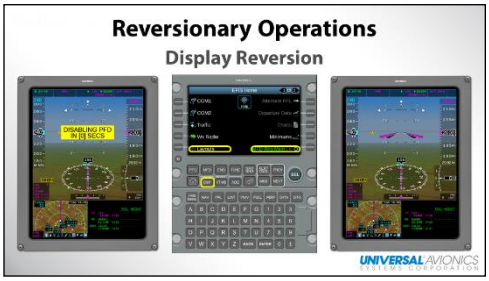
1. Know how to display PFD information on the MFD.

Examples of Behavior

1. Given an ECDU and MFD, identify which keys to press to access the PFD display.

Video Script

Display Reversion



In the event of a PFD failure, you can convert your MFD into a backup PFD. This is called reversionary display mode, and the MFD effectively becomes the PFD for the ECDU that triggered the reversionary mode. It will assume all PFD display function such as formats, annunciators, inputs, and outputs for as long as it is in reversionary mode. The means of control and the available formats will be the same as for the PFD. No formats are restricted on a reverted display and off-side control is still possible if an off-side ECDU or external control panels are present and functional.

To enter into display reversionary mode, press the DISP revert key on the ECDU.

On both the ECDU from which the revert was triggered and the on-side PFD, if it is still displaying normally, a yellow banner will be shown indicating that the PFD will be disabled in 5 seconds and a countdown timer will be shown.

A “CANCEL REVERT” Line Select Key will be available to cancel the display revert countdown and return the PFD and MFD to their normal states. Pressing the DISP revert key again before the countdown timer expires will also cancel the revert trigger. If reversion is canceled, the ECDU will return to the page it was previously displaying.

A “DISABLE PFD NOW” Line Select Key will be available in the lower right position to immediately disable the PFD. Either pressing this key or allowing the countdown timer to expire will cause the reverted MFD to display PFD information.

To exit Reversionary Display, press the DISP revert key and the MFD will turn the PFD back on and enable each display to resume normal operation.

Self-Assessment Questions

1. How do you change your MFD into a PFD if your primary PFD fails?

2. How do you cancel this change?

3. What are the limitations to functionality of the MFD in reversionary display?

29 EQUIPMENT REVERSION

Lesson Overview

This module explains how to deal with equipment failures through Reversionary Operations. This process provides back-up access to data in the event of Attitude, Heading, ADC, and ECDU failures.

Learning Objectives

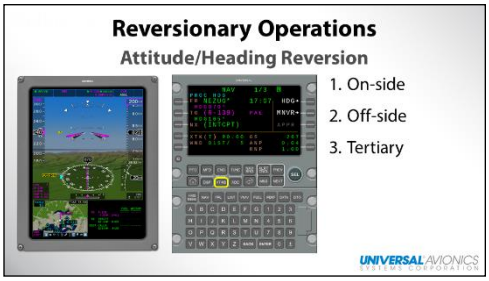
1. Know how to access secondary and tertiary Attitude, Heading, and ADC information.
2. Know how to operate the displays and FMS using the off-side ECDU.

Examples of Behavior

1. Given an ECDU, identify which keys to press to access to access secondary and tertiary Attitude, Heading, and ADC information.
2. Given an off-side ECDU, identify which keys will access your on-side FMS and displays.

Video Script

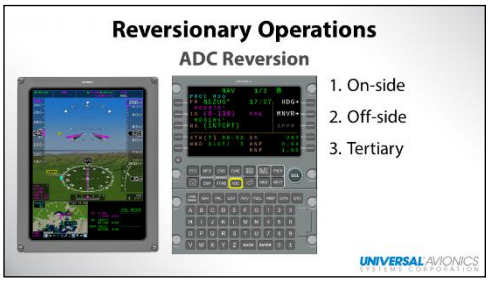
Attitude/Heading Reversion



Attitude heading reversion may be controlled via an external switch in the cockpit or by the dedicated key on the ECDU.

Successive presses of the attitude/heading revert key will sequence through the available attitude/heading sources for that cockpit side. The general order for each side is to sequence through its on-side source, its off-side source, and a tertiary source if configured.

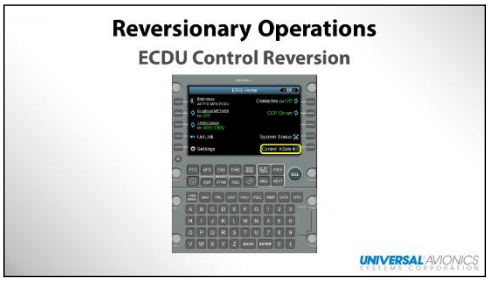
ADC Reversion



Air Data Computer reversion may be controlled via an external switch in the cockpit or the dedicated key on the ECDU.

Just like the attitude/heading reversion key, successive presses of the ADC revert key will sequence through the available air data sources in the installation for that cockpit side. The general order for each side is again to sequence through its on-side source, its off-side source, and a tertiary source if configured. In a simple example, the key on ECDU1 would sequence between ADC1 and ADC2.

ECDU Control Reversion



The ECDU can control the off-side displays. This is especially useful if the cross-cockpit ECDU fails or if there is only a single ECDU in the installation. To enable cross-cockpit control, the pilot must manually select this Line Select Key on HOME page 2.

If cross-cockpit control is selected, all of the user interface options, colors, and interfaces will still function normally, but for the selected off-side display. The ECDU annunciates this unusual control condition by bordering the ECDU page with yellow, changing the title bar to yellow, and changing the InSight display system number to the cross-cockpit designation.

To return to normal on-side control, the pilot must manually select CONTROL ONSIDE from HOME page 2.

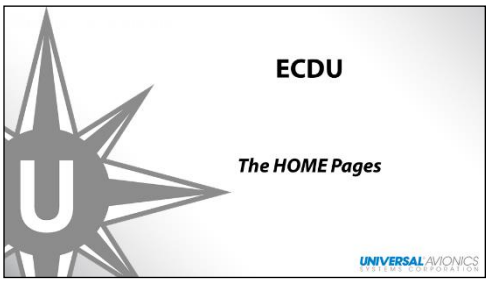
Self-Assessment Questions

1. The pilot's primary air data source is ADC1. How does the pilot select ADC2 for air data?

2. Pressing the AT/HD will cycle through available attitude and heading sources. In general, what is the sequence of sources?

30 THE HOME PAGES

Lesson Overview



This module covers ECDU pages not already covered in other lessons, specifically the HOME pages.

Learning Objectives

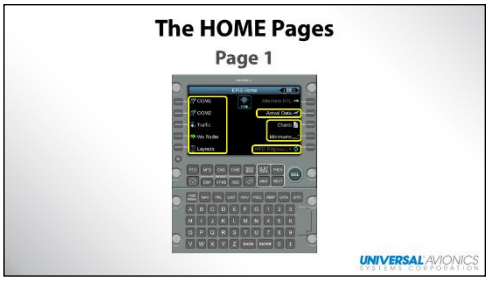
1. Know the various options associated with the HOME pages.

Examples of Behavior

1. Be able to identify which pages and key to press to change the display brightness.

Video Script

HOME Page 1



The HOME pages are accessed by pressing the HOME key on the ECDU. These two pages provide access to functions that are more InSight centric than the individual PFD or MFD functions.

All of these Line Select Keys are covered in other modules.

The Departure Data Line Select Key will be displayed when the aircraft is on the ground and will activate the airport pop-up menu for the departure airport. Notice how we are now on MFD page 1 with our planned departure, the BURRO 4, as the displayed chart.

Once the aircraft is airborne and is no longer on the departure procedure, this Departure Data Line will change to Arrival Data. But since we are still on the departure, this is what we will see.

If no map is displayed on the MFD, then this option will be gray.

If there is a map on the MFD, then Line Select Key 5 Right will be green. If you have more than one map displayed on the MFD, toggle this key to select the desired map: Main, Left Inset, or Right Inset. Remember, unavailable options are gray, available options are white, and the selected option is green. InSight will default to the first available map; Main in this example.

The outer knob will cycle through the map icons on the map selected and the inner knob will change the range.

You can select an alternate flight plan from the off-side FMS if it is in Independent Mode.

For example, there is a thunderstorm along our departure route. The copilot modifies his flight plan with using a different transition. Pressing this line select key and then choosing the cross-side FMS will display it on the MFD.

The flight plan waypoints will be displayed in a pop-up window. The pilot can scroll through the plan's waypoints by using the control knob.

If you wish to remove the flight plan from the InSight display system, press this line select key.

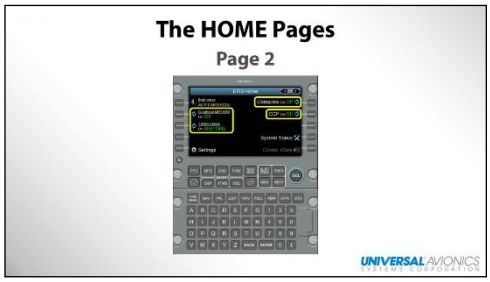
If you want to activate the alternate flight plan, select the cross-side FMS and then press this line select key. This will upload it into the on-side FMS.

If neither of these Line Select Keys is chosen, the alternate flight plan will be retained until replaced by a subsequent upload or until the InSight display system is turned off.

HOME page 2

Home page 2 contains less frequently adjusted InSight settings, including toggles for enabling TAWS Colors, Obstacles, and METAR symbols on map displays which are discussed in other modules.

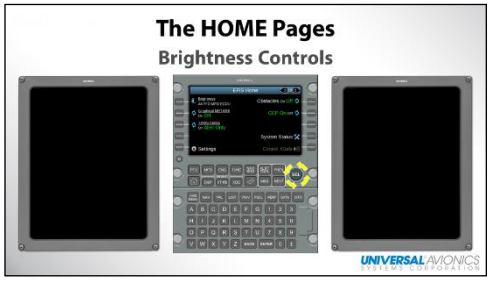
To enable the external Cursor Control Panel, toggle it ON here.



Brightness Controls

When controlling cockpit lighting, you will use the aircraft's master controls. The InSight display system gives you the ability to trim the back lighting for the ECDU's and InSight displays.

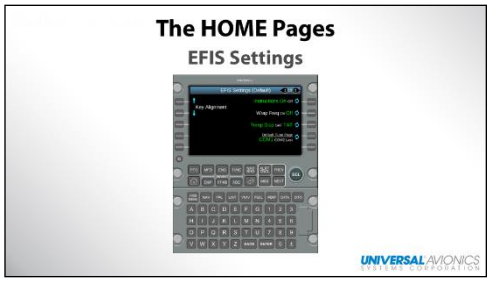
Selecting the brightness toggle will allow the user to trim the brightness of the selected display device. Selecting the All option will allow the user to adjust all onside displays simultaneously.



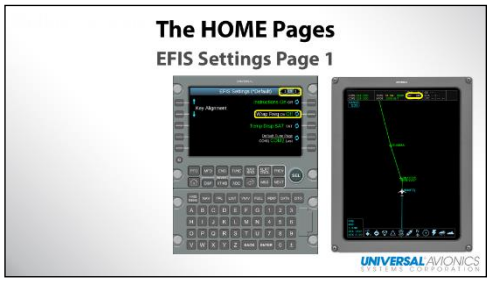
If the display brightness is reduced to at or below 70, then charts will be displayed in night mode.

EFIS Settings

Pressing the EFIS SETTINGS Line Select Key will bring up the EFIS SETTINGS pages.



EFIS Settings Page 1



The up and down keys allow the user to adjust the ECDU display up and down within its bezel to facilitate key alignment.

EFIS SETTINGS page 1 contains a toggle for turning on and off frequency wrapping during tuning. The setting for Wrap Freq is synchronized between ECDUs.

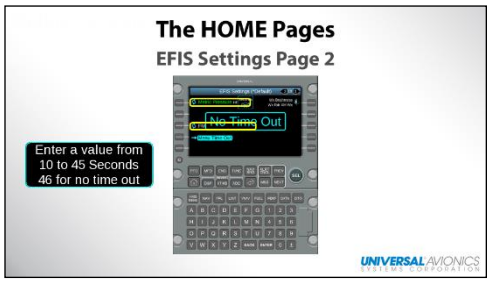
What is frequency wrapping? When frequency wrapping is ON, continuing to rotate the ECDU control knob will go back to the beginning of that radio's range. For example, when tuning a VHF radio and reaching the max value of 136 MHz, continuing to rotate the knob clockwise will go back to 118 MHz and then continue increasing. The same principle works when turning the knob counter-clockwise; when reaching the min value, additional turns go back to the max value and decrease from there.

When frequency wrapping is OFF, continued turns of the control knob after reaching the min or max value will not change the value further.

The next toggle sets the default displayed value for static air temperature or total air temperature in the MFD status bar.

The fourth toggle sets the default page when the TUNE key is pressed for that ECDU. Notice that pressing the TUNE function key took us to page 2 of 2, making it more convenient for the pilot operating the number 2 radio.

EFIS Settings Page 2



Let's move to Page 2 of EFIS Settings.

Metric Pressure enables the pilot to choose either Hectopascals or millibars for the altimeter setting when metric values are being used.

Line Select Key 3 Left enables the pilot to toggle the FMS landing page on and off. Selecting ON will enable the layout to automatically post the Landing Page on the ECDU.

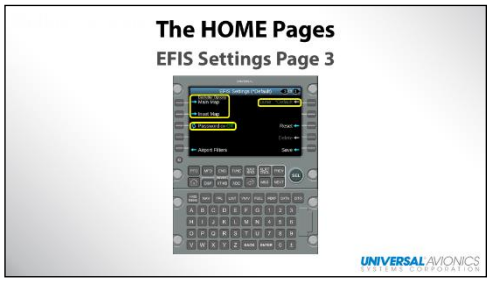
Pressing the Menu Time Out Line Select Key will allow the pilot to change the amount of time pop-up menus appear on the MFD.

It is settable from 10 to 45 seconds. If using the ECDU control knob, one click past 45 will set the NO TIMEOUT value which prevents menus from clearing automatically and requires the pilot to do so manually.

If using the alphanumeric keyboard, entering 46 will also set the NO TIMEOUT value.

EFIS Settings Page 3

Let's move to page 3.



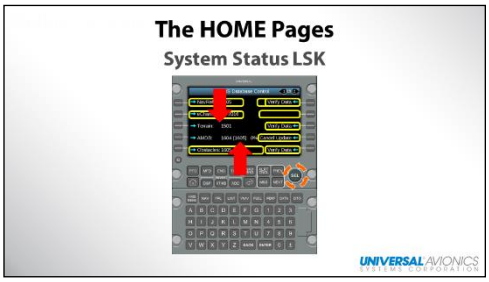
The Declutter Options is covered in the Map Overlay section of the MFD modules.

To change the settings on the HOME pages, the password must be turned OFF.

Pressing the Airport Filters Line Select Key will enable the pilot to set additional airport filtering criteria such as runway length and type as well as other criteria.

The top right Line Select Key, currently labeled as DEFAULT, indicates the Pilot Profile currently in use. Pilot profiles are covered in the LAYOUTS module.

System Status LSK



If the System Status Line Select Key is pressed on HOME page 2, this page will be displayed.

The Display EFIS Config and Display EFIS Status options are covered in the MFD modules.

The Config Transfer key is used by maintenance when replacing installed units with spares.

Display Inputs is also used by maintenance personnel.

The FMS Software Loading toggle allows use of the alphanumeric keyboard to load FMS software during maintenance operations. Normal FMS key function of the alphanumeric keyboard will be suspended while this toggle is ON.

Pressing the Database Control option allows for loading of the databases. Each installed database will be listed by name and cycle number on the left side. The verify data Line Select Keys will be displayed opposite each database key.

The database Line Select Keys enable you to select a database cycle. The currently loaded cycle number will be shown with an asterisk. Turning the ECDU control knob will scroll up and down the list and pressing the SEL key will select the highlighted cycle number.

Selecting a new database cycle will display the current cycle number on the left with the newly selected cycle number in parentheses to its right. The Line Select Key on the right side is pressed to start the database update.

Updating databases temporarily disables the synthetic vision processor, so a confirmation pop-up window is provided.

Selecting the DECLINE option will return to the previous state. Selecting the ACCEPT option will start the update, display its progress, and change the Start Update Line Select Key to Cancel Update.

Pressing a Verify Data Line Select Key will follow the same sequence as just described for a cycle change, except that the currently loaded cycle is compared against its source on the SD card and refreshed in the system.

Self-Assessment Questions

1. When does the Departure Data become Arrival Data?

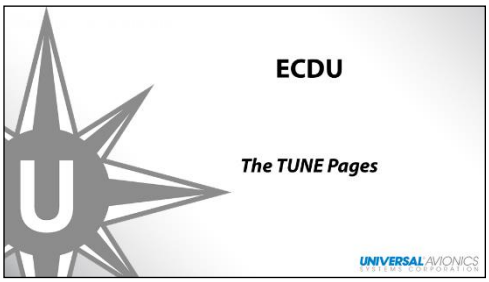
2. How dim must you set the MFD lighting for charts to be displayed in night mode?

3. What does Frequency Wrapping On do?

4. Using the ECDU page map, how would you load the Terrain database?

31 THE TUNE PAGES

Lesson Overview



This module covers how to tune both communication and navigation radios.

Learning Objectives

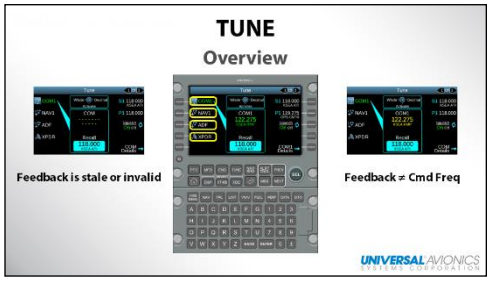
1. Know the various options associated with the TUNE pages.

Examples of Behavior

1. Given an ECDU, identify which pages and keys to press to tune any radio.

Video Script

TUNE



Pressing the TUNE function key will access the default radio page set in the EFIS Settings. The default radio page, either radio 1 or radio 2, is set by going to HOME page 2 and pressing the Settings Line Select Key. You can then set your default tune page as either COM1, COM2, or the last communication system accessed.

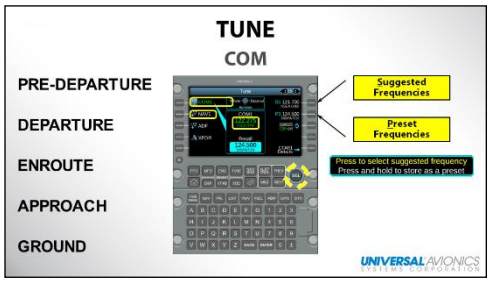
Pressing either the TUNE or NEXT key will cycle through the available radios.

Each left side Line Select Key is a shortcut key to select that radio for tuning. If there are more radios configured than will fit on a single radios overview page, additional pages will be added.

The frequencies, transponder codes, and transponder modes will be displayed on all pages according to the following criteria:

- Yellow dashes in place of digits and/or text if radio feedback is invalid.
- Yellow digits and text if radio feedback does not match the commanded frequency.
- Green digits and text if radio feedback matches the commanded frequency.

COM



Selecting a COM radio will display the tuning page controls for that radio.

The information block in the center shows the active radio frequency in row 1 with the name or identifier assigned to that frequency in row 2.

Line Select Keys 1 and 2 Right show the currently selected FMS Suggested and user Preset frequencies.

Pressing the Line Select Key and rotating the control knob will cycle through the programmed suggested frequencies. Releasing the knob will keep the new frequency. Pressing the SEL key or the Line Select Key again will push that frequency into the active position.

A Line Select Key is also provided for toggling squelch ON or OFF.

Tuning a standby frequency is accomplished via the control knob or the alphanumeric keyboard. Pressing the SEL key or ENTER key will push the standby frequency active and move the previously active frequency into the recall position.

Pressing the COM Details Line Select Key will bring up this page:

A Line Select Key is provided for toggling the VHF radio tuning mode between 8.33 and 25 if the configured radio supports both modes; otherwise, this Line Select Key will not be displayed. The current mode is shown in green and successive presses will toggle the mode back and forth.

A Line Select Key is provided to test the radio.

To access all of the presets, press Line Select Key 2 Right. Here you have two pages available to enter, edit, or select preset frequencies.

To store or edit a frequency as a preset, select its desired position and hold that Line Select Key until the field enters into the edit mode.

Enter the frequency identifier using either the knob or the keyboard. When using the keyboard, press the ± key to create a space. When complete with the identifier, use either the ± key or the outer knob to advance to the frequency field. Again, entries can be made by either the knob or the keyboard.

Exiting the page, selecting another preset, or pressing either the SEL or ENTER keys commits the modified preset to memory.

To delete a preset, press its Line Select Key until it enters the edit mode, and then press the Clear Line Select Key.

You can also tune the radio with a preset from this page merely by pressing its Line Select Key. You will immediately be taken back to the TUNE page. Recall that you can also select a preset from this page by pressing Line Select Key 2 Right and then using the knob to choose the desired preset and the SEL key to enter it.

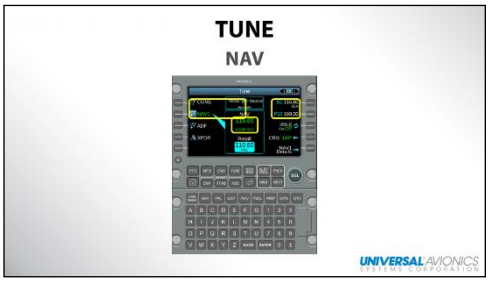
Let's go back to COMM DETAILS to look at the suggested frequencies. They are provided by the FMS, which searches a database using both your location and five different phases of flight to determine the six frequencies you are most likely to use.

If desired, a frequency may be stored as a preset in the next available slot by pressing and holding any Line Select Key for more than 2 seconds.

Press the appropriate Line Select Key to tune the radio to that suggested frequency. Again, you will be taken back to the TUNE page for that radio.

NAV

Selecting a NAV radio will display the tuning page controls for that radio.



The radio block in the center displays the active radio frequency and its identifier, if it exists.

If the DME is using a different frequency, that information will be presented below.

Suggested and Preset tuning is accomplished the same as previously described for COM.

Below the Preset Tuning Line Select Key is an option for toggling the DME HOLD on and off. If DME hold mode is engaged, the center display will change as shown. Additional DME hold annunciations are also displayed in the NAV DATA BLOCK.

Below the DME Hold Line Select Key is the current course associated with the active radio. Pressing the course Line Select Key allows the pilot to change the course in the same manner as in using the NAV/BRG function key.

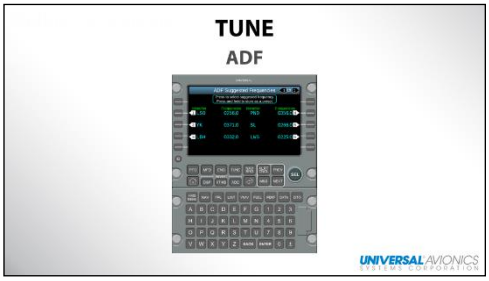
Selecting the NAV Details key will bring up this page.

You have the ability to test your navigation radios and receive diagnostic code reporting.

You can toggle your Marker Sensitivity between low and high.

ADF

Selecting an ADF radio, will display the tuning page controls for that radio. This page is similar to the other radios, but with the addition of two other keys.



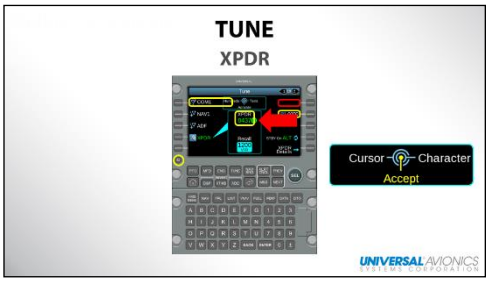
The ADF Mode key gives you the ability to toggle between ADF and Antenna.

You also have the ability to toggle the Beat Frequency Oscillator on and off.

Like the other radios, ADF Details provides for ADF testing as well as suggested and preset frequencies.

XPDR

Selecting XPDR will display the tuning page controls for the active transponder.



The radio block in center displays the active radio frequency.

Preset tuning is accomplished the same as previously described for COM; The FMS does not provide suggested ATC transponder codes.

The transponder mode can be toggled to STANDBY, ON, and ALT. Switching the active transponder will keep all of the other settings the same.

Pressing the Transponder Details Line Select Key will bring up this page.

The operation of Presets Line Select Key is similar to the other radios.

You can set the Transponder TCAS mode selection by toggling between STANDBY, TA ONLY, and TA/RA. If the transponder mode is set to standby or on, these options will be in cyan.

To test the TCAS system, press this Line Select Key.

You have the ability to enter your flight ID. Pressing this Line Select Key enables the pilot to enter the value using either the alphanumeric keyboard or the control knob.

Turning the inner knob will scroll through digits 0 through 9 and letters A through Z in the cursor.

Turning the outer knob will move the cursor left or right.

Pressing the SEL key or the FLIGHT ID Line Select Key will activate the new flight ID. The Flight ID must match what you filed on your flight plan, either your tail number or your call sign, whichever is appropriate.

If the flight ID received from the transponder does not match the programmed flight ID, or if the transponder data is invalid, the ECDU will indicate this by showing the flight ID in yellow.

If ATC requests an ident, press and hold the IDENT key. Pressing the IDENT key will not change your ECDU page, but it will cause the ID annunciator to be displayed on the transponder tune page and the MFD Status Bar.

Self-Assessment Questions

1. The FMS will suggest frequencies based on your location and five different phases of flight. What are the five phases?

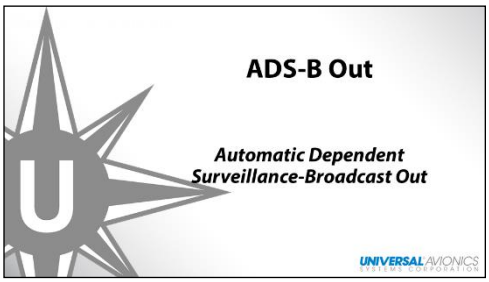
2. How do you select a suggested frequency?

3. What should be entered in the Flight ID field?

4. When entering text in a field, what key do you press to enter a space?

32 ADS-B OUT

Lesson Overview



This lesson covers the basics of ADS-B Out and what to do in the event of an ADSB OUT DEGRADED or ADSB OUT FAIL message.

Learning Objectives

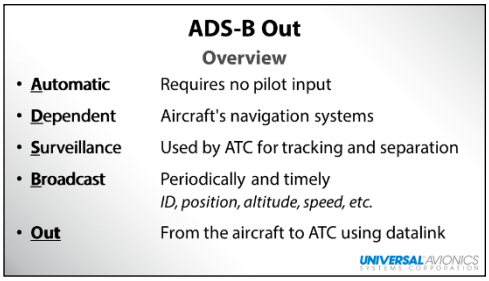
1. Know the steps to take in the event of an ADSB OUT DEGRADED message.
2. Know the steps to take in the event of an ADSB OUT FAIL message.

Examples of Behavior

1. Be able to list the steps taken if the ADS-B is either degraded or fails.

Video Script

Overview



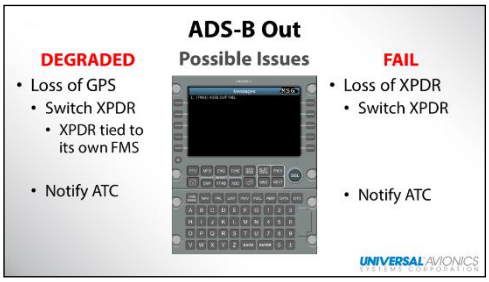
Throughout the world, agencies that govern aviation safety are mandating higher standards for communication, navigation, and surveillance. Examples include the Single European Sky ATM Research project, the United States' NextGen mandate, and many others. ADS-B is one of the technologies designed to meet those mandates.

ADS-B stands for Automatic Dependent Surveillance – Broadcast. As an **automatic** system, it requires no pilot input; it is entirely autonomous. It is **dependent** on the aircraft's navigation systems - specifically satellite navigation. Air Traffic Control uses this information instead of radar to provide **surveillance** for the purpose of tracking and separation standards, which requires the information be **broadcast** in a timely manner.

Broadcast consists of two different services, ADS-B **Out** and ADS-B In. This module only addresses the former.

ADS-B Out periodically broadcasts aircraft identification, position, altitude, velocity and other information through the transponder. It relies on two avionics components - a high-integrity GPS navigation source and a data-link. Your FMS and UniLink are certified in meeting these requirements.

Possible Issues



If the system is autonomous and requires no pilot inputs, what is the point of this module? As with every other automated system on your aircraft, the crew must be able to respond if something goes wrong.

There are two Possible Issues; the system could be degraded or it could fail. Either one will give you a message. Let's look at degradation first. This problem is caused by the loss of satellite data which is most likely caused by equipment failure. If the GPS unit within the FMS has failed, you will also get a GPS FAIL or SBAS FAIL message. In this situation, switching the transponder will likely resolve the issue. That is because the other transponder accesses the other FMS - which has its own GPS.

If the problem is not a GPS failure, but GPS NOT NAV, that means that the GPS is working, but it is not receiving enough satellites to determine a position. Although it could be due to satellite geometry, this is not likely at altitude. It could indicate a problem with your GPS antenna or the cable from the antenna to the GPS card within your FMS. If the problem lies with only one FMS, switching transponders may again resolve the issue.

If there is a GPS FAIL or GPS NOT NAV message for both units, switching the transponder will not resolve the issue.

Please note that it is possible to get the ADSB OUT DEGRADED message before getting a POS UNCERTAIN message because the former has more stringent standards.

If you are unable to resolve the issue, then notify ATC that your GPS position is insufficient to support ADS-B Out.

The other ADS-B problem is a failure. In this situation, it is not the GPS position that is at fault, but the data-link or the transponder. Again, switching transponders may resolve the issue. If it does not, then notify ATC of the issue and your inability to support ADS-B Out.

Self-Assessment Questions

1. If you get both an ADSB OUT DEGRADED and GPS1 FAIL message, what step(s) should you take to resume ADS-B Out service?

2. If you get an ADSB OUT FAIL message, what step(s) should you take to resume ADS-B Out service?

APPENDIX A: ANSWERS TO SELF-ASSESSMENT QUESTIONS

The ECDU

1. Does the ECDU display cautions or warnings?

Answer: The ECDU does not display any caution or warning annunciators; these are only displayed on the InSight display system.

2. What does the icon shown in Figure 1 next to a Line Select Key do?

Answer: Toggle arrows toggle between or among the options listed next to the key.

3. What does it mean when an icon or text is gray?

Answer: The option is not unavailable and/or not selectable.

4. What does a gray X'd icon signify?

Answer: A function that has failed.

5. What does it mean that the ECDU pages loop?

Answer: If you get to the end of a sequence of pages, pressing the NEXT key will transition forward to the first page in the sequence loop. If you are at the beginning of a sequence, pressing the PREV key will transition backward to the last page in the sequence.

6. What does the key in Figure 2 do?

Answer: It allows the pilot to step back through previously viewed InSight display system control pages up to either 10 pages deep, or the last selected FMS page, whichever comes first. Any changes made to the current page will also be undone.

7. You enter a value into the ECDU using the alphanumeric keyboard. The value flashes for about 3 seconds and then returns to the original value. What happened?

Answer: The value entered was outside of the range of acceptable values.

8. How do you turn on the FMS?

Answer: Press any of the FMS function keys on the top row of the ECDU, other than the LIST key, to bring up the FMS POWER CONTROL page. Then, press the Line Select Key 5 Left (POWER-UP THE FMS) which will power up and initialize the FMS. When complete, verify your position, date, and time and then press Line Select Key 5 Left (ACCEPT.)

Secondary Interfaces

1. When the Altitude Preselect is set with an external control, which side is affected?

   Answer: When the Altitude Preselect is set with an external control, it changes the preselected altitude for the entire InSight display system.

2. When using the cursor to select objects, what indication is given if the object is selectable?

   Answer: Scrolling the cursor over map objects such as airways, airspace boundaries, navaids, or airports will cause these items to momentarily change to bold lines.

3. How do you select an item using the cursor?

   Answer: You select these items by clicking on the A button which will open up a pop-up menu or dialog box and slew the cursor to the upper left corner.

4. How do you use the cursor to select a particular item from among several in a group?

   Answer: If you were to click in an area with multiple objects, a pop-up menu will enable you to choose which object you intended. Just scroll to the desired object and click the A button.

5. When using the cursor to interrogate navaids on the MFD, what options are available?

   Answer: Interrogating navaids will allow you to select the frequency directly from the map and push it into the standby frequency location for the appropriate radio. Flight plan operations can also be performed, such as adding them to the flight plan, initiating a direct-to steering leg, or selecting a holding pattern if one is defined for that navaid.

6. What happens if you click the A button in free space on an MFD map?

   Answer: It will enable a menu for creating radar waypoints and performing flight plan operations with them.

7. How do you enable panning mode on a map using the cursor?

   Answer: If the B button of the Cursor Control Panel is clicked anywhere on a map, it will enable a panning mode. To indicate this mode, the cursor shape is changed and the ownship is placed in a cyan circle.

Introduction to the PFD

1. What does the color cyan usually indicate?

   Answer: Cyan is used for among other things, symbol and information types not coupled to flight guidance.

2. What does the color gray usually indicate?

Answer: Gray depicts options, controls, or features that are unavailable due to the flight state or failure.

3. What does the color magenta usually indicate?

Answer: Magenta is used for flight guidance information and symbology and information types that are coupled to flight guidance.

4. What does the color white usually indicate?

Answer: White is used for flight guidance that is available, armed, or not yet active.

Attitude Display Area

1. Using the ECDU Page Map, identify the key presses required to turn Synthetic Vision on or off.

Answer: PFD ► NEXT (or PFD) ► LSK 1L

2. Does the SVS lag or delay in responding to changes in pitch or roll?

Answer: No, the Synthetic Vision System gives an egocentric full-color terrain image of the area in front of the aircraft and responds in real time to changes in aircraft attitude.

3. When using the single-cue aircraft symbol, where is the current pitch indicated?

Answer: The current pitch is at the midpoint between the two chevrons, not at their projected intersection. The pitch ladder is also rolled about this point by the current airplane roll angle. In addition, the pitch scale contains a white horizon line corresponding to zero pitch that runs the entire width of the PFD.

4. Using the ECDU Page Map, identify the key presses required to turn the dual-cue aircraft symbol on.

Answer: PFD ► LSK 3L

5. Which view has the larger pitch range, the blue/brown background or SVS?

Answer: SVS; when synthetic vision is the background, the pitch ladder range will be limited to maintain conformance with the terrain image via an expanded field of view.

6. During unusual attitude conditions, what visually aids the pilot in returning to level flight?

Answer: To aid the pilot in returning to more level flight when in a dive, large red chevrons pointing to the horizon

7. Using the ECDU Page Map, identify the key presses required to turn obstacles on.

Answer: HOME ► NEXT (or HOME) ► LSK 1R

8. When are obstacles displayed on the PFD?

Answer: When the Obstacles option is turned ON and they are greater than 200 feet in height. Obstacles less than 200 feet in height are not shown.

9. What do the obstacle colors mean?

Answer: An obstacle will be displayed in red if its height is greater than 50 feet above the aircraft's current altitude or in yellow if the obstacle's height is between the aircraft's current altitude and the required obstacle clearance value received from TAWS, up to the red color threshold. Otherwise obstacles are displayed in green.

10. What does "SVS INIT" displayed at the top left of the roll index mean?

Answer: The Synthetic Vision System is initializing an SVS INIT annunciator will be.

11. What does "SVS INH" displayed at the top left of the roll index mean?

Answer: Synthetic Vision System has suffered a loss of reference data such as attitude, heading, or position, causing the system to be inhibited.

Annunciators

1. How do you distinguish between traffic advisories and warnings?

Answer: Traffic Advisories are depicted in yellow and warnings are displayed in red.

2. Which takes priority; traffic or terrain alerts?

Answer: In the event of simultaneous traffic and terrain alert annunciators, the terrain annunciator will take priority.

3. When you get a miscompare annunciator, it will flash. How do you stop the flashing?

Answer: These annunciators will flash when triggered and will continue to flash until the pilot presses the Alert Cancel key. This will cause the annunciator to become solid.

4. What does a miscompare mean?

Answer: Miscompares do not mean that the data is incorrect, only that it does not agree with secondarily sensed input data.

5. Your heading is set to magnetic and the co-pilot's is set to true. Your compasses differ by 20°. Will you get a heading comparator alert?

Answer: Heading comparator functions are only active if both heading sources are using the same heading reference; either magnetic or true.

6. Both pilots are using ADC1 for air data. What indications will be shown on the PFD?

Answer: In the event that either pilot's PFD is using a source for air data or attitude other than its normal on-side source, then the annunciator "ADC1" will be displayed left of the PFD

Navigation Display on BOTH pilot's PFDs. Since the co-pilot is also using ADC1, an off-side source for the co-pilot, it is ADC1 – not ADC2 – that is displayed.

7. If ADC2 fails, what will the pilot see indicated on the PFD?

Answer: If all of the inputs for the active primary data source are stale or are flagged as failed, the display using that source will present a red "X" over it to indicate the failure. The co-pilot will see ADC2 with a red X over it, but the pilot will not see any indication on the pilot's PFD.

8. If ECDU1 fails, what will be displayed on the co-pilot's PFD?

Answer: If the InSight display system detects that an ECDU has completely failed, it will annunciate a solid ECDU1 in yellow on both PFDs.

FMA Status Bar

1. Where in the FMA Status Bar is the Autopilot Status Block?

Answer: The far left block of the FMA Status Bar is the Autopilot Status Block.

2. If the autopilot or yaw damper enter a failure condition, what indications are given in the FMA Status Bar?

Answer: If the autopilot enters a failure condition, the AP annunciator will change to white until disengaged. If the yaw damper enters a failure condition, the YD annunciator will change to white until disengaged.

3. How do you identify which flight director (left or right) is coupled?

Answer: Which flight director is coupled (left or right) is indicated by a small green pointer on the side of the "AP" and "YD" annunciators which points to the correct side. In dual channel flight guidance systems that support both channels being coupled (for precision approaches, for example), both left and right coupled arrows will be displayed.

4. Where in the FMA Status Bar is the Lateral Mode Block?

Answer: The second from the left block of the FMA Status Bar is the Flight Guidance Lateral Mode Block.

5. What does each row in the Lateral Mode Block indicate?

Answer: The first row indicates which mode is being used for flight director lateral navigation (magenta on the coupled side / cyan on the uncoupled side). The second row indicates which navigation source is armed for capture to be used for flight director lateral navigation (shown in white to indicate that it has not yet been captured as the active source).

6. What indications are given if the SBAS Level of Service changes to a lower level or to none?

Answer: The LOS annunciator will change to yellow and flash for five seconds before displaying the new LOS annunciator in green. Changing to a higher level of service will simply display the new LOS annunciator in green.

7. What does each row in the Vertical Mode Block indicate?

Answer: The first row indicates which mode is being used for flight director vertical navigation (shown in magenta to indicate that it is coupled to the flight director). The second row indicates which navigation source is armed for capture to be used for flight director vertical navigation (shown in white to indicate that it has not yet been captured as the active source.)

8. MSG is flashing on the PFD indicating a new message? How do you view the message?

Answer: To see the message, the pilot must press the Message key on the ECDU. Once the ECDU message page or pages have been displayed, the MSG annunciator will be removed from the PFD. InSight display system messages are updated dynamically, but FMS messages will not clear until the message page is exited. This is to ensure that FMS messages do not clear until they are viewed. If you were to leave the message page and then return at a later time, new messages will be displayed in white and at the top, whereas old messages that have not cleared will be displayed in green.

Altitude

1. What does "RALT COMP" displayed above the radio altitude indicate?

Answer: Radio altimeter miscompare (on-side and off-side radio altimeters differ by 40 feet for more than 1 second). This annunciator will flash when triggered and will continue to flash until the pilot presses the Alert Cancel key, causing the annunciator to become solid. An annunciated warning, whether flashing or solid, will only be removed when the miscompare condition resolves.

2. What are the indications of an invalid radio altimeter data?

Answer: If invalid radio altitude data is being received, this entire radio altimeter data block is not displayed and the text "RALT FAIL" is displayed in red in its place.

3. What does the symbol in Figure 1 mean on the altimeter strip?

Answer: It is the altitude trend vector which extends from the current altitude window to the altitude that the aircraft is expected to be in 10 seconds, based on current vertical speed. The vector is not shown unless the vertical speed is $\geq$ 200 feet per minute.

4. What is an altitude miscompare?

Answer: It is an annunciator ("ALT COMP") to the left of the ALT SEL window. It indicates that the altitude data does not agree with secondarily sensed input data. (It does not mean that the altitude data is wrong.) It is triggered when both on-side and off-side data are valid, neither display is already annunciating an ALT COMP caution, and the on-side and off-side pressure altitude differ by more than 300 feet for more than 5 seconds. The

annunciator will flash when triggered and will continue to flash until the pilot presses the Alert Cancel, causing the annunciator to become solid. An annunciated caution, whether flashing or solid, will only be removed when the miscompare condition does not exist for more than 1 second.

5. What are the indications of loss of valid altitude data?

Answer: In the event that all means of displaying valid altitude are lost, all indices, numerics, bugs, and colored cues are removed and a red "X" is placed over the Altitude Tape.

6. Using the ECDU Page Map, identify the key presses required to change the barometric pressure from inHg to MB.

Answer: First, change the units to metric: PFD ► LSK 4R [Meters]. Next, change the units from HPA to millibars: HOME ► NEXT (or HOME) ► LSK 5L [Settings] ► NEXT ► LSK 1L [Metric Pressure MB]

7. What is the easiest method to set a standard altimeter setting such as 29.92 inHg?

Answer: Go to PFD page 1 and then press and hold the SEL key in the ECDU knob for a moment. The standard altimeter setting of 29.92 inHg, 1013 hPa, or 1013 mb, depending on the selected units, will automatically be entered.

8. How do you enter an altitude select?

Answer: There are three methods to enter your altitude select. (1) You can dial it using your Reference Select Panel. You can press the Altitude Preselect key on the ECDU, enabling you to use either the ECDU knob or the alphanumeric keyboard. (2) When using the knob, the inner knob changes the Altitude Preselect value in hundreds of feet and the outer knob changes the value in thousands of feet (clockwise to increase). (3) When using the alphanumeric keyboard, you need only enter the Flight Level and then press the ENTER key.

Minimums

1. How do you enter approach minimums for InSight?

Answer: Press HOME ► LSK 4R [Minimums] ► LSK 4R [DA MIN] or LSK 5R [RA MIN] as appropriate. Enter the value using either the alphanumeric keyboard or the ECDU knob.

2. What are the indications you will see as you descend toward your Decision Altitude?

Answer: The DA bug will come into view on the altitude tape when the current barometric altitude is ≤ 1,000 feet above DA. The DA numeric and annunciator will change to yellow when the aircraft's current barometric altitude is ≤ the enabled value, triggering the TAWS to give the MINIMUMS alert. The alert will automatically cancel and the DA value will change back to white when the aircraft transitions to an on-ground condition. Initiating the go-around mode will also cancel the alert, but the DA value won't change back to white until climbing above the DA setting.

3. What are the indications you will see as you descend toward your RA?

Answer: (1) The radio altitude is shown graphically on the Altitude Tape via a yellow and white barber pole that runs from the bottom of the tape scale to the ground elevation. (2) The RA bug will come into view when the barometric altitude is ≤ 1,000 feet above RA. (3) When the RA bug is shown, a yellow band is drawn from the bug to the Ground Altitude. (4) The RA numeric value and annunciator will change to yellow when the aircraft's current barometric altitude is ≤ the enabled value, triggering the MINIMUMS alert. (5) The alert will automatically cancel and the RA value will change back to white when the aircraft transitions to an on-ground condition. Initiating the go-around mode will also cancel the alert, but the RA value won't change back to white until climbing above the RA setting.

4. In Figure 1, what is the altitude associated with A, B, and C? (not the numerical value)

Answer: A is the aircraft's current altitude. B is the radio altitude minimum, commonly reffered to as the Decision Height, and is indicated by the top of the yellow band. C is the runway elevation, which comes from the Nav database. It is the boundary between the yellow barberpole below and the yellow band above.

Airspeed for Part 23 Aircraft

1. What is the indication of an airspeed data input failure?

Answer: The airspeed tape window will be empty and overlaid with a red "X".

2. What does the symbol in Figure 1 mean on the airspeed strip?

Answer: It is the speed trend vector which extends from the current airspeed window to the airspeed on the tape that the aircraft is expected to be in 10 seconds

3. What are the indications that the InSight display system is not receiving valid Fast/Slow data?

Answer: If the InSight display system is not receiving valid Fast/Slow data or its associated signal is invalid, the deviation pointer and scale will be removed and replaced with a failure annunciator. The indicator will automatically resume normal operation once valid data is restored.

4. What is an Airspeed Miscompare?

Answer: It is an annunciator ("ASPD COMP") displayed to the right of the Airspeed Select value. It indicates that the airspeed does not agree with secondary input data; it does not mean that the airspeed data is incorrect. It is triggered if off-side data is valid, neither display has a currently annunciated ASPD COMP caution, the current airspeed is above the minimum configured airspeed, and if the on-side and off-side indicated airspeed differ by more than 10 knots for greater than 5 seconds and will only be removed when the miscompare condition does not exist for greater than 1 second. The annunciator will flash when triggered and will continue to flash until the pilot activates the alert cancel, causing the annunciator to become solid.

5. What are the indications of an airspeed failure?

Answer: In the event that all means of displaying valid airspeed are lost, all indices, numerics, bugs, and colored cues are removed and a red “X” is placed over the Airspeed Tape.

6. What does the red and gray band indicate?

Answer: The Maximum Operating Limit is indicated by an interlaced red and gray band above the VMO/MMO value, which may be a fixed value or a value received from an Air Data Computer.

7. What does the white band indicate?

Answer: The white band indicates the flap operating range, bounded on the top by VS0 and the bottom by VFE.

Airspeed for Part 25 Aircraft

1. What is the indication of an airspeed data input failure?

Answer: The airspeed tape window will be empty and overlaid with a red "X".

2. What does the symbol in Figure 1 mean on the airspeed strip?

Answer: It is the speed trend vector which extends from the current airspeed window to the airspeed on the tape that the aircraft is expected to be in 10 seconds

3. What are the indications that the InSight display system is not receiving valid Fast/Slow data?

Answer: If the InSight display system is not receiving valid Fast/Slow data or its associated signal is invalid, the deviation pointer and scale will be removed and replaced with a failure annunciator. The indicator will automatically resume normal operation once valid data is restored.

4. What is an Airspeed Miscompare?

Answer: It is an annunciator ("ASPD COMP") displayed to the right of the Airspeed Select value. It indicates that the airspeed does not agree with secondary input data; it does not mean that the airspeed data is incorrect. It is triggered if off-side data is valid, neither display has a currently annunciated ASPD COMP caution, the current airspeed is above the minimum configured airspeed, and if the on-side and off-side indicated airspeed differ by more than 10 knots for greater than 5 seconds and will only be removed when the miscompare condition does not exist for greater than 1 second. The annunciator will flash when triggered and will continue to flash until the pilot activates the alert cancel, causing the annunciator to become solid.

5. What are the indications of an airspeed failure?

Answer: In the event that all means of displaying valid airspeed are lost, all indices, numerics, bugs, and colored cues are removed and a red “X” is placed over the Airspeed Tape.

6. What does the red and gray band indicate?

Answer: The Maximum Operating Limit is indicated by an interlaced red and gray band above the VMO/MMO value, which may be a fixed value or a value received from an Air Data Computer.

7. What does the white band indicate?

Answer: The white band indicates the flap operating range, bounded on the top by VS0 and the bottom by VFE.

8. How are low speed conditions displayed on the airspeed tape?

Answer: The InSight display system displays AOA bands that scroll up and down as the normalized AOA changes. The AOA Caution band, depicted by a yellow and black dashed bar, ranges from the configured Stall Warning/Stick Shaker value to the configured Stall/Stick Pusher Activation value. The AOA Warning band, depicted by a red and black dashed bar, is bounded on the top by the configured Stall/Stick Pusher Activation value and extends to the bottom of the tape. Both the AOA Caution and Warning bands are dynamic and positioned such that the current airspeed pointer also points to the current normalized AOA. The airspeed window and digital value will match the current AOA band's color.

9. How does the Fast/Slow indicator show airspeed deviations?

Answer: The Fast/Slow deviation pointer moves up and down the scale relative to the deviation from the reference AOA (which takes into account the flaps configuration) such that: (1) The deviation pointer will deflect to the fast side of the scale when the input data indicates that the aircraft is below the reference AOA and (2) it will deflect to the slow side of the scale when the aircraft is above the reference AOA.

Vertical Speed Indicator

1. According to Figure 1, what is the current vertical speed?

Answer: +4200 fpm

2. According to Figure 2, what is the TCAS RA "fly to" zone?

Answer: -500 to -1,000 fpm

3. What are the indications of lost or invalid vertical speed?

Answer: All indices, numerics, bugs, and colored cues are removed and a red “X” is placed over the VSI.

Deviation Indicators

1. The shape of the vertical and lateral deviation pointers are dependent upon what source is being used for deviation. Short range navigation sources such as an ILS are depicted by a _____-shaped pointer. Long range navigation sources such as an FMS are depicted by a _____-shaped pointer.

Answer: triangular, cross

2. What do the cyan, magenta, and white colors mean for the deviation pointers?

Answer: When an on-side data source for vertical deviation is selected and valid, with the Flight Director not active, or is armed but has not yet captured the source, the display pointer is cyan. When the Flight Director captures the source, the pointer changes to magenta. In all cases, if the vertical deviation is coming from an off-side source, the pointer is white.

3. What are the indications that vertical deviation data is lost?

Answer: If invalid deviation data is received, the pointer and scale value are removed and a yellow glideslope failure flag will be placed over the zero reference mark. During an approach, the pointer and scale value are removed and a yellow "VNV" failure flag will be placed over the zero reference mark to indicate that the pilot should initiate a missed approach.

4. If the source for lateral deviation is a VOR, each dot represents _____ deviation from centerline.

Answer: 5°

5. What are the indications that the deviation source has failed?

Answer: The pointer and scale value are removed and a yellow NAV failure flag will be placed over the zero reference mark.

6. An ANP/RNP scale may be displayed when FMS operation indicates a Required Navigation Performance segment or procedure is being flown and is represented by a composite symbol consisting of a vertical pointer and horizontal band. How is this symbol interpreted?

Answer: The displacement, left or right of the vertical deviation pointer indicates cross-track. The width of the band, as measured from its center, indicates the ANP.

Data Blocks

1. According to Figure 1, label each of the data blocks.

Answer:
A: Primary Nav Data Block
B: Primary Bearing Data Block
C: Secondary Bearing Data Block
D: Secondary Nav Data Block

2. What data is contained in each row of the Navigation Data Blocks?

Answer: The first row indicates the navigation source identifier by name (such as FMS) followed by a representation of the head of the course pointer.

For LRN sources, the second row indicates the next waypoint identifier. If the FMS is flying a heading instead of to a waypoint, then the word VECTOR will be shown.

The third row indicates distance to the next waypoint. If the current leg is a vector, then a constant distance of 20 nautical miles will be shown.

The fourth row indicates the ANP value if provided by the LRN. If ANP is not provided by the LRN, then the fourth row indicates the desired track in ° when in magnetic or °T when in true.

The fifth row indicates the cross-track in nautical miles.

3. Using the ECDU page map, change the secondary bearing source to ADF.

Answer: NAV/BRG ► NEXT (or NAV/BRG) ► LSK 1R (continue pressing until ADF is selected)

PFD Nav Display Transfer

1. What does the symbol in Figure 1 mean?

Answer: All sources of valid heading are lost

2. Identify each of the pointers in Figure 2.

Answer: A: Primary navigation pointer
B: Secondary navigation pointer
C: Primary bearing pointer
D: Secondary bearing pointer

3. Using the ECDU map, how do you display the winds on the PFD in component format?

Answer: PFD ► NEXT (or PFD) ► LSK 5R (continue pressing until XY is selected)

Manual Navigation Source Transfer

1. List the steps to execute a source transfer when flying an approach.

Answer: Turn to final, NAV/BRG ► LSK 5L (Source Transfer), Set flight director to APPR Mode

2. List the steps to execute a source transfer when flying a missed approach.

Answer: NAV ► LSK 3R (MISSED APPR) ► NAV/BRG ► LSK 5L (Source Transfer), Set flight director to NAV Mode

3. What is the function of the Source Transfer function?

Answer: Provide an efficient and simplified method of transferring navigation between the primary and secondary navigation sources.

CAT II Operations

1. What are the CAT II excessive deviation limits?

Answer: Localizer deviation ±1/3 dot, Glideslope deviation ±1 dot, Airspeed > +10 kts or < -5 kts.

2. You see the indications shown in Figure 1 on your airspeed indicator. What does it mean?

Answer: You are currently more than 5 knots too slow in relation to VREF and need to increase your airspeed.

Introduction to the MFD

1. After turning the MFD on, what must you first do?

Answer: If the MFD has just powered up, it will display the Database Status page and no other MFD controls will be available. Review the system status and then press the Accept Line Select Key to access the rest of the MFD capabilities

2. Where is the TAWS status displayed on the MFD Status Bar?

Answer: Column 5

3. Where is the TCAS data displayed on the MFD Status Bar?

Answer: Column 2, middle row.

Engine Data

1. What do the colors red, yellow, green, and white mean on the engine display?

Answer: Every parameter except fuel flow is also assigned normal, caution, and warning ranges (color coded as green, yellow, and red respectively). The tape and numerical value will color match the caution or warning region providing an annunciator to the pilot. All tape and numerical values within normal parameters are displayed in white.

2. Using the ECDU page map, how would you set the Fan Bug to 97.5%

Answer: ENG ► LSK 3L (until Manual is selected) ► ECDU Outer Knob (rotate CW until 97%) ► ECDU Inner Knob (rotate CW until 97.5%)

3. Using the ECDU page map, what steps would you take if your EIU failed?

Answer: ENG ► LSK 2R (select the working EIU)

The Map Display

1. Using the ECDU page map, display airports with METAR symbology.

Answer: MFD (until Map is selected) ► LSK 3L (until On is selected) ► HOME ► NEXT (or HOME) ► LSK 2L (until Graphical METARS is On)

2. How would you use the cursor to turn high airways on?

Answer: Place the cursor over the airway icon at the bottom of the MFD and press the A button until the J1 symbol appeared.

3. You notice on your MFD map that you are approach airspace boundaries. How do you determine its altitude range?

   Answer: Place the cursor on a border of the airspace and then click the A button.

4. How do you locate a fix using the Waypoint Search function?

   Answer: MFD (until Map is selected) ► LSK 2L (Waypoint Search) ► LSK 1L (until FIX is selected) ► LSK 2L - 5L (as appropriate) ► ANK (type in the fix name) ► ENTER (or SEL)

Traffic

1. Using the ECDU page map, display traffic on the MFD map.

   Answer: MFD (until Map is selected) ► LSK 3R (until Traffic On)

2. Using the ECDU page map, set the altitude filtering so that all traffic between 2700 feet below to 9,000 feet above your aircraft is displayed.

   Answer: HOME ► LSK 3l (Traffic) ► LSK 2R (until AB is selected)

3. What does the symbol in Figure 1 mean?

   Answer: There is a Traffic Advisory (yellow text and circle) that is 8,000' (80) above (+) you and is climbing (arrow).

Weather

1. Most map overlays can be displayed with weather. Which one cannot?

   Answer: The terrain depiction is mutually exclusive with the weather display.

Universal TAWS Terrain

1. If the TAWS colors is not toggled ON, will you still get terrain alerts?

   Answer: Yes. When the TAWS Colors is set to Alert Only, the red and yellow alert colors are shown when TAWS triggers an alert. When set to On, the colors will be displayed full time.

2. Will turning away from terrain eliminate a terrain alert?

   Answer: Resolving the terrain alert by climbing or turning away from the terrain may resolve the issue, but it will not eliminate the alert. To do so, you will need to press the alert cancel key to acknowledge the alert and remove the inset window.

3. Using the ECDU page map, set the TAWS colors to Alert Only.

   Answer: HOME ► NEXT (or HOME) ► LSK 3L (until Alert Only is selected)

Other MFD Displays

1. Should the 3D Map view be used for course guidance?

   Answer: No. Due to parallax error, you may appear off course in 3D map when in fact you are not. This display is intended to provide situational awareness, not course deviation data.

2. Using the ECDU page map, how do you display a 3D display with a below/directly behind perspective?

   Answer: MFD ► LSK 1L (until 3D Map is selected) ► LSK 4R ► Outer knob CCW (as required)

3. Using the Waypoint Search function, you locate a potential divert airport. How do you get the weather?

   Answer: From MFD page 1, press LSK 3L for the airport menu. Then, using either the rotary knob or the cursor, select the WX tab.

4. How do you determine the remaining runway length using the MFD chart display?

   Answer: Scroll the cursor over the appropriate location of the runway and then click the A button.

Insets

1. Can you turn the Inset displays off on the PFD and MFD?

   Answer: You can turn them off for the MFD (MFD pg. 1, LSK 4L), but not for the PFD.

2. What is required in order for the FPL Stat to display fuel and weight?

   Answer: A flight plan and a performance database.

3. Using the ECDU map, set the left inset to map with both Weather Radar and Traffic on.

   Answer: PFD ► LSK 5L (Left Inset) ► LSK 1L (until Map is selected) ► LSK 1R (until Wx Rdr is selected) ► LSK 3R (until Traffic is on).

Layouts

1. How many layouts can be created?

   Answer: Five layouts per pilot, including modified Takeoff and Landing layouts plus three additional layouts.

2. Can the Takeoff layout be deleted?

   Answer: No, but a modified Takeoff layout can be deleted, leaving the default Takeoff layout in its place.

3. Using the ECDU page map, enter your name as a pilot profile.

Answer: HOME ► NEXT (or HOME) ► LSK 5L (Settings) ► ENTER (or SEL) ► LSK 5R (Save) ► (type in your name using a maximum of 10 characters) ► ENTER (or SEL) ► ENTER (or SEL).

Display Reversion

1. How do you change your MFD into a PFD if your primary PFD fails?

   Answer: Press the DISP key.

2. How do you cancel this change?

   Answer: Press the DISP key again or LSK 5L (Cancel Revert) prior to the end of the countdown. Once the countdown expires and the MFD is functioning as a PFD, then you must press the DISP key to cancel the change.

3. What are the limitations to functionality of the MFD in reversionary display?

   Answer: None. It will assume all PFD display function such as formats, annunciators, inputs, and outputs for as long as it is in reversionary mode. The means of control and the available formats will be the same as for the PFD. No formats are restricted on a reverted display and off-side control is still possible if an off-side ECDU or external control panels are present and functional.

Equipment Reversion

1. The pilot's primary air data source is ADC1. How does the pilot select ADC2 for air data?

   Answer: The pilot should press the ADC key.

2. Pressing the AT/HD will cycle through available attitude and heading sources. In general, what is the sequence of sources?

   Answer: The on-side source, the off-side source, the tertiary source.

The HOME Pages

1. When does the Departure Data become Arrival Data?

   Answer: When airborne and no longer on the departure procedure.

2. How dim must you set the MFD lighting for charts to be displayed in night mode?

   Answer: 70.

3. What does Frequency Wrapping On do?

   Answer: With frequency wrapping on, when dialing a frequency, the ECDU will not stop at the radio's maximum frequency, but will return to the minimum with continued clockwise turns.

4. Using the ECDU page map, how would you load the Terrain database?

Answer: HOME ► NEXT (or HOME) ► LSK 4R (System Status) ► LSK 4K (Database Control) ► LSK 3L (Terrain) ► (Use the rotary knob to select the desired database) ► ENTER (or SEL) ► LSK 3R (Start Update) ► ENTER (or SEL) ACCEPT (to continue with the update).

The TUNE Pages

1. The FMS will suggest frequencies based on your location and five different phases of flight. What are the five phases?

Answer: Pre-departure, Departure, Enroute, Approach, and Ground

2. How do you select a suggested frequency?

Answer: Method 1: From the appropriate radio page, press LSK 1R and then rotate the control knob which will cycle through the six suggested frequencies. When the appropriate frequency is highlighted, press the SEL key.
Method 2: From the appropriate radio page, press LSK 5R (Details), LSK 1R (Suggested), and then select the appropriate frequency by pressing its LSK.

3. What should be entered in the Flight ID field?

Answer: The Flight ID must match what you filed on your flight plan, either your tail number or your call sign, whichever is appropriate.

4. When entering text in a field, what key do you press to enter a space?

Answer: Use the +/- key.

ADS-B Operations

1. If you get both an ADSB OUT DEGRADED and GPS1 FAIL message, what step(s) should you take to resume ADS-B Out service?

Answer: Switch to the other transponder which accesses the other FMS, and therefore, the other GPS. If this does not resolve the issue, then notify ATC of the problem.

2. If you get an ADSB OUT FAIL message, what step(s) should you take to resume ADS-B Out service?

Answer: Switch to the other transponder. If this does not resolve the issue, then notify ATC of the problem.

APPENDIX B: GLOSSARY

AB .....ABOVE mode. An annunciator on the ECDU/HOME/TRAFFIC Options page signifying the traffic altitude filtering mode is set to ABOVE. In the ABOVE mode, all traffic between -2,700 and +9,000' relative altitude will be shown. The annunciator will also appear in the TCAS information box of any map display where Targets is enabled.

AC .....Advisory Circular. A type of publication offered by the Federal Aviation Administration to provide guidance for compliance with airworthiness, pilot certification, operational standards, training standards, and any other rules within the 14 CFR Aeronautics and Space Title. They define acceptable means of accomplishing or showing compliance with airworthiness regulations.

ADC .....Air Data Computer. (1) An annunciator (followed by its numerical designation) in the lower left main display area of the PFD indicating the primary source for air data when other than its normal on-side source. (2) The label of the ADC Revert Key on the second row of the ECDU which cycles through available air data computer sources available to that side.

AGL .....Above Ground Level. Altitude that is measured Above Ground Level.

AHRS .....Attitude Heading Reference System. An annunciator (followed by its numerical designation) in the lower left main display area of the PFD indicating the primary source for attitude when other than its normal on-side source.

AHRS ALIGN .....Attitude Heading Reference System Alignment. An annunciator on the PFD when a Universal AHS-525 AHRS is put into in-flight alignment mode.

AIL .....Aileron. An autopilot warning annunciator in the upper left area of the PFD main display that indicates the aileron is out of trim.

AIRMET .....Airmen's Meteorological Information. A concise description of weather phenomena that are occurring or may occur along an air route that may affect aircraft safety.

ALRT CNCL .....Alert Cancel. A key on top row of the ECDU used to cancel an alert on the PFD.

ALT .....Altitude. (1) A distance measurement, usually in the vertical, between a reference point and another point or object. (2) An abbreviation on both the TUNE/XPDR page1 and the MFD Status Bar indicating the pilot has selected the ALT (Mode-C) setting for the transponder.

ALT COMP .....Altitude Miscompare. An annunciator on the PFD next to the ASEL value that indicates barometric altitude information does not agree with secondarily sensed input data.

AMLCD .....Active Matrix Liquid Crystal Display.

ANK .....Alphanumeric Keyboard.

ANP.....Actual Navigation Performance. A measurement of the current performance of a navigation system's accuracy, usually measured in nautical miles.

ANT .....Antenna. An annunciation in the Bearing Data Blocks indicating that the pilot has selected Antenna as the ADF mode on TUNE/ADF page 1.

AOA.....Angle of Attack. The AOA indicator is displayed on the left side of the attitude display area, to the right of the airspeed tape, and contains both Caution and Warning zones.

ARINC .....Aeronautical Radio Inc. A standardized data interface format such as ARINC-429 Data Bus, named after the company that developed the standards.

ASEL.....Selected Altitude.

ASPD COMP .....Airspeed Miscompare. An annunciator on the PFD that indicates airspeed information does not agree with secondarily sensed input data.

AT/HD .....Attitude/Heading. The label of the Attitude Heading Revert Key. Successive presses of the AT/HD revert key on an ECDU will sequence through the available AT/HD sources for that cockpit side. The general order for each side is to sequence through its on-side source, its off-side source, and a tertiary source if configured.

ATC.....Air Traffic Control. (1) An annunciator in Column 2 of the MFD's Status Bar that indicates ATC code and ID.

ATC MSG.....Air Traffic Control Message. An annunciator found in the FMA Status Bar far right field that indicates the UniLink has received a CPDLC message from ATC.

ATT.....Attitude. An annunciator overlaying the aircraft symbol indicating a full attitude failure (both pitch and roll), such as losing a digital AHRS or IRS.

ATT COMP .....Attitude Miscompare. An annunciator that indicates the full attitude display does not agree with secondarily sensed input data.

BFO.....Beat Frequency Oscillation. (1) A mode of the ADF, which can be toggled ON or OFF on TUNE/ADF page 1. (2) An annunciator on the fourth line of the Bearing Data Block indicating the Beat Frequency Oscillation mode of the ADF has been toggled ON.

BL .....Below Mode. An annunciator on the ECDU/HOME/TRAFFIC Options page signifying the traffic altitude filtering mode is set to BELOW. In the BELOW mode, all traffic between -9,000 and +2,700 feet relative altitude will be shown. The annunciator will also appear in the TCAS information box of any map display where Targets is enabled.

BRG .....Bearing.

CAT.....Category. A method to rate instrument approaches (CAT I, CAT II, & CAT III) .

CCP.....Cursor Control Panel. An external device used to drive the cursor for MFD Map functions.

CDU .....Control Display Unit.

COM .....Communication. An annunciator for communication radio. When referring to a specific radio, the number will follow (COM1 or COM2).

CPDLC.....Controller-Pilot Data Link Communications. A method by which air traffic controllers can communicate with pilots over a datalink system.

CRS .....Course.

CRZ.....Cruise. An annunciator in the second column of the MFD Status Bar and Cruise. If the airspeed is > V2, the N1 or Fan performance data will be displayed as climb (CLB) in column 1 and cruise (CRZ) in column 2.

CSDB .....Commercial Standard Data Bus. A type of unidirectional asynchronous bus data interface format such as ADC-86 CSDB bus.

DA.....Decision Altitude. (1) A specified altitude or height on approach with vertical guidance at which a Missed Approach must be initiated if the reference required to continue the approach has not been established. (2) An annunciator shown on the PFD when a Decision Altitude has been set as a minimum. (3) An annunciated bug on the altimeter tape that comes into view when the current baro altitude ≤ 1,000' above DA (i.e., the bug comes within the scale range) . (4) A label on FMS NAV page 1 during approaches that indicates the current Drift Angle.

DCU II .....Data Concentrator Unit II. the Model 4310 Data Concentrator Unit which acts as expansion ports for the InSight display system providing a large number of digital and discrete input/output ports under the control of the PFD and MFD. Based on the installation designer's configuration, DCU inputs from external systems may be processed by one or more of the displays, while DCU outputs may be sourced from one or more displays.

DEST.....Destination. A field on the fourth row of the Flight Plan Status block that indicates flight plan information regarding the destination, including the destination name, distance to go, time to go, estimated fuel and weight overhead.

DG MODE .....Directional Gyro Mode. The annunciator DG MODE will appear above the compass heading of the PFD Navigation Display when in directional gyro mode.

DGVG .....Direction Gyro/Vertical Gyro. An annunciator (followed by its numerical designation) in the lower left main display area of the PFD indicating the primary source for attitude when other than its normal on-side source.

DISP .....Display. A key on the ECDU used for Display Reversion.

DME.....Distance Measuring Equipment.

DMEH.....DME-Hold. An annunciator shown in the Navigation Data Blocks and Bearing Data Blocks to indicate the DME is in the HOLD mode.

DR .....Dead Reckoning. An annunciator shown in the lower left corner of the PFD main display indicating that navigation is in Dead Reckoning mode.

DTO .....Direct-To. A dedicated function key on the ECDU that enables a pilot to access the FMS DTO page to select navigation direct to a waypoint.

ECDU.....Electronic Control Display Unit.

EFIS .....Electronic Flight Instrument System.

EGPWS.....Enhanced Ground Proximity Warning System. A system developed by Honeywell that uses aircraft inputs such as position, altitude, airspeed and glideslope, along with databases, to predict potential conflicts between the aircraft's flight path and terrain.

EIU.....Engine Interface Unit. (1) A sensor that provides digital engine data from all engine sensors to the InSight display system. (2) An annunciator on the Engine Display that indicates which EIU is used for source data, either EIU1 or EIU2, by drawing a green box around it.

ELEV .....Elevator. An autopilot warning annunciator in the upper left area of the PFD main display that indicates the elevator is out of trim.

ENG .....Engine. A dedicated function key on the ECDU that enables a pilot to access the Engine Display page.

ETA.....Estimated Time of Arrival. A field label in column 4 of the MFD Status Bar that indicates the estimated time of arrival to the destination in hours and minutes.

EXP.....Expanded Mode. An annunciator on the ECDU/HOME/TRAFFIC Options page signifying the traffic altitude filtering mode is set to EXPANDED. In the EXPANDED mode, all traffic between -9,000 and +9,000 feet relative altitude will be shown. The annunciator will also appear in the TCAS information box of any map display where Targets is enabled.

F/S.....Fast/Slow. An annunciator indicating that the InSight display system is not receiving valid fast/slow data or its associated valid signal (if applicable) is invalid.

FD .....Flight Director. An annunciator for Flight Director.

FDD.....Functional Design Description.

FGS .....Flight Guidance System.

FLOC .....FMS Localizer.

FMA.....Flight Mode Annunciations. A status bar at the top of the PFD consisting of five 2-row blocks of flight guidance and FMS information. Displays include the Autopilot Status Block, Flight Guidance Lateral Mode block, FMS Nav Data Block, Flight Guidance Vertical Mode block, and Message annunciators.

FMS.....Flight Management System. A specialized computer system that automates in-flight tasks to decrease the workload of flight crew.

FMSPGS .....FMS Pseudo Glide Slope.

FMSPLOC .....FMS Pseudo Localizer.

FP .....Flight Path.

FPL.....Flight Plan. A dedicated function key on the ECDU that enables a pilot to select the FMS flight planning pages.

FPL STAT.....Flight Plan Status. One of the displays available to the MFD main display and the PFD/MFD Inset displays.

FPM.....Flight Path Marker. The FPM shows the real-time linear trajectory of the aircraft on the attitude display when configured and selected. The flight path marker indicates the current path of the aircraft but does not predict the future path. Like the track angle and flight path angle from which its position is derived, the flight path marker will lag during dynamic maneuvers.

GLS .....GPS Landing System. A system allowing a GPS precision approach by using differentially corrected satellite data.

GPS .....Global Positioning System. The US space-based satellite navigation system that provides location and time information.

GPWS .....Ground Proximity Warning System. (1) One of the modes used by the Universal TAWS. (2) An annunciator GPWS INOP is shown on the right side of the display if the TAWS system is in this mode.

GS .....Glideslope.

GS .....Ground Speed.

HDG.....Heading. (1) An annunciator in the current heading window that indicates all sources of valid heading are lost. (2) An annunciator on the MAP display at the aircraft position that indicates heading information is lost but the position is still known from a long range navigation source.

HDG COMP.....Heading Miscompare. An annunciator that indicates heading information does not agree with secondarily sensed input data.

HPA.....Hectopascals (also abbreviated as hPa). A metric unit of measurement for barometric air pressure. One hectopascal is equivalent to one millibar.

HSI .....Horizontal Situation Indicator. The InSight display system PFD Navigation Display depiction provides all the normal features and symbology of a traditional HSI, but aligns it with the three-dimensional view of the terrain.

IAS .....Indicated Air Speed.

ICAO.....International Civil Aviation Organization. The International Civil Aviation Organization. It is a specialized agency of the United Nations that codifies the principles and techniques of international air navigation and fosters the planning and development of international air transport to ensure safe and orderly growth.

IGN .....Ignition. An annunciator that is shown below the TURB% values and indicates that the ignition select switch is active for that engine.

IM.....Inner Marker. An annunciator displayed in the middle of the pitch scale that indicates the aircraft has intercepted the Inner Marker beacon during an approach.

IN .....Inches. Shown in the altimeter setting field of the PFD whenever inches mercury (in Hg) is selected as the unit of measurement for barometric pressure.

INOP .....Inoperative.

INS .....Inertial Navigation System. A self-contained navigation system using an IRS and with a pilot interface allowing a limited number of waypoints to be entered and basic navigation information to be displayed.

INTEG.....Integrity. An annunciator shown in the lower left corner of the PFD main display indicating that the FMS has determined that GPS Integrity has failed.

IRS .....Inertial Reference System. An annunciator (followed by its numerical designation) in the lower left main display area of the PFD indicating the primary source for attitude when other than its normal on-side source.

ISA .....International Standard Atmosphere. An atmospheric model of how the pressure, temperature, density, and viscosity of the Earth's atmosphere change over a wide range of altitudes or elevations.

ITT .....Interstage Turbine Temperature. The temperature of the exhaust gases between the high pressure and the low pressure turbines. The gas temperature is measured by a number of thermocouples mounted in the exhaust stream and is presented on the InSight display system in either °F or °C.

KIAS .....Knots Indicated Air Speed.

LAM.....Low Altitude Mode.

LCD.....Liquid Crystal Display.

LOC.....Localizer. The lateral component of the ILS for the runway centerline.

LOS .....Level of Service.

LP.....Localizer Performance without vertical guidance.

LPV .....Localizer Performance with Vertical guidance.

LRN.....Long Range Navigation.

LSK .....Line Select Key.

LVL.....Level.

MB .....Millibars.

METAR.....Meteorological Terminal Aviation Routine Weather Report or Meteorological Aerodrome Report.

MFD.....Multi-Function Display.

MHz .....Megahertz. One million hertz (one million cycles per second).

MIN.....Minutes.

MLSA .....Manual Low Speed Awareness.

MM .....Middle Marker. An annunciator displayed in the middle of the pitch scale that indicates the aircraft has intercepted the Middle Marker beacon during an approach.

MOAs.....Military Operations Area. "Airspace established outside Class A airspace to separate or segregate certain nonhazardous military activities from IFR Traffic and to identify for VFR traffic where these activities are conducted." (14 CFR §1.1, U.S.A.) .

MOPS.....Minimum Operational Performance Standards. Standards for specific equipment useful to designers, manufacturers, installers and users of the equipment. MOPS provide the information needed to understand the rationale for equipment characteristics and requirements stated, describe typical equipment applications and operational goals, and establish the basis for required performance under the standard.

MSG.....Message. An annunciator that indicates there is a new FMS message that requires pilot attention.

MTRIM.....Mach Trim. An autopilot warning annunciator in the upper right area of the PFD main display that indicates the Mach trim system has failed.

Nav.....Navigation.

NDB .....Non-Directional Beacon.

NEXRAD.....Next Generation Radar. A network of 159 high-resolution S-band Doppler weather radars operated by the National Weather Service, the FAA, and the U.S. Air Force. Its technical name is Weather Surveillance Radar, 1988, Doppler (WSR-88D).

NM .....Nautical Miles.

NORM.....Normal Mode. An annunciator on the ECDU/HOME/TRAFFIC Options page signifying the traffic altitude filtering mode is set to NORMAL. In the NORMAL mode, all traffic between -2,700 and +2,700 feet relative altitude will be shown. The annunciator will also appear in the TCAS information box of any map display where Targets is enabled.

NVIS .....Night Vision.

NVRAM.....Non-Volatile RAM. Independently power protected computer memory.

NX.....Next.

OM.....Outer Marker. An annunciator displayed in the middle of the pitch scale that indicates the aircraft has intercepted the Outer Marker beacon during an approach.

PFD.....Primary Flight Display.

PGS.....Pseudo-Glideslope.

PITCH.....Pitch Failure. An annunciator overlaying the aircraft symbol indicating the loss of pitch information.

PITCH COMP.....Pitch Miscompare. An annunciator that indicates the pitch information does not agree with secondarily sensed input data.

PLOC.....FMS Pseudo-Localizer.

POS.....Position. An annunciator shown in the lower left corner of the PFD main display indicating that the FMS has determined that the FMS position is uncertain.

PPH.....Pounds per Hour. Used to measure the rate of fuel flow.

PREV.....Previous.

PSA CAP.....Altitude Preselect Capture.

PSI.....Pounds per Square Inch.

R/T.....Receive/Transmit.

RA.....Radio Altitude minimum.

RALT.....Radar Altimeter or Radio Altimeter.

RALT COMP.....Radio Altitude Miscompare. Radio altitude data does not agree with secondarily sensed input data.

RCL.....Recall.

Rdr.....Radar.

REV.....Reversionary.

RF.....Radio Frequency.

RGBS.....Red Green Blue Sync. A type of analog video that uses four signals/cables (red, green, blue, sync) where the sync is separated onto its own cable.

RNP.....Required Navigational Performance. A type of performance-based navigation (PBN) that allows an aircraft to fly a specific path between two 3D-defined points in space. RNP also refers to the level of performance required for a specific procedure or a specific block of airspace.

ROC .....Required Obstacle Clearance.

ROLL .....Roll Failure. An annunciator overlaying the aircraft symbol indicating the loss of roll information.

ROLL COMP.....Roll Miscompare. An annunciator that indicates roll information does not agree with secondarily sensed input data.

RPM .....Rotations per Minute.

RSB .....Radio Serial Bus.

RUD .....Rudder. An autopilot warning annunciator in the upper left area of the PFD main display that indicates the rudder is out of trim.

RVSM .....Reduced Vertical Separation Minimum. The reduction of the standard vertical separation required between aircraft flying between FL290 and FL410 inclusive, from 2,000 feet to 1,000 feet.

SAT .....Static Air Temperature. The temperature of the air around an aircraft, unaffected by the passage of the aircraft through it.

SCITS.....Storm Cell Identification and Tracking.

SD .....Secure Digital.

SEL .....Select.

SIGMET.....Significant Meteorological Information. A weather advisory containing meteorological information concerning the safety of aircraft.

SPD .....Speed. The rate of change of distance with time.

SRD.....Software Requirements Document.

SRN.....Short Range Navigation.

SRS .....System Requirements Specification.

STAB .....Stabilizer.

STBY .....Standby.

STD.....Standard.

SUAS .....Special Use Airspace. An area designated for operations of a nature such that limitations may be imposed on aircraft not participating in those operations. Often these operations are of a military nature.

SVP .....Synthetic Vision Processor.

SVS .....Synthetic Vision System.

SVS INH .....Synthetic Vision System Inhibited. An annunciator displayed at the top left of the roll index indicates that the Synthetic Vision System is inhibited because of loss of reference data such as attitude, heading, or position.

SXTK .....Selected Cross-Track.

SYN.....Synchronized.

SYNC.....Synchronization Steering.

T/O .....Take-Off.

TA .....Traffic Advisory.

TA/RA.....Traffic Advisory/Resolution Advisory.

TAF .....Terminal Aerodrome Forecast. A format for reporting weather forecast information, particularly as it relates to aviation.

TAS .....True Airspeed. The speed of the aircraft relative to the air mass in which it is flying.

TAT.....Total Air Temperature.

TAWS .....Terrain Awareness and Warning System.

TCAS .....Traffic Alert and Collision Avoidance System. An aircraft collision avoidance system designed to reduce the incidence of mid-air collisions between aircraft.

TCAS II.....Traffic Alert and Collision Avoidance System II.

TCS .....Touch Control Steering.

TERR .....Terrain.

TERR INH .....Terrain Inhibited. An annunciator displayed on the right side of the MFD Status Bar in gray if the terrain system has been inhibited.

TFC .....Traffic.

TGT.....Target.

TRB.....Turbulence.

TRIM.....Pitch Trim. An autopilot warning annunciator in the upper right area of the PFD main display that indicates the trim system has failed for either pitch or yaw.

TSO .....Technical Standard Order. The minimum performance standard issued by FAA for specified materials, parts, processes, and appliances used on civil aircraft. Articles with TSO design approval are eligible for use on the United States type certified products.

TST .....Test.

TURB.....Turbulence.

TX .....Transmit.

UASC.....Universal Avionics Systems Corporation.

VALT.....Vertical Altitude.

UTC.....Coordinated Universal Time. The primary time standard by which the world regulates clocks and time.

VERT .....Vertical.

VFLC .....VNAV Flight Level Change.

VFR.....Visual Flight Rules.

VHF.....Very High Frequency. The range of radio frequency electromagnetic waves from 30 MHz to 300 MHz, with corresponding wavelengths of one to ten meters.

VNAV .....Vertical Navigation.

VNAV/ASEL.....FMS Vertical Nav Mode and ASEL active.

VOR .....VHF Omni-directional Radio. A type of short-range radio navigation system for aircraft, enabling aircraft to determine their position and stay on course by receiving radio signals transmitted by a network of fixed ground radio beacons. It uses frequencies in the very high frequency (VHF) band from 108 to 117.95 MHz.

VORTAC .....VOR/TACAN. A navigational aid for aircraft pilots consisting of a co-located VHF omni-directional range (VOR) beacon and a tactical air navigation system (TACAN) beacon.

VP .....Vertical Profile.

VS .....Vertical Speed.

VSI .....Vertical Speed Indicator.

VSPEEDS .....Standard terms used to define airspeeds important or useful to the operation of all aircraft. These speeds are derived from data obtained by aircraft designers and manufacturers during flight testing and verified in most countries by government flight inspectors during aircraft type-certification testing. Using them is considered a best practice to maximize aviation safety, aircraft performance or both. The actual speeds represented by these designators are specific to a particular model of aircraft.

V_1 .....The maximum speed in the takeoff roll at which the pilot must take the first action to stop the airplane within the accelerate-stop distance. This speed is represented by a speed bug.

V_2 .....Takeoff safety speed represented by a speed bug.

V_{APP}.....Approach speed represented by a fixed labeled tick.

V_{ENR} .....Enroute speed represented by a fixed labeled tick.

V_{FE}.....Maximum flap extended speed, top of the white band represented by a tape color band boundary.

V_{FE1} .....Approach flaps represented by a fixed labeled white tick.

V_{LE} .....Maximum landing gear extended speed represented by a fixed labeled dark magenta tick.

V_{LO} .....Maximum landing gear operating speed. This speed is represented by a fixed labeled light brown tick.

V_{MAX} .....Maximum safe speed based on bank angle for an RF flight plan leg represented by a speed bug.

V_{MC} .....Minimum control speed with the critical engine inoperative represented by a fixed labeled red tick.

V_{MO}/M_{MO} .....Maximum operating limit speed, upper boundary of the high speed caution band represented by a tape color band boundary.

$V_{MO\text{-}CAUTION}$ .....Lower boundary of high speed caution band represented by a tape color band boundary.

V_{NE} .....Maximum operating limit speed (red tick) mutually exclusive with V_{MO}/M_{MO}, also referred to as the Velocity Not to Exceed represented by a fixed labeled red tick, beginning of solid red band.

V_{NO}.....Maximum structural cruising speed, lower boundary of high speed caution band represented by a tape color band boundary.

V_R.....Rotation speed, i.e., nose up speed represented by a speed bug.

V_{REF}.....Reference landing speed represented by a speed bug.

V_{S0}.....The stalling speed or the minimum steady flight speed in the landing configuration, lower boundary of the white band represented by a tape color band boundary.

V_{S1}.....The stalling speed or the minimum steady flight speed obtained in a specific configuration, lower boundary of the green band represented by a tape color band boundary.

V_{SWARN}.....Top of the low-speed awareness barber pole represented by a tape color band boundary.

$V_{SWARN\text{-}OFFSET}$ .....A configurable off-set value for V_{SWARN}.

V_{TGT} .....Reference target speed represented by a speed bug.

V_{YSE}.....Speed for best rate of climb on single engine (blue tick) represented by a fixed labeled light blue tick.

WAAS.....Wide Area Augmentation System. An air navigation aid developed by the FAA to augment the GPS in the North American region, with the goal of improving its accuracy, integrity, and availability.

WOW .....Weight-On-Wheels.

WX.....Weather.

XM .....XM Satellite Weather. An interactive weather data service for pilots.

XPDR.....Transponder. An automated and electronic monitoring device that receives, cross examines, amplifies and retransmits incoming signals. A transponder is also a transceiver that generates reply signals upon proper electronic examination. The transponder term is a blend of the words transmitter and responder.

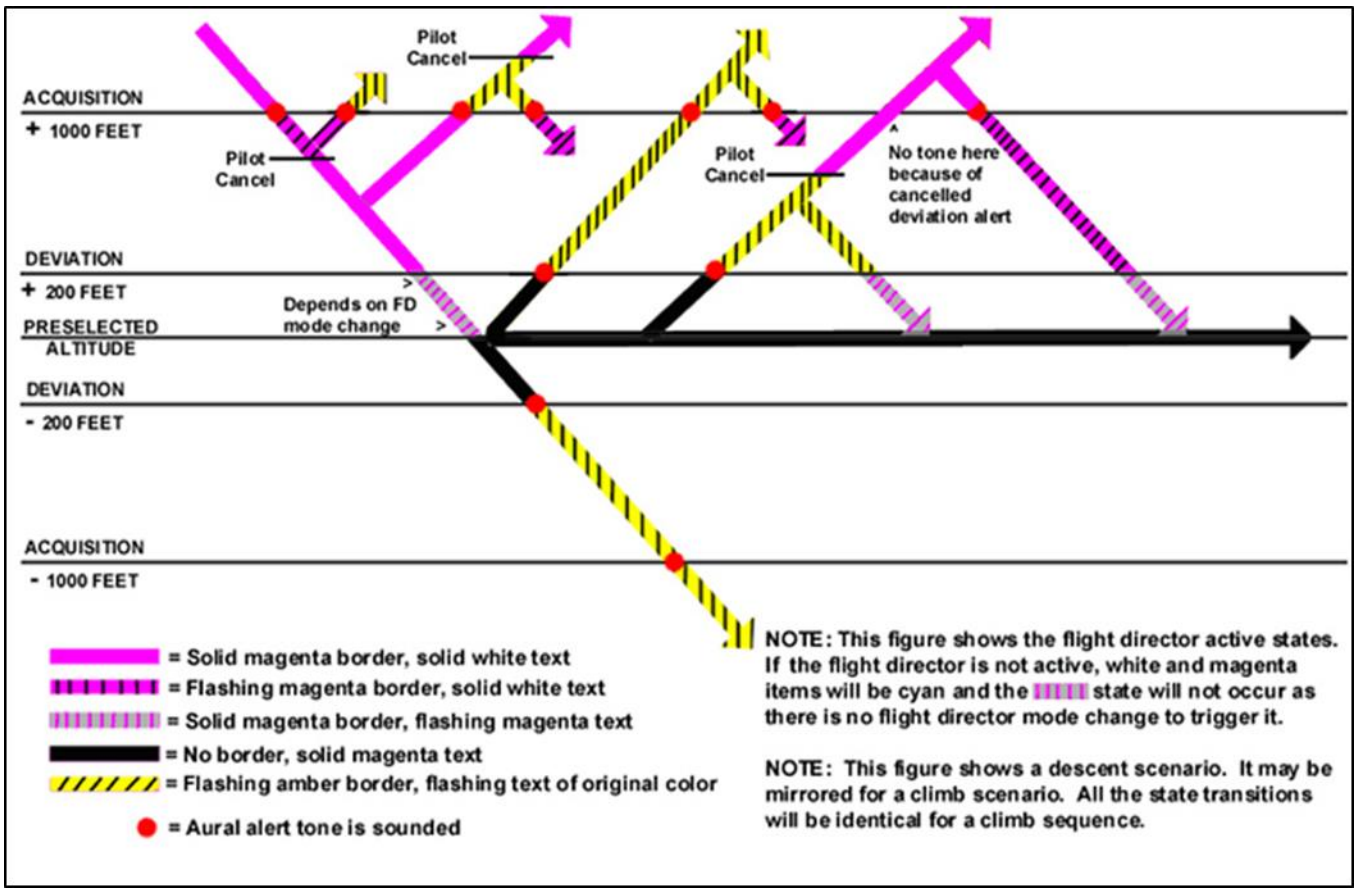
XSIDE.....Cross-Side.

XTK .....Cross-Track.

YD.....Yaw Damper. A device used on many aircraft (usually jets and turboprops) to damp (reduce) the rolling and yawing oscillations known as the Dutch roll mode. It requires yaw rate sensors and a processor that provides a signal to an actuator connected to the rudder.

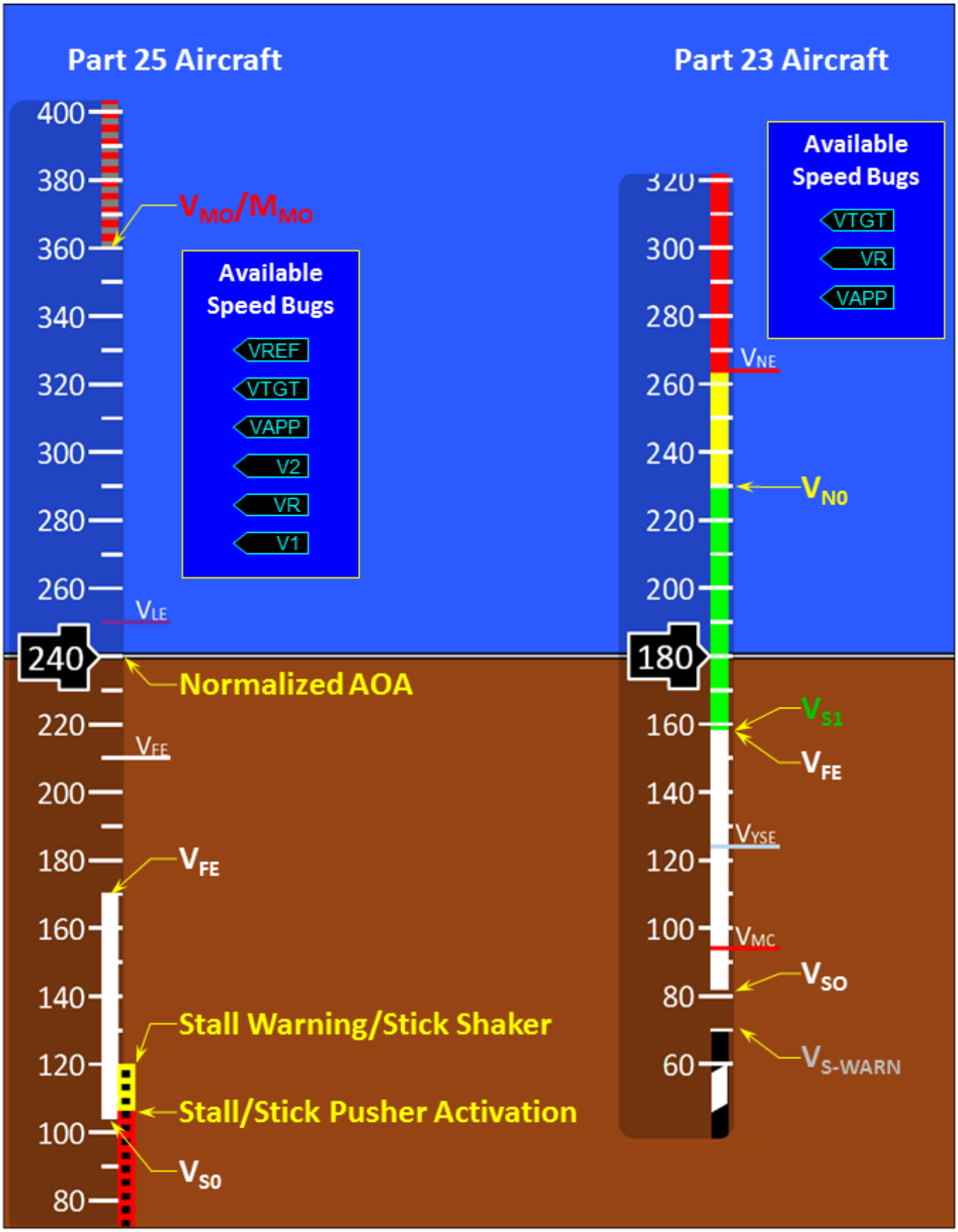
APPENDIX C: FMA STATUS BAR

APPENDIX D: ASEL AND TAWS ANNUNCIATIONS

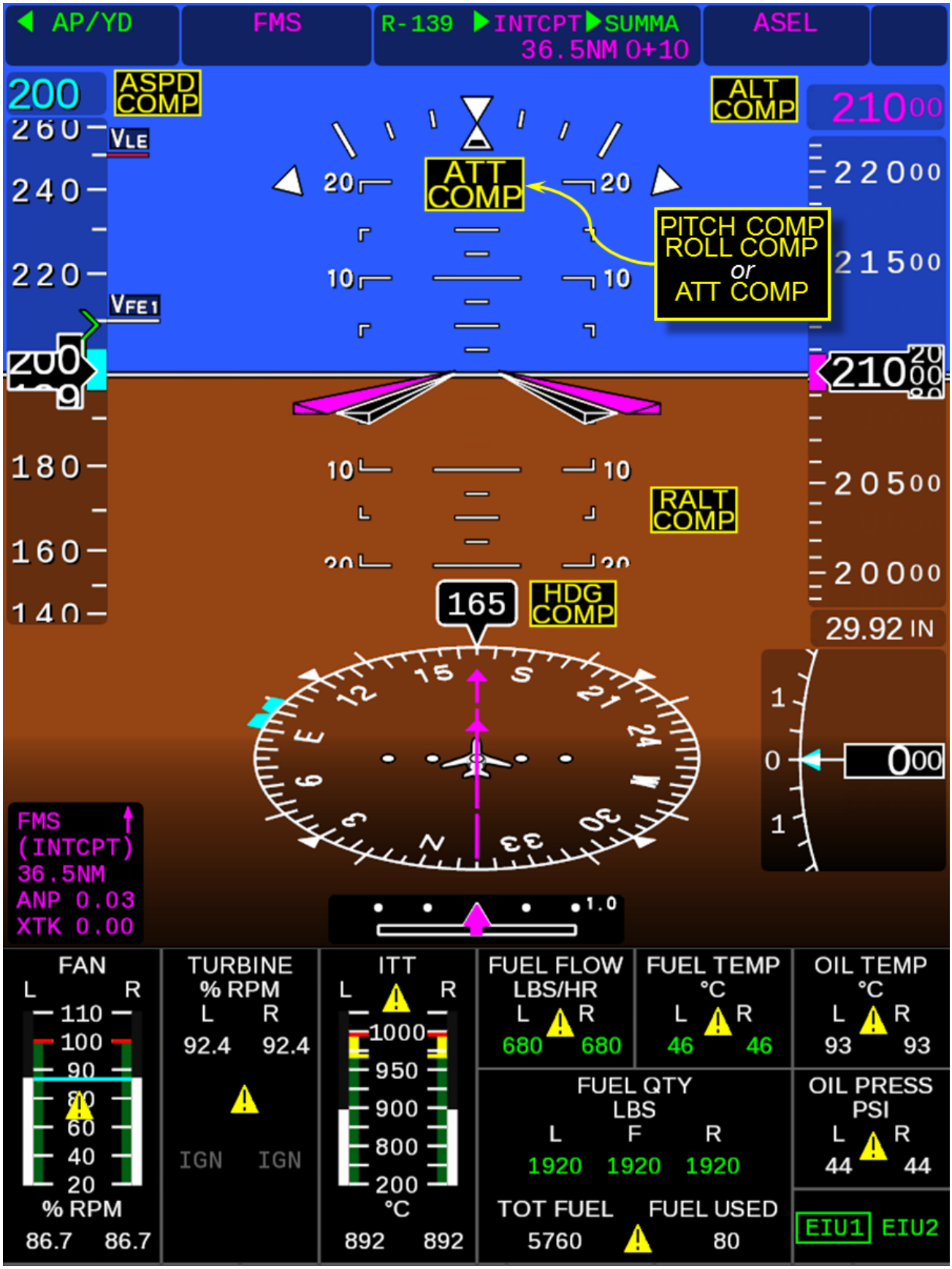


Priority	Description	TAWS Alert Message	Level
1	Windshear warning	"WINDSHEAR"	Warning
2	Mode 1 pull up	"PULL UP"	Warning
3	Mode 2A pull up	"PULL UP"	Warning
4	Mode 2A terrain	"PULL UP"	Warning
7	Terrain above airplane best climb path	"PULL UP"	Warning
7	Terrain above airplane altitude	"PULL UP"	Warning
7	Terrain below airplane altitude	"PULL UP"	Warning
9	Mode 2B pull up	"PULL UP"	Warning
9	Mode 2B terrain	"TERRAIN"	Caution
9	Mode 2A terrain caution	"TERRAIN"	Caution
11	Terrain above airplane best climb path caution	"TERRAIN"	Caution
11	Terrain above airplane altitude caution	"TERRAIN"	Caution
11	Terrain below airplane altitude caution	"TERRAIN"	Caution
12	Mode 4 Terrain	"TERRAIN"	Caution
13	MGCB caution	"TERRAIN"	Caution
16	Mode 4A gear	"TERRAIN"	Caution
17	Mode 4B flaps	"TERRAIN"	Caution
18	Mode 1 sink rate	"TERRAIN"	Caution
19	Mode 3 don't sink	"TERRAIN"	Caution
20	Mode 5 loud glide slope	"GLIDE SLOPE"	Caution
21	Mode 5 soft glide slope	"GLIDE SLOPE"	Caution
22	Windshear caution	"WINDSHEAR"	Caution

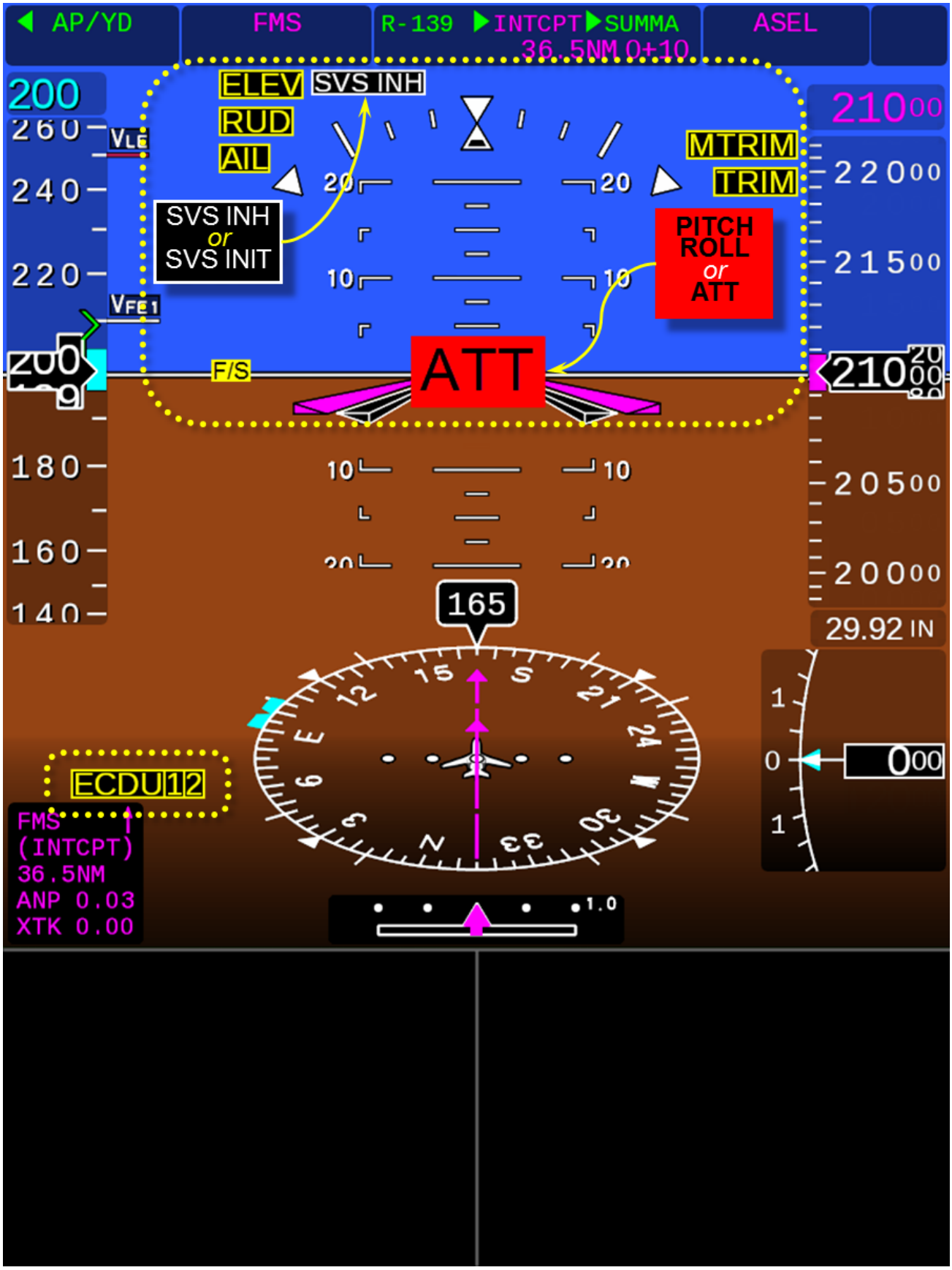
APPENDIX E: THE AIRSPEED TAPE



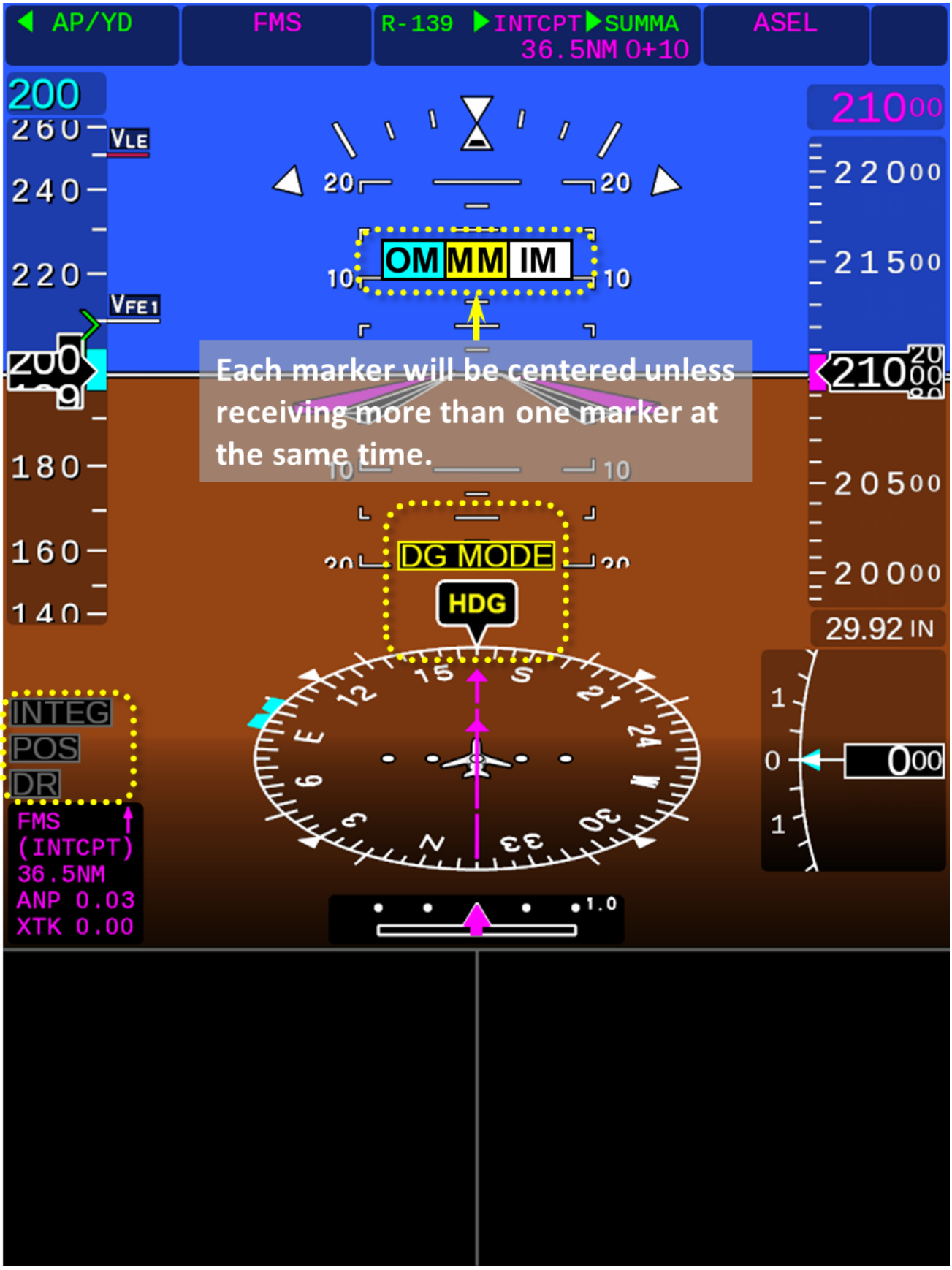
APPENDIX F: PFD ANNUNCIATIONS (MISCOMPARE)



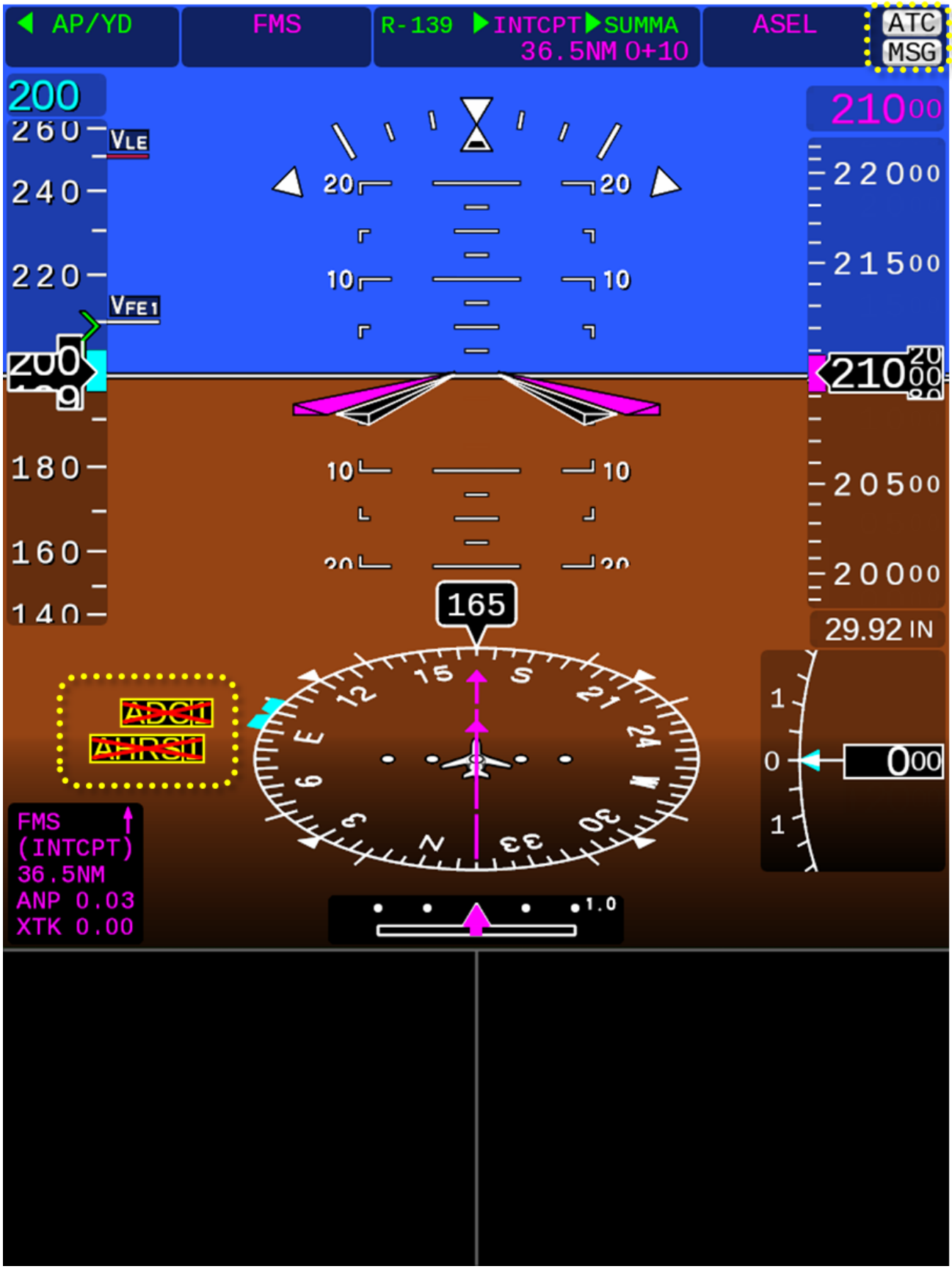
(Failure Annunciations)



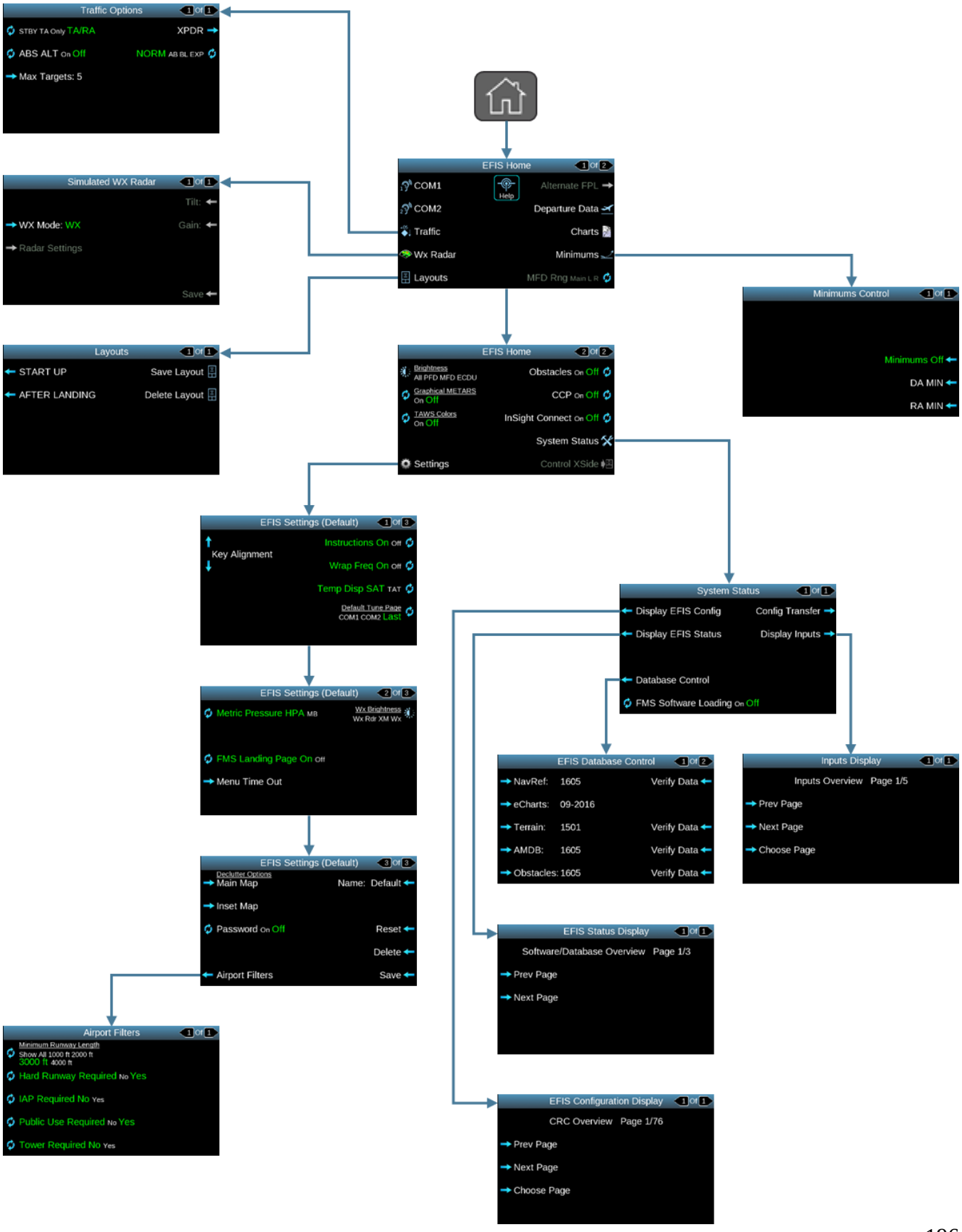
(Position Annunciations)

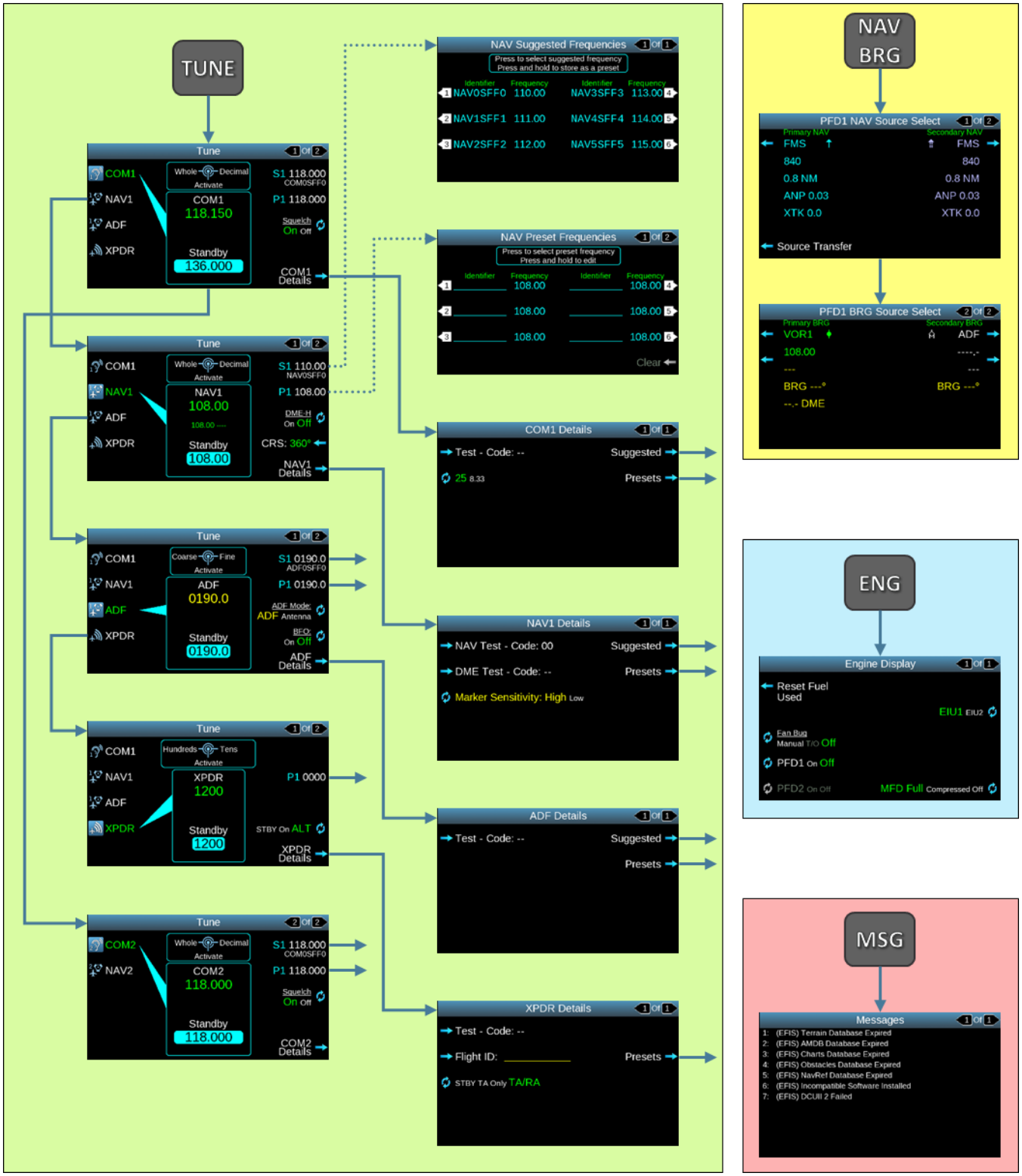


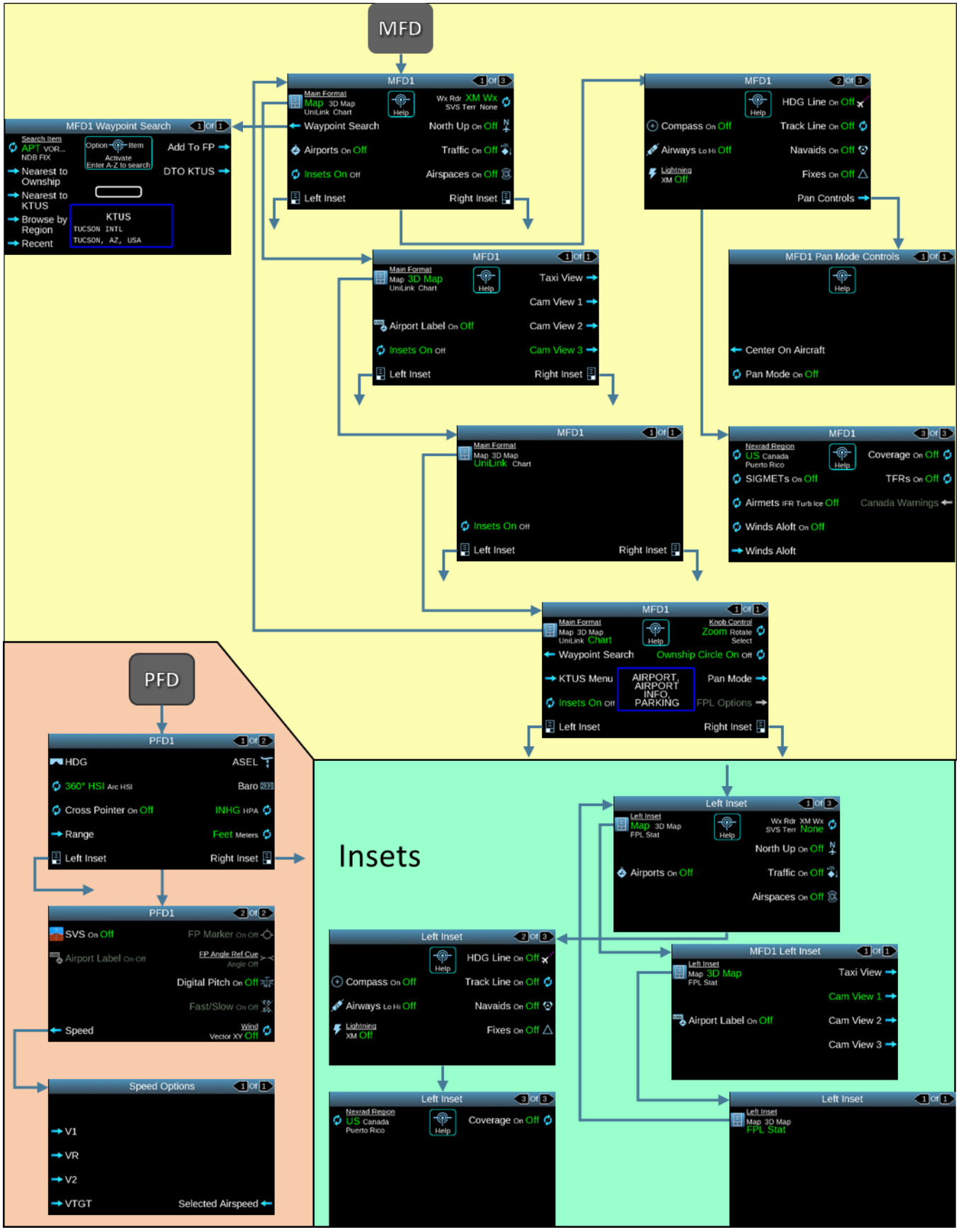
(Secondary Source and MSG Annunciations)



APPENDIX G: ECDU PAGE MAP




TUNE
Tune 1 Of 2
COM1
NAV1
ADF
XPDR
Whole Decimal
Activate
COM1
118.150
Standby
136.000
S1 118.000
COM0SFF0
P1 118.000
Squelch
On Off
COM1 Details
NAV Suggested Frequencies 1 Of 1
Press to select suggested frequency
Press and hold to store as a preset
Identifier Frequency Identifier Frequency
1 NAV0SFF0 110.00 NAV3SFF3 113.00 4
2 NAV1SFF1 111.00 NAV4SFF4 114.00 5
3 NAV2SFF2 112.00 NAV5SFF5 115.00 6
NAV Preset Frequencies 1 Of 2
Press to select preset frequency
Press and hold to edit
Identifier Frequency Identifier Frequency
1 108.00 4
2 108.00 108.00 5
3 108.00 108.00 6
Clear
Tune 1 Of 2
COM1
NAV1
ADF
XPDR
Whole Decimal
Activate
NAV1
108.00
Standby
108.00
S1 110.00
NAV0SFF0
P1 108.00
DME-H
On Off
CRS: 360°
NAV1 Details
COM1 Details 1 Of 1
Test - Code: --
Suggested
25 8.33
Presets
Tune 1 Of 2
COM1
NAV1
ADF
XPDR
Coarse Fine
Activate
ADF
0190.0
Standby
0190.0
S1 0190.0
ADF0SFF0
P1 0190.0
ADF Mode:
ADF Antenna
BFO:
On Off
ADF Details
NAV1 Details 1 Of 1
NAV Test - Code: 00
Suggested
DME Test - Code: --
Presets
Marker Sensitivity: High Low
Tune 1 Of 2
COM1
NAV1
ADF
XPDR
Hundreds Tens
Activate
XPDR
1200
Standby
1200
P1 0000
STBY On ALT
XPDR Details
ADF Details 1 Of 1
Test - Code: --
Suggested
Presets
Tune 2 Of 2
COM2
NAV2
Whole Decimal
Activate
COM2
118.000
Standby
118.000
S1 118.000
COM0SFF0
P1 118.000
Squelch
On Off
COM2 Details
XPDR Details 1 Of 1
Test - Code: --
Flight ID: _____
Presets
STBY TA Only TA/RA
NAV
BRG
PFD1 NAV Source Select 1 Of 2
Primary NAV
Secondary NAV
FMS
FMS
840
840
0.8 NM
0.8 NM
ANP 0.03
ANP 0.03
XTK 0.0
XTK 0.0
Source Transfer
PFD1 BRG Source Select 2 Of 2
Primary BRG
Secondary BRG
VOR1
ADF
108.00
BRG ---°
BRG ---°
--.- DME
ENG
Engine Display 1 Of 1
Reset Fuel
Used
EIU1 EIU2
Fan Bug
Manual T/O Off
PFD1 On Off
PFD2 On Off
MFD Full Compressed Off
MSG
Messages 1 Of 1
1: (EFIS) Terrain Database Expired
2: (EFIS) AMDB Database Expired
3: (EFIS) Charts Database Expired
4: (EFIS) Obstacles Database Expired
5: (EFIS) NavRef Database Expired
6: (EFIS) Incompatible Software Installed
7: (EFIS) DCUII 2 Failed


MFD
MFD1
Main Format
Map 3D Map
UniLink Chart
Help
Wx Rdr XM Wx
SVS Terr None
Waypoint Search
North Up On Off
Airports On Off
Traffic On Off
Insets On Off
Airspaces On Off
Left Inset
Right Inset
MFD1 Waypoint Search
Search Item
APT VOR... NDB FIX
Option Item
Activate
Enter A-Z to search
Add To FP
Nearest to Ownship
DTO KTUS
Nearest to KTUS
Browse by Region
Recent
KTUS
TUCSON INTL
TUCSON, AZ, USA
MFD1
HDG Line On Off
Compass On Off
Track Line On Off
Airways Lo Hi Off
Navaids On Off
Lightning XM Off
Fixes On Off
Pan Controls
MFD1
Taxi View
Cam View 1
Airport Label On Off
Cam View 2
Insets On Off
Cam View 3
MFD1 Pan Mode Controls
Center On Aircraft
Pan Mode On Off
MFD1
Nexrad Region
US Canada Puerto Rico
Coverage On Off
SIGMETs On Off
TFRs On Off
Airmets IFR Turb Ice Off
Canada Warnings
Winds Aloft On Off
Winds Aloft
MFD1
Knob Control
Zoom Rotate Select
Waypoint Search
Ownship Circle On Off
KTUS Menu
AIRPORT, AIRPORT INFO, PARKING
Pan Mode
FPL Options
PFD
PFD1
HDG
ASEL
360° HSI Arc HSI
Baro
Cross Pointer On Off
INHG HPA
Range
Feet Meters
PFD1
SVS On Off
FP Marker On Off
Airport Label On Off
FP Angle Ref Cue
Digital Pitch On Off
Fast/Slow On Off
Speed
Wind Vector XY Off
Speed Options
V1
VR
V2
VTGT
Selected Airspeed
Insets
Left Inset
Left Inset
Map 3D Map
FPL Stat
Wx Rdr XM Wx
SVS Terr None
North Up On Off
Airports On Off
Traffic On Off
Airspaces On Off
Left Inset
HDG Line On Off
Compass On Off
Track Line On Off
Airways Lo Hi Off
Navaids On Off
Lightning XM Off
Fixes On Off
MFD1 Left Inset
Taxi View
Cam View 1
Airport Label On Off
Cam View 2
Cam View 3
Left Inset
Nexrad Region
US Canada Puerto Rico
Coverage On Off
Left Inset
Map 3D Map
FPL Stat