

Green Castle Aero Club Foundation



Green Castle Advanced Aviation Training Device (AATD)

Avionics Manual

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Revised 3/31/2024

Revision #1

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1. Table of Contents

1.	Table of Contents	3
2.	Log of Revisions.....	5
3.	Introduction	6
3.1.	WARNING	6
3.2.	Avionics Components.....	6
4.	Simulated GMA340 – Audio Panel	7
5.	Simulated GNS530 – GPS & COMM / NAV Transceiver.....	8
5.1.	Setting the COM 1 Frequency	9
5.2.	Setting the NAV 1 Frequency	10
5.3.	“Nav” Page Group	11
5.4.	“Waypoint” Page Group.....	14
5.5.	“Nearest” Page Group.....	18
5.6.	Flight Plan Page Group	22
5.7.	Programming a Flight Plan	24
5.8.	The OBS Function	40
5.9.	SUSPEND (SUSP) Mode	42
5.10.	Messages.....	43
6.	Simulated GNS430– GPS & COMM / NAV Transceiver.....	44
6.1.	Setting the COM 2 Frequency	45
6.2.	Setting the NAV 2 Frequency	46
6.3.	“Nav” Page Group	47
6.4.	“Waypoint” Page Group.....	49
6.5.	“Nearest” Page Group.....	53
6.6.	Flight Plan Page Group	57
6.7.	Programming a Flight Plan	58
6.8.	The OBS Function	69
6.9.	SUSPEND (SUSP) Mode	70
6.10.	Messages.....	71
7.	Simulated BendixKing KT76C - Transponder	72
8.	Simulated BendixKing KR-87 – Automatic Direction Finder (ADF).....	74
9.	Davtron M800 Chronometer.....	76

9.1.	Davtron 800 Operation Summary	76
10.	Annunciator Panel.....	78

2. Log of Revisions

Description of Changes	Revision	Affected Pages	Edited By
Initial Version	1	All	MN

3. Introduction

The Green Castle AATD incorporates an advanced set of simulated avionics equipment making the system an excellent IFR training platform.

3.1. WARNING

Do not attempt to use this equipment without proper check-out and instruction.

This AATD is a high-value, advanced training device. As such, the Green Castle Aero Club requires you to receive training and a check-out before using it.

3.2. Avionics Components

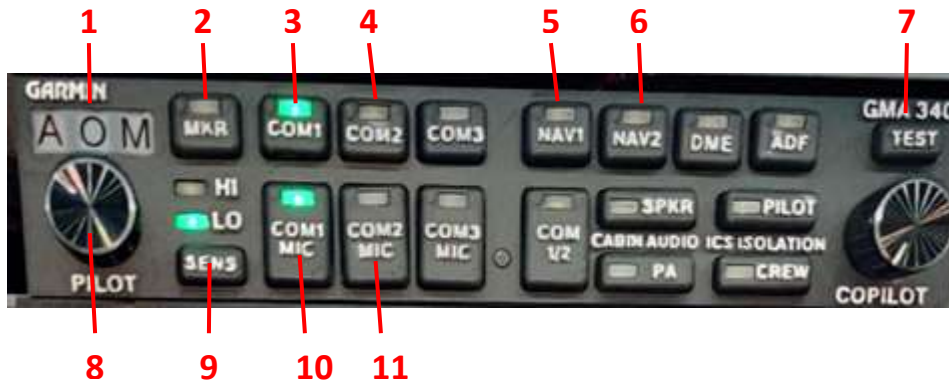
The Green Castle AATD avionics stack consists of several components:

- Audio Panel: Resembles the Garmin GMA340 audio panel. Allows the user to select audio channels and various other settings such as marker beacon, transmit radio selection and more.
- GPS1: The first GPS unit resembles a Garmin GNS530; a common unit in GA aircraft.
- GPS2: The second GPS unit resembles a Garmin GNS430; another common unit in GA aircraft.
- Transponder: Resembles a BendixKing KT76C; for setting codes and transmit modes.
- ADF Receiver: Resembles a BendixKing KR-87; for tuning and tracking omnidirectional beacons.

As appropriate, these avionics instruments interface with other cockpit instruments to create a realistic simulated avionics stack. It is important to note that the avionics instruments in the simulator are simulated versions that work similarly, but not exactly the same, as their real-world counterparts. The Green Castle AATD is not meant to be a training tool for the real-world versions of the simulated avionics instruments.

4. Simulated GMA340 – Audio Panel

The audio panel in the Green Castle AATD resembles the Garmin GMA340 but it is important to note that the functionality of this device is not the same as the real-world device it is inspired by. This panel is used to enable or disable audio from radio and navigation devices. The audio system in the simulator is such that most of the functions of the panel are disabled. The functionality provided is as follows:



1. Marker beacon lamps: “O” is the outer marker, “M” is the middle marker and “A” is the airway or inner marker, part of the ILS.
 - a. Outer Marker: This marker is typically located about 4 to 7 miles from the runway threshold. It indicates that the aircraft is nearing the start of the final approach. The outer marker light blinks blue.
 - b. Middle Marker: The middle marker is located approximately 0.5 to 1.5 miles from the runway. It signals that the aircraft is close to its decision height. The middle marker light blinks red.
 - c. Inner Marker: This marker, less common than the outer and middle markers, is used in some precision approach systems. It indicates that the aircraft is very close to the runway. The inner marker light blinks white.
2. Use the MKR button to listen to the morse signal from the marker beacon.
3. Transceiver Audio Selector Button for COM1, the radio in the simulated GNS530
4. Transceiver Audio Selector Button for COM2, the radio in the simulated GNS430
5. Aircraft Radio Audio Selection Button for NAV1, tune into the audio on the navigation radio of the simulated GNS530
6. Aircraft Radio Audio Selection Button for NAV2, tune into the audio on the navigation radio of the simulated GNS430
7. Annunciator test button
8. On/Off switch, volume function is non-functional
9. Marker beacon sensitivity high/low
10. Transmitter Mic selection button COM1 (Note: Transmit functionality INOP)
11. Transmitter Mic selection button COM2 (Note: Transmit functionality INOP)

The primary utility of the audio panel in this simulator is listening to the morse signals from various navigation aids and to AWOS/ASOS transmissions. Currently, there is no ATC communication feature.

5. Simulated GNS530 – GPS & COMM / NAV Transceiver

The Green Castle AATD contains a large screen GPS unit that resembles the Garmin GNS530. It is important to note that the capabilities and operation of this device are similar to but not exactly the same as the real product. In this manual we shall refer to this unit simply as “530”.



1. **Com 1 Frequency Flip-Flop Key:** Used to swap the active and stand-by frequencies
2. **Com 1 Volume and Squelch:** Not active
3. **Nav 1 VLOC (VOR/Localizer) Frequency Flip-Flop Key:** Used to swap the active and stand-by VLOC (VOR / Localizer) frequencies
4. **VLOC (VOR / Localizer) ID Volume & Squelch:** Not active
5. **Comm / VLOC Outer Rotary Control:** Adjusts the selected stand-by frequency (numeric portion) up or down.
6. **Comm / VLOC Inner Rotary Control Center (Push Button):** Toggles between stand-by comm radio frequency and stand-by VLOC (VOR / Localizer) frequency
7. **Comm / VLOC Inner Rotary Control:** Adjusts the selected stand-by frequency (decimal portion) up or down.
8. **Course Deviation Indicator (CDI) button:** Toggles between the VOR/Localizer and GPS as the active navigation device. This applies to the 530 unit, and the connected aircraft instrumentation. In VLOC mode, the aircraft navigation instruments will reference the selected radio navigation aid(s) (e.g. VOR or ILS localizer). In GPS mode, the aircraft navigation instruments, and autopilot, will reference the 530.
9. **Omni Bearing Selector (OBS) button:** Provides the pilot with the capability to select a ‘radial’ bearing to or from the active waypoint.
10. **Message (MSG) button:** Used to view system messages and alerts.
11. **Flight Plan (FPL) button:** Used to create, edit, and activate flight plans.

12. **Vertical Navigation (VNAV) button:** Used to add a three-dimensional profile to your lateral flight plan.
13. **Procedures (PROC) button:** Used to select departure and arrival procedures for your flight plan.
14. **GPS Inner Rotary Control:** Multi-function control, depending on the selected mode.
15. **GPS Inner Rotary Control Center (Cursor Button):** Multi-function control, depending on the selected mode.
16. **GPS Outer Rotary Control:** Multi-function control, depending on the selected mode.
17. **Enter (ENT) button:** Used to approve an operation, complete a data entry, or move to the next data field.
18. **Clear (CLR) button:** Used to erase an entry, or cancel a command.
19. **MENU button:** Displays a context-sensitive menu of operations.
20. **Direct To button:** Fly direct to a designated waypoint.
21. **Range (RNG) button (up or down):** Selects the desired map scale.
22. N/A

5.1. Setting the COM 1 Frequency



Push the center of the Comm/VOR Localizer Rotary to highlight the standby COM 1 frequency.

Rotate the Outer rotary to change the numeric portion of the COM 1 frequency.

Rotate the Inner rotary to change the decimal portion of the COM 1 frequency.



Press the Comm Frequency Flip-Flop Key to swap the standby and active COM 1 frequency.

5.2. Setting the NAV 1 Frequency



Push the center of the Comm/VOR Localizer Rotary to highlight the standby NAV 1 frequency.

Rotate the Outer rotary to change the numeric portion of the NAV 1 frequency.

Rotate the Inner rotary to change the decimal portion of the NAV 1 frequency.



Push the VLOC (VOR / Localizer) Frequency Flip-Flop Key to swap the standby and active NAV 1 frequency.

While the NAV 1 frequency is tuned to a navigation aid that is within range, an audible Morse-Code identifier is available to confirm the correct tuning. Select the "NAV 1" button (item 5 in Section 3) on the audio panel to listen to the morse code signal.

5.3. “Nav” Page Group

This is a group of three “pages” on the 530 that collectively provide positional awareness to the pilot, via a plan view of the route and flight plan (if any). A VNAV flight profile may also be input here. To get to the Nav page group, rotate the Outer GPS rotary control counterclockwise until the NAV page group shows in the lower right corner of the screen.

5.3.1. The Active Page



The NAV page group has three pages. These are:

1. Map Page with Direction of travel up. This is the default Page.
2. Map Page – North up.
3. VNAV Page.

The Active Page is indicated by the bar display at the lower right corner of the screen.

Use the GPS Inner Rotary to switch between the individual Nav Pages.

5.3.2. Default Nav Page



This Page displays a plan view of your location, together with local waypoints and airspace boundaries.

Your aircraft is fixed at the center-bottom of the Page, facing upwards towards the compass.

In the example to the left, the current track is 105 degrees.

5.3.3. Map Page



This Page displays a plan view of your location, together with local waypoints and airspace boundaries.

Your aircraft is fixed at the center of the Page.

In the example to the left, the course is 105 degrees.

The map may be displayed with north up, or track-up (by pressing the MENU key).

5.3.4. VNAV Page



The Vertical Navigation (VNAV) Page provides the capability to designate a target altitude for a single waypoint in your flight plan. This feature is only active during the execution of a flight plan, or a "Direct To" instruction.

As you approach the designated waypoint, the Vertical Speed Required (VSR) and STATUS data fields on the VNAV Page will provide guidance to ensure the target altitude is achieved.

Programming a VNAV Scenario

Let's consider a scenario whereby, at the end of a flight to KSFO San Francisco International, the pilot wishes to descend at a rate of 500 feet per minute to a pattern altitude of 1,000 MSL, three miles before arrival.



To program the VNAV Page: Push the CENTER of the GPS Rotary to activate the cursor. This will initially appear in the TARGET ALTITUDE box. Use the GPS Outer Rotary to move forward or backwards to the desired data field. Within the desired data field, use the GPS Inner Rotary, to change the value.

Note: The target position may only comprise a waypoint in your flight plan. The example to the left shows the completed VNAV Page for this specific scenario.



In the example to the left, the flight is underway, and we are approaching KSFO. The pilot has left his descent a little late, and therefore a rate of more than the desired 500 feet per minute is now required. The VSR and STATUS data fields are highlighted in yellow. The pilot has been instructed to "Descend to target" at a rate of -752 feet per minute.

If the pilot follows these instructions, the aircraft will arrive at the pattern altitude of 1,000 MSL at precisely 3 nautical miles from the field.

5.4. “Waypoint” Page Group

This is a group of six pages that collectively display information about the origin and destination airports. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Outer Rotary one click clockwise.

5.4.1. The Active Page



The 530 has six Waypoint Pages. These are:

1. Airport Location Page. This is the default Page.
2. Airport Runway Page.
3. Airport Frequency Page.
4. Airport Approach Page.
5. Airport Arrival Page.
6. Airport Departure Page.

Use the GPS Inner Rotary to switch between the individual Waypoint Pages.

5.4.2. Airport Location Page



This Page displays basic information about the destination airport, (or current airport where no destination is specified).

Information displayed includes name, latitude/longitude, and elevation.

5.4.3. Airport Runway Page



This Page displays a plan view of the runways at the destination airport, (or current airport where no destination is specified), and basic information about each one.

To select the desired runway:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available runways.

5.4.4. Airport Frequency Page



This Page displays the frequencies associated with the destination airport, (or current airport where no destination is specified).

AWOS = Automated Weather Observation System

CTAF = Common Traffic Advisory Frequency

DEL = Clearance Delivery Frequency

GND = ATC-Ground Frequency

TWR = ATC-Tower Frequency

DEP = ATC-Departure Frequency

APP = ATC-Approach Frequency

CTR = ATC-Center Frequency

5.4.5. Airport Approach Page



This Page supports the selection of the desired runway approach for the destination airport.

Push the CENTER of the GPS Inner Rotary to display a list of available approaches for the destination airport.

Rotate the GPS Inner Rotary to select the desired approach.

Push the ENT (Enter) button to complete the selection.

Note: You will have to additionally select (ATC) vectors to the desired

approach, or a specific initial approach fix waypoint. Use the same method to make the selection.

5.4.6. Airport Arrival Page



This Page supports the selection of the desired STAR (Standard Arrival) procedure for the destination airport.

Push the CENTER of the GPS Inner Rotary to display a list of available STARs for the destination airport.

Rotate the GPS Inner Rotary to select the desired STAR.

Push the ENT (Enter) button to complete the selection.

Note: You will have to additionally select the desired transition

waypoint and runway for your chosen STAR. Use the same method to make these selections.

5.4.7. Airport Departure Page



This Page supports the selection of the desired SID (Standard Instrument Departure) procedure for the airport of origin.

Push the CENTER of the GPS Inner Rotary to display a list of available SIDs for the airport of origin.

Rotate the GPS Inner Rotary to select the desired SID.

Push the ENT (Enter) button to complete the selection.

Note: You will have to additionally select the desired runway and

transition waypoint for your chosen SID. Use the same method to make these selections.

5.5. “Nearest” Page Group

This is a group of five pages that collectively display information about the nearest airports, intersections, NDB, VOR and airspace. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Inner Rotary two clicks clockwise.



The 530 has five Nearest Pages. These are:

1. Nearest Airport Page. This is the default Page.
2. Nearest Intersection Page.
3. Nearest NDB Page.
4. Nearest VOR Page.
5. Nearest Airspace.

Use the GPS Inner Rotary to switch between the individual Waypoint Pages.

5.5.1. Nearest Airport Page



This Page displays the nearest airport to your current location, together with the direct heading (bearing) to that airport, the distance, the available approach-type (or VFR) and the length of the longest runway.

To proceed DIRECT to any of the airports displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available airports.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

5.5.2. Nearest Intersection Page



This Page displays the nearest intersection to your current location. An intersection is a virtual navigation fix, and is usually (but not always) the intersection of two VOR radials.

Also displayed are the direct heading (bearing) to that intersection and the distance.

To proceed DIRECT to any of the intersections displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available intersections.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

5.5.3. Nearest NDB Page



The Page displays the nearest Non-Directional Beacon (NDB) to your current location, together with the direct heading (bearing) to that NDB, the distance, and the frequency (for manually-tuned ADF devices).

To proceed DIRECT to any of the NDBs displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available NDBs.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

5.5.4. Nearest VOR Page



This Page displays the nearest VOR to your current location, together with the direct heading (bearing) to that VOR, the distance, and the frequency (for manually-tuned VOR receivers).

To proceed DIRECT to any of the VORs displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available VORs.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

5.5.5. Nearest Airspace Page



This Page displays the nearest controlled, or special-use, airspace to your current location, together with the airspace type.

5.6. Flight Plan Page Group

This is a group of two pages that collectively allow the viewing and loading of flight plans. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Outer Rotary three clicks clockwise.



The 530 has two Flight Plan Pages.

These are:

1. Active Flight Plan Page. This is the default Page.
2. Flight Plan Catalog Page.

Use the GPS Inner Rotary to switch between the individual Flight Plan Pages.

5.6.1. Active Flight Plan Page



This Page displays the waypoints in the currently active flight plan.

The functions of this page will be described in detail later in the manual (Section 4.7).

5.6.2. Flight Plan Catalog Page



The Page displays the catalog of saved flight plans that currently exists in the following folder:

X-Plane 12 > Output > FMS Plans

The functions of this page will be described in detail later in the manual (Section 0).

5.7. Programming a Flight Plan

In this section of the guide, the steps associated with programming a flight plan will be discussed. The sample flight plan used here will be:

KLAX FIXIT3 RZS SERFR ALWAYS1 KSFO

Note that, due to changing waypoints and procedures over time, the example provided here may not be repeatable exactly.

5.7.1. Initializing the 530 / Deleting a previous Flight Plan

Before inputting a new flight plan, it's important to initialize the 530 - by deleting any existing flight plan that may be present. To accomplish this:



Rotate the GPS Outer Rotary counterclockwise until the NAV page group is displayed.

Push the FPL (Flight Plan) button to display the Active Flight Plan page.

Push the MENU button.

Rotate the GPS Inner Rotary to select the "Delete Flight Plan" option.

Push the ENT (Enter) button to complete the operation.

5.7.2. The Initial Waypoint



Push the FPL (Flight Plan) button to invoke the Flight Plan Page (1 of 2).

By default, your current location will be the initial waypoint in your new Flight Plan.

5.7.3. Activating the Cursor



To create, update or delete waypoints in a flight plan, the cursor must be activated.

Push the CENTER of the GPS Inner Rotary to activate the cursor. The waypoint will be highlighted.

5.7.4. Inserting Waypoints



To insert a new waypoint into the flight plan:

Activate the Cursor (see Section 5.7.3).

Rotate the GPS Outer Rotary to position the cursor at the desired line in the flight plan (noting that the new waypoint will be inserted prior to this line).



Rotate the GPS Inner Rotary 1 click clockwise to highlight the first character of the new waypoint identifier.

Rotate the GPS Inner Rotary to change the characters in the highlighted position.

Rotate the GPS Outer Rotary to move to the next or previous character in the waypoint identifier as required.



Push the ENT (Enter) button twice to save the waypoint.

5.7.5. Deleting Waypoints



To delete a waypoint from the flight plan:

Activate the Cursor (see Section 5.7.3).

Rotate the GPS Outer Rotary to select the desired waypoint.



Push the CLR Button to invoke the 'Remove Waypoint' Page.

Rotate the GPS Inner to toggle between 'Yes' and 'No'.

Push the ENT (Enter) Button to complete the operation.

5.7.6. Selecting a Standard Instrument Departure (SID)

A SID, or Standard Instrument Departure, is a predefined aerial route used by aircraft when departing from an airport. It is designed to facilitate safe and efficient routing of aircraft during the initial phase of flight and to manage air traffic effectively. Although a SID will keep aircraft away from terrain, it is optimized for air traffic control route of flight and will not always provide the lowest climb gradient. It strikes a balance between terrain and obstacle avoidance, noise abatement (if necessary), and airspace management considerations.



Activate the Cursor (see Section 5.7.3).

Rotate the GPS Outer Rotary to select the departure airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Departure' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the departure runway.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired transition waypoint.

Push the ENT (Enter) button.



A graphical representation of the chosen departure procedure is displayed.

Push the ENT (Enter) Key to load the procedure into the flight plan.



The chosen departure procedure is now converted to the individual waypoints it comprises. These appear in the appropriate order at the start of your flight plan.

5.7.7. Selecting a Standard Terminal Arrival (STAR)

A Standard Terminal Arrival Route (STAR) is a predefined flight path provided by air traffic control. It typically guides you from the final waypoint of your en-route phase to the initial point of your approach to the airport, usually the Initial Approach Fix (IAF). Essentially, a STAR bridges your flight's en-route segment with its approach phase.



Activate the Cursor (see Section 4.7.3).

Rotate the GPS Outer Rotary to select the arrival airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Arrival' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired arrival procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired transition waypoint.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the arrival runway.

Push the ENT (Enter) button.



A graphical representation of the chosen arrival procedure is displayed.

Push the ENT (Enter) Key to load the procedure into the flight plan.



The chosen arrival procedure is now converted to the individual waypoints it comprises. These appear in the appropriate order at the end of your flight plan.

5.7.8. Selecting an Approach

An Instrument Approach, or Instrument Approach Procedure (IAP), is a set of specific maneuvers designed for guiding an aircraft under instrument flight rules (IFR) from the start of the initial approach to either a landing or to a point where you can proceed to land visually.



Activate the Cursor (see Section 4.7.3).

Rotate the GPS Outer Rotary to select the arrival airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Approach' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired approach procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired initial approach fix (IAF). You may select VECTORS in place of an IAF, if ATC is providing these.

Push the ENT (Enter) button.



A graphical representation of the chosen approach procedure is displayed.

Push the ENT (Enter) Key to load the procedure into the flight plan.



The chosen approach procedure is displayed in your flight plan, immediately after the destination airport.

5.7.9. Direct To (a Waypoint)



From the Active Flight Plan Page, or any of the 'Nearest' Pages:

Activate the Cursor (see Section 4.7.3).

Rotate the GPS Outer Rotary to select the desired waypoint.

Push the "Direct To" button.

Push ENT (Enter) to activate.

5.7.10. Activating a Leg

Use the “Activate Leg” menu option to resume navigation at a specific leg (waypoint to waypoint) within your flight plan, bypassing previous legs.



From the Active Flight Plan Page:

Activate the Cursor (see earlier in guide).

Rotate the GPS Inner Rotary to highlight the waypoint that represents the conclusion of the desired leg.

Push the MENU button.



Rotate the GPS Inner Rotary to highlight the ‘Activate Leg’ menu option.

Push the ENT (Enter) button.

The 530 will navigate to the first waypoint in the chosen leg, and then (once reached) to the second waypoint in the chosen leg. The flight plan will then continue from that point.

5.7.11. Activating an Approach

Use the “Activate Approach” menu option once ATC clears you for an instrument approach via a transition or an initial approach fix. This will switch from en-route (ENR) or terminal (TERM) navigation to approach (APR) navigation. Flight plan navigation is canceled, and approach navigation is activated. Instead of flying to the center of the airport from an arbitrary direction, the GPS will now guide you according to the (previously) selected approach procedure.



From the Active Flight Plan Page:
Push the PROC (Procedure) button to invoke the Procedures menu.



Rotate the GPS Inner Rotary to highlight the ‘Activate Approach’ menu option.

Push the ENT (Enter) button.

The 530 will commence the approach, by navigating (first) to the initial approach fix for the chosen procedure.

5.7.12. Activating Vectors to Final

Use the “Activate Vectors to Final” menu option when you are vectored to the approach by ATC. When you select this, the GPS removes all approach transitions and instead shows you an extended line-up for the final approach course to the final approach fix (FAF) for the selected approach procedure.



From the Active Flight Plan Page:

Push the PROC (Procedure) button to invoke the Procedures menu.



Rotate the GPS Inner Rotary to highlight the ‘Activate Vector-To-Final’ menu option.

Push the ENT (Enter) button.

The pilot is now in control of the navigation, under instructions from ATC. The 530 will display an extended localizer for the pilot to intercept.

5.7.13. Loading a (Saved) Flight Plan

Flight plans that have been created previously (and saved in the appropriate format for X-Plane) may be loaded into the 530 (replacing the currently active flight plan). The following file (extension) types are acceptable:

- FMS (compatible from X-Plane 9 and up, contains only waypoints)
- FLP (compatible with aircraft for both X-Plane and other simulators, supports airways)
- FML (X-Plane 12 internal format, for saving your own flight plans)

This Page displays the catalog of saved flight plans that currently exists in the following folder:
X-Plane 12 > Output > FMS Plans



Turn the GPS Outer Rotary counterclockwise to get to the Nav page group.

Push the FPL button.

Rotate the GPS Inner Rotary to invoke the Flight Plan Catalog Page.



Activate the Cursor (see Section 4.7.3).

Rotate the GPS Inner Rotary to select the desired flight plan.

Push the ENT (Enter) button to load the flight plan.

5.8. The OBS Function

The Omni Bearing Selector (OBS) button provides the pilot with the capability to fly to, or from, any waypoint or fix via a chosen bearing.

Let's assume we are starting from KLAX, and the next waypoint in the Flight Plan is KTOA. Due to circumstances during the flight, the pilot wishes to approach KTOA on a bearing of North (360 degrees).



A direct course from KLAX to KTOA would look like this.

The pilot would approach KTOA on a bearing of approximately 142 degrees, and this is not the desired outcome.



Using the OBS Rotary associated with the VOR/ILS Receiver on the instrument panel:

Select the desired bearing which in this example is 360 degrees.

Note that the instrument on the left has the same functionality as the instrument in the Green Castle AATD but looks slightly different.



Click the OBS Button to place the 530 in OBS mode.

The 530 now displays a new course to KTOA. The magenta line represents the TO course (360 degrees) and the white line represents the FROM course (360 degrees).

To approach KTOA on a bearing of 360 degrees, the pilot would intercept the magenta line, and follow it to KTOA.

5.9. SUSPEND (SUSP) Mode

“Suspend” mode is invoked by the 530 when there is a requirement to delay the automatic sequencing to the next leg of the flight plan.

When OBS mode is active:

- The pilot may fly beyond the target waypoint, and then follow a radial FROM that point. When the aircraft crosses the waypoint, the 530 will automatically invoke “Suspend” mode, allowing the pilot to continue flying the FROM radial, until the pilot makes the decision to sequence to the next leg of the Flight Plan (by pushing the OBS button).

When OBS Mode is inactive:

- “Suspend” mode becomes active when a Flight Plan contains a “Hold”, and the aircraft enters that portion of the route. The 530 will continue to fly the hold without sequencing to the next leg until instructed by the pilot (by pushing the OBS button).
- “Suspend” mode becomes active when executing a published approach procedure, and a missed approach decision is required. The 530 cannot make this decision for the pilot because it is dependent on the visibility conditions, and therefore invokes “Suspend” mode. If the pilot makes the decision to continue with the approach, the 530 remains in “Suspend” mode, and continues to fly the procedure to a landing. If the pilot initiates a missed-approach, the “OBS” button must be pushed, to deactivate “Suspend” mode, at which time the 530 will sequence to the first leg of the missed approach.



530 in “Suspend” mode.

5.10. Messages

The 530 features a 'MSG' annunciator at the bottom of the display panel to alert the pilot to information that is pertinent to the flight. Most messages are advisory in nature, but some may require pilot intervention.



If the MSG annunciator is displayed:
Push the MSG (Message) button to
invoke the Messages Page.

6. Simulated GNS430– GPS & COMM / NAV Transceiver

In addition to the 530, the Green Castle AATD also contains a smaller screen GPS unit that resembles the Garmin GNS430. It is important to note that the capability and operation of this device are similar to but not exactly the same as the real product. In this manual we shall refer to this unit simply as “430”.



1. **Com 2 Volume and Squelch:** Not active
2. **Frequency Flip-Flop Key:** Used to swap the active and stand-by frequencies for the Com 2 radio
3. **VLOC (VOR / Localizer) ID Volume & Squelch:** Not active
4. **Nav 2 VLOC (VOR/Localizer) Frequency Flip-Flop Key:** Used to swap the active and stand-by VLOC (VOR / Localizer) frequency for Nav 2
5. **Comm / VLOC Outer Rotary Control:** Adjusts the selected stand-by frequency (numeric portion) up or down.
6. **Comm / VLOC Inner Rotary Control Center (Push Button):** Toggles between stand-by comm radio frequency and stand-by VLOC (VOR / Localizer) frequency
7. **Comm / VLOC Inner Rotary Control:** Adjusts the selected stand-by frequency (decimal portion) up or down.
8. **Course Deviation Indicator (CDI) button:** Toggles between the VOR/Localizer and GPS as the active navigation device. This applies to the 430 unit, and the connected aircraft instrumentation. In VLOC mode, the aircraft navigation instruments, will reference the selected radio navigation aid(s) (e.g. VOR or ILS localizer). In GPS mode, the aircraft navigation instruments, and autopilot, will reference the 430.
9. **Omni Bearing Selector (OBS) button:** Provides the pilot with the capability to select a ‘radial’ bearing to or from the active waypoint.
10. **Message (MSG) button:** Used to view systems messages and alerts.

11. **Flight Plan (FPL) button:** Used to create, edit, and activate flight plans.
12. **Procedures (PROC) button:** Used to select departure and arrival procedures for your flight plan.
13. **GPS Inner Rotary Control:** Multi-function control, depending on the selected mode.
14. **GPS Inner Rotary Control Center (Cursor Button):** Multi-function control, depending on the selected mode.
15. **GPS Outer Rotary Control:** Multi-function control, depending on the selected mode.
16. **Clear (CLR) button:** Used to erase an entry or cancel a command.
17. **Enter (ENT) button:** Used to approve an operation, complete a data entry, or move to the next data field.
18. **MENU button:** Displays a context-sensitive menu of operations.
19. **Range (RNG) button (up or down):** Selects the desired map scale.
20. **Direct To button:** Fly direct to a designated waypoint.

6.1. Setting the COM 2 Frequency



Push the center of the Comm/VOR Localizer Rotary to highlight the standby COM 2 frequency.

Rotate the Outer rotary to change the numeric portion of the COM 2 frequency.

Rotate the Inner rotary to change the decimal portion of the COM 2

frequency.



Press the Comm Frequency Flip-Flop Key to swap the standby and active COM 2 frequency.

6.2. Setting the NAV 2 Frequency



Push the center of the Comm/VOR Localizer Rotary to highlight the standby NAV 2 frequency.

Rotate the Outer rotary to change the numeric portion of the NAV 2 frequency.

Rotate the Inner rotary to change the decimal portion of the NAV 2 frequency.



Push the VLOC (VOR / Localizer) Frequency Flip-Flop Key to swap the standby and active NAV 2 frequency.

While the NAV 2 frequency is tuned to a navigation aid that is within range, an audible Morse-Code identifier is available to confirm the correct tuning. Select the "NAV 2" button (item 6 in Section 3) on the audio panel to listen to the morse code signal.

6.3. “Nav” Page Group

This is a group of three “pages” on the 530 that collectively provide positional awareness to the pilot, via a plan view of the route and flight plan (if any). A VNAV flight profile may also be input here. To get to the Nav page group, rotate the Outer GPS rotary control counterclockwise until the NAV page group shows in the lower right corner of the screen.

6.3.1. The Active Page



The NAV page group has three pages. These are:

1. Map Page with Direction of travel up. This is the default Page.
2. Map Page – North up.
3. VNAV Page.

The Active Page is indicated by the bar display at the lower right corner

of the screen. Use the GPS Inner Rotary to switch between the individual Nav Pages.

6.3.2. Default Nav Page



This Page features a graphic course deviation indicator (CDI) across the top of the display. This informs the pilot if the

aircraft is steering left or right of the desired course, and the degree of correction required.

Also displayed is the next waypoint identifier, together with the distance (DIS), the desired track (DTK), the (actual) bearing (BRG) to the waypoint, the ground speed (GS), current track (TRK) and estimated time en-route (ETE).

6.3.3. Map Page



This Page displays a plan view of your location, together with local waypoints and airspace boundaries.

Your aircraft is fixed at the center of the Page, oriented towards the direction of travel.

In the example to the left, the course currently being flown is 074 degrees.

The magenta line represents the desired track (DTK).

6.3.4. VNAV Page



The Vertical Navigation (VNAV) Page provides the capability to designate a target altitude for a single waypoint in your flight plan. This feature is only active during the execution of a flight plan, or a “Direct To” instruction.

As you approach the designated waypoint, the Vertical Speed Required

(VSR) and STATUS data fields on the VNAV Page will provide guidance to ensure the target altitude is achieved.

Programming a VNAV Scenario

Let’s consider a scenario whereby, at the end of a flight to KSFO San Francisco International, the pilot wishes to descend at a rate of 500 feet per minute to a pattern altitude of 1,000 MSL, three miles before arrival.



To program the VNAV Page: Push the CENTER of the GPS Rotary to activate the cursor. This will initially appear in the TARGET ALTITUDE box. Use the GPS Outer Rotary to move forward or backwards to the desired data field. Within the desired data field, use the GPS Inner Rotary, to change the value.

Note: The target position may only comprise a waypoint in your flight plan. The example above shows the completed VNAV Page for this specific scenario.



In the example to the left, the flight is underway, and we are approaching KSFO. The pilot has left the descent a little late, and therefore a rate of more than the desired 500 feet per minute is now required. The VSR data field is highlighted. The pilot should descend at a rate of -752 feet per minute.

If the pilot follows these instructions, the aircraft will arrive at the pattern altitude of 1,000 MSL at precisely 3 nautical miles from the field.

6.4. “Waypoint” Page Group

This is a group of six pages that collectively display information about the origin and destination airports. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Outer Rotary one click clockwise.

6.4.1. The Active Page



The 430 has six Waypoint Pages. These are the Airport Location (default) page, and the Runway, Frequency, Approach, Arrival, and Departure pages. Use the GPS Inner Rotary to switch between the individual Waypoint Pages.

6.4.2. Airport Location Page



This Page displays basic information about the destination airport, (or current airport where no destination is specified).

Information displayed includes name, latitude/longitude, and elevation.

6.4.3. Airport Runway Page



This Page displays a plan view of the runways at the destination airport, (or current airport where no destination is specified), and basic information about each one.

To select the desired runway:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available runways.

6.4.4. Airport Frequency Page



This Page displays the frequencies associated with the destination airport, (or current airport where no destination is specified).

AWOS = Automated Weather Observation System

CTAF = Common Traffic Advisory Frequency

DEL = Clearance Delivery Frequency

GND = ATC Ground Frequency

TWR = ATC Tower Frequency

DEP = ATC Departure Frequency

APP = ATC Approach Frequency

CTR = ATC Center Frequency

6.4.5. Airport Approach Page



the desired approach.

Push the ENT (Enter) button to complete the selection.

This Page supports the selection of the desired runway approach for the destination airport.

Push the CENTER of the GPS Inner Rotary to display a list of available approaches for the destination airport.

Rotate the GPS Inner Rotary to select



Note: You will have to additionally select (ATC) vectors to the desired approach, or a specific initial approach fix waypoint. Use the same method to make the selection.

6.4.6. Airport Arrival Page



Push the ENT (Enter) button to complete the selection.

This Page supports the selection of the desired STAR (Standard Arrival) procedure for the destination airport.

Push the CENTER of the GPS Inner Rotary to display a list of available STARs for the destination airport.

Rotate the GPS Inner Rotary to select the desired STAR.



Note: You will have to additionally select the desired transition waypoint and runway for your chosen STAR. Use the same method to make these selections.

6.4.7. Airport Departure Page



This Page supports the selection of the desired SID (Standard Instrument Departure) procedure for the airport of origin.

Push the CENTER of the GPS Inner Rotary to display a list of available SIDs for the airport of origin.

Rotate the GPS Inner Rotary to select

the desired SID.

Push the ENT (Enter) button to complete the selection.



Note: You will have to additionally select the desired runway.



As well as the transition waypoint for your chosen SID. Use the same method to make these selections.

6.5. “Nearest” Page Group

This is a group of five pages that collectively display information about the nearest airports, intersections, NDB, VOR and airspace. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Outer Rotary two clicks clockwise.



The 430 has five Nearest Pages. These are the Nearest Airport (default) page, and the Nearest Intersection, NDB, VOR, and Airspace pages. Use the GPS Inner Rotary to switch between the individual Waypoint Pages.

6.5.1. Nearest Airport Page



This Page displays the nearest airport to your current location, together with the direct heading (bearing) to that airport, the distance, the available approach-type (or VFR) and the length of the longest runway.

To proceed DIRECT to any of the airports displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available airports.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

6.5.2. Nearest Intersection Page



This Page displays the nearest intersection to your current location. An intersection is a virtual navigation fix and is usually (but not always) the intersection of two VOR radials.

Also displayed are the direct heading (bearing) to that intersection and the distance.

To proceed DIRECT to any of the intersections displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available intersections.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

6.5.3. Nearest NDB Page



This Page displays the nearest Non-Directional Beacon (NDB) to your current location, together with the direct heading (bearing) to that NDB, the distance, and the frequency (for manually-tuned ADF devices).

To proceed DIRECT to any of the NDBs displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available NDBs.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

6.5.4. Nearest VOR Page



This Page displays the nearest VOR to your current location, together with the direct heading (bearing) to that VOR, the distance, and the frequency (for manually-tuned VOR receivers).

To proceed DIRECT to any of the VORs displayed:

Push the CENTER of the GPS Inner Rotary to activate the cursor.

Rotate the GPS Inner Rotary to cycle through the available VORs.

Push the “Direct To” button.

Push the ENT (Enter) button to complete the selection.

6.5.5. Nearest Airspace Page



This Page displays the nearest controlled, or special-use, airspace to your current location, together with the airspace type.

6.6. Flight Plan Page Group

This is a group of two pages that collectively allow the viewing and loading of flight plans. A fast way to get to this page group is, to turn the GPS Outer Rotary counterclockwise to get to the Nav page group, then rotate the GPS Outer Rotary three clicks clockwise.



The 430 has two Flight Plan Pages:

1. Active Flight Plan Page. This is the default Page.
2. Flight Plan Catalog Page.

Use the GPS Inner Rotary to switch between the individual Flight Plan Pages.

6.6.1. Active Flight Plan Page



This Page displays the waypoints in the currently active flight plan.

The functions of this page will be described in detail later in the manual (see Section 6.7).

6.6.2. Flight Plan Catalog Page



The Page displays the catalog of saved flight plans that currently exists in the following folder:

X-Plane 12 > Output > FMS Plans

The functions of this page will be described in detail later in the manual (see Section 0).

6.7. Programming a Flight Plan

In this section of the guide, the steps associated with programming a flight plan will be discussed. The sample flight plan used here will be:

KLAX FIXIT3 RZS SERFR ALWAYS1 KSFO

Note that, due to changing waypoints and procedures over time, the example provided here may not be repeatable exactly.

6.7.1. Initializing the 430 / Deleting a previous Flight Plan

Before inputting a new flight plan, it's important to initialize the 430 - by deleting any existing flight plan that may be present. To accomplish this:



Rotate the GPS Outer Rotary counterclockwise until the NAV page group is displayed.

Push the FPL (Flight Plan) button to display the Active Flight Plan page.

Push the MENU button.

Rotate the GPS Inner Rotary to select

the "Delete Flight Plan" option.

Push the ENT (Enter) button to complete the operation.

6.7.2. The Initial Waypoint



Push the FPL (Flight Plan) button to invoke the Flight Plan Page (1 of 2).

By default, your current location will be the initial waypoint in your new Flight Plan.

6.7.3. Activating the Cursor



To create, update or delete waypoints in a flight plan, the cursor must be activated.

Push the CENTER of the GPS Inner Rotary to activate the cursor. The waypoint will be highlighted.

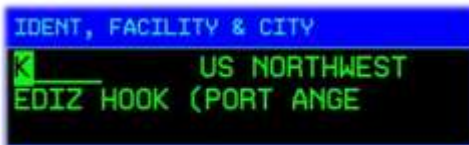
6.7.4. Inserting Waypoints



To insert a new waypoint into the flight plan:

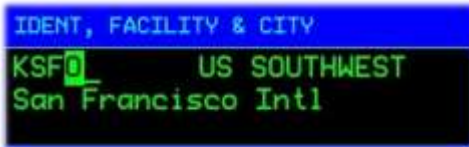
Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to position the cursor at the desired line in the flight plan (noting that the new waypoint will be inserted prior to this line).



Rotate the GPS Inner Rotary 1 click clockwise to highlight the first character of the new waypoint identifier.

Rotate the GPS Inner Rotary to change the characters in the highlighted position.



Rotate the GPS Outer Rotary to move to the next or previous character in the waypoint identifier as required.



Push the ENT (Enter) button twice to save the waypoint.

6.7.5. Deleting Waypoints



To delete a waypoint from the flight plan:

Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to select the desired waypoint.



Push the CLR Button to invoke the 'Remove Waypoint' Page.

Rotate the GPS Inner to toggle between

'Yes' and 'No'.

Push the ENT (Enter) Button to complete the operation.

6.7.6. Selecting a Standard Instrument Departure (SID)

A SID, or Standard Instrument Departure, is a predefined aerial route used by aircraft when departing from an airport. It is designed to facilitate safe and efficient routing of aircraft during the initial phase of flight and to manage air traffic effectively. Although a SID will keep aircraft away from terrain, it is optimized for air traffic control route of flight and will not always provide the lowest climb gradient. It strikes a balance between terrain and obstacle avoidance, noise abatement (if necessary), and airspace management considerations.



Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to select the departure airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Departure' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the departure runway.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired transition waypoint.

Push the ENT (Enter) button.



A graphical representation of the chosen departure procedure is displayed.

Push the ENT (Enter) Key to load the procedure into the flight plan.



The chosen departure procedure is now converted to the individual waypoints it comprises. These appear in the appropriate order at the start of your flight plan.

6.7.7. Selecting a Standard Terminal Arrival (STAR)

A Standard Terminal Arrival Route (STAR) is a predefined flight path provided by air traffic control. It typically guides you from the final waypoint of your en-route phase to the initial point of your approach to the airport, usually the Initial Approach Fix (IAF). Essentially, a STAR bridges your flight's en-route segment with its approach phase.



Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to select the arrival airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Arrival' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired arrival procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired transition waypoint.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the arrival runway.

Push the ENT (Enter) button.



A graphical representation of the chosen arrival procedure is displayed.

Push the ENT (Enter) button to load the procedure into the flight plan.



The chosen arrival procedure is now converted to the individual waypoints it comprises. These appear in the appropriate order at the end of your flight plan.

6.7.8. Selecting an Approach

An Instrument Approach, or Instrument Approach Procedure (IAP), is a set of specific maneuvers designed for guiding an aircraft under instrument flight rules (IFR) from the start of the initial approach to either a landing or to a point where you can proceed to land visually.



Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to select the arrival airport.



Push the PROC (Procedure) button.

Rotate the GPS Inner Rotary to highlight the 'Select Approach' menu option.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired approach procedure.

Push the ENT (Enter) button.



Rotate the GPS Inner Rotary to select the desired initial approach fix (IAF). You may select VECTORS in place of an IAF, if ATC is providing these.

Push the ENT (Enter) button.



A graphical representation of the chosen approach procedure is displayed.

Push the ENT (Enter) Key to load the procedure into the flight plan.



The chosen approach procedure is displayed in your flight plan, immediately after the destination airport.

6.7.9. Direct To (a Waypoint)



From the Active Flight Plan Page, or any of the 'Nearest' Pages:

Activate the Cursor (see Section 6.7.3).

Rotate the GPS Outer Rotary to select the desired waypoint.

Push the "Direct To" button.

Push ENT (Enter) to activate.

6.7.10. Activating a Leg

Use the "Activate Leg" menu option to resume navigation at a specific leg (waypoint to waypoint) within your flight plan, bypassing previous legs.



From the Active Flight Plan Page:

Activate the Cursor (see earlier in guide).

Rotate the GPS Inner Rotary to highlight the waypoint that represents the conclusion of the desired leg.

Push the MENU button.



Rotate the GPS Inner Rotary to highlight the 'Activate Leg' menu option.

Push the ENT (Enter) button.

The 430 will navigate to the first waypoint in the chosen leg, and then (once reached) to the second waypoint in the chosen leg. The flight plan will continue from that point.

6.7.11. Activating an Approach

Use the "Activate Approach" menu option once ATC clears you for an instrument approach via a transition or an initial approach fix. This will switch from en-route (ENR) or terminal (TERM) navigation to approach (APR) navigation. Flight plan navigation is canceled, and approach navigation is activated. Instead of flying to the center of the airport from an arbitrary direction, the GPS will now guide you according to the (previously) selected approach procedure.



From the Active Flight Plan Page:

Push the PROC (Procedure) button to invoke the Procedures menu.



Rotate the GPS Inner Rotary to highlight the 'Activate Approach' menu option.

Push the ENT (Enter) button.

The 430 will commence the approach, by navigating (first) to the initial approach fix for the chosen procedure.

6.7.12. Activating Vectors to Final

Use the “Activate Vectors to Final” menu option when you are vectored to the approach by ATC. When you select this, the GPS removes all approach transitions and instead shows you an extended line-up for the final approach course to the final approach fix (FAF) for the selected approach procedure.



From the Active Flight Plan Page:

Push the PROC (Procedure) button to invoke the Procedures menu.



Rotate the GPS Inner Rotary to highlight the ‘Activate Vector-To-Final’ menu option.

Push the ENT (Enter) button.

The pilot is now in control of the navigation, under instructions from ATC. The 430 will display an extended localizer for the pilot to intercept.

6.7.13. Loading a (Saved) Flight Plan

Flight plans that have been created previously (and saved in the appropriate format for X-Plane) may be loaded into the 430 (replacing the currently active flight plan). The following file (extension) types are acceptable:

- FMS (compatible from X-Plane 9 and up, contains only waypoints)
- FLP (compatible with aircraft for both X-Plane and other simulators, supports airways)
- FML (X-Plane 12 internal format, for saving your own flight plans)

This Page displays the catalog of saved flight plans that currently exists in the following folder:
X-Plane 12 > Output > FMS Plans



Turn the GPS Outer Rotary counterclockwise to get to the Nav page group.

Push the FPL button.

Rotate the GPS Inner Rotary to invoke the Flight Plan Catalog Page.



Activate the Cursor (see Section 6.7.3).

Rotate the GPS Inner Rotary to select the desired flight plan.

Push the ENT (Enter) button to load the flight plan.

6.8. The OBS Function

The Omni Bearing Selector (OBS) button provides the pilot with the capability to fly to, or from, any waypoint or fix via a chosen bearing.

Let's assume we are starting from KLAX, and the next waypoint in the Flight Plan is KTOA. Due to circumstances during the flight, the pilot wishes to approach KTOA on a bearing of North (360 degrees).



A direct course from KLAX to KTOA would look like this.

The pilot would approach KTOA on a bearing of approximately 130 degrees, and this is not the desired outcome.



Using the OBS Rotary associated with the VOR/ILS Receiver on the instrument panel:

Select the desired bearing which in this example is 360 degrees.

Note that the instrument on the left has the same functionality as the instrument in the Green Castle AATD but looks slightly different.



Click the OBS Button to place the 430 in OBS mode.

The 430 now displays a new course to KTOA. The magenta line represents the TO course (360 degrees) and the white line represents the FROM course (360 degrees).

To approach KTOA on a bearing of 360 degrees, the pilot would intercept the magenta line, and follow it to KTOA.

6.9. SUSPEND (SUSP) Mode

“Suspend” mode is invoked by the 430 when there is a requirement to delay the automatic sequencing to the next leg of the flight plan.

When OBS mode is active:

- The pilot may fly beyond the target waypoint, and then follow a radial FROM that point. When the aircraft crosses the waypoint, the 430 will automatically invoke “Suspend” mode, allowing the pilot to continue flying the FROM radial, until the pilot makes the decision to sequence to the next leg of the Flight Plan (by pushing the OBS button).

When OBS Mode is inactive:

- “Suspend” mode becomes active when a Flight Plan contains a “Hold”, and the aircraft enters that portion of the route. The 430 will continue to fly the hold without sequencing to the next leg until instructed by the pilot (by pushing the OBS button).
- “Suspend” mode becomes active when executing a published approach procedure, and a missed approach decision is required. The 430 cannot make this decision for the pilot because it is dependent on the visibility conditions, and therefore invokes “Suspend” mode. If the pilot makes the decision to continue with the approach, the 430 remains in “Suspend” mode, and continues to fly the procedure to a landing. If the pilot initiates a missed-approach, the “OBS” button must be pushed, to deactivate “Suspend” mode, at which time the 430 will sequence to the first leg of the missed approach.



430 in “Suspend” mode.

6.10. Messages

The 430 features a 'MSG' annunciator at the bottom of the display panel to alert the pilot to information that is pertinent to the flight. Most messages are advisory in nature, but some may require pilot intervention.



If the MSG annunciator is displayed:

Push the MSG (Message) button to invoke the Messages Page.

7. Simulated BendixKing KT76C- Transponder

A transponder is an electronic device in your aircraft that communicates with ground-based radar systems. When interrogated by radar signals, primarily from Air Traffic Control (ATC), it transmits a coded response providing specific information about your aircraft. The transponder in the Green Castle AATD resembles the BendixKing KT76C but it is important to note that the functionality of this device is not exactly the same as the real-world device it is inspired by. This device functions similarly to any other transponder commonly found in GA airplanes. The provided functionality is as follows:



1. IDENT: This function sends a unique signal to ATC radar, highlighting your aircraft's blip momentarily. Use this feature only when instructed by ATC.
2. Function selector knob:
 - a. OFF: The Transponder is turned off.
 - b. SBY: The transponder is in standby mode, a transponder code can be set but it is not transmitted to ATC.
 - c. TST: Test the display function of the transponder.
 - d. ON: The transponder is on and will transmit the transponder code to ATC without altitude information.
 - e. ALT: Same as ON but now includes altitude information.
3. These number buttons are used to input a transponder squawk code.
4. This button can be used when a mistake is made typing in the transponder code. It removes the number in the opposite order in which they were typed (last in, first out).
5. This button will start squawking VFR (1200) immediately.

To use the transponder instrument, simply turn the transponder on (usually on ALT). When a squawk code is received from ATC, type this code into the transponder using the number keys (item 3 in the image above). As soon as the 4 numbers for the squawk code are entered, the transponder will start transmitting them.

When the device is turned on the display provides information about the status of the device. In test mode, all display elements are turned on and this shows all information available from the display.



The following elements are visible on the display:

1. Altitude Window: displays Flight Level Altitude, marked by the letters “FL” and a number in hundreds of feet, on the left side of the display. For example, the reading “FL 065” corresponds to the altitude of 6,500 feet, referenced to 29.92 inches of mercury at sea level.
2. Function Indicator: What the current function setting of the transponder is.
3. Reply Indicator: Lights up when the transponder is pinged by a radar signal.
4. Code Window: This shows the current code that the transponder is squawking.

8. Simulated BendixKing KR-87 – Automatic Direction Finder (ADF)

An Automatic Direction Finder (ADF) is a navigational instrument used in aircraft to determine the bearing to a non-directional radio beacon (NDB) on the ground. The ADF in the Green Castle AATD resembles the Bendixking KR-87 but it is important to note that the functionality of this device is not exactly the same as the real-world device it is inspired by. The provided functionality is as follows:



1. Switches between Antenna (ANT) and ADF mode. In ANT mode the bearing instrument is not active and no bearing is shown.
2. Select BFO, this Beat Frequency Oscillator mode allows a pilot to listen to the morse code from an NDB. In the Green Castle AATD this functionality is not active, using the audio panel the pilot can always listen to the NDB.
3. Frequency transfer button, moves the stand-by frequency to the active frequency and vice versa.
4. Select Flight Timer or Elapsed Timer
5. Set and reset elapsed time
6. On/Off switch
7. Frequency select, large adjustment (by 100) of the inactive frequency.
8. Frequency select, small adjustment (by 1) of the inactive frequency.



The ADF is coupled to the ADF bearing indicator instrument that indicates the bearing to whatever NDB station who's frequency is set to the active frequency. For the example instrument to the left, the NDB is located straight east of the airplane. In order to be able to read the bearing, use the heading adjustment to set the instrument to the current heading. In the example instrument, the plane's heading straight north.

In regular mode the display shows both the active and inactive frequency:



9. Displays ANT or ADF depending on the mode. To use the ADF for navigating, ADF mode must be selected.
10. Active frequency, the frequency the ADF is tuned to.
11. Shows FRQ if a stand-by frequency is shown on the right side of the display or if a timer is shown instead. Shows BFO if BFO mode is enabled.
12. The stand-by frequency.

This particular model of ADF has a built-in timer that can be used as a primary or backup timer. To select timer mode press the FLT/ET button (button 4) and the display will change. The right side of the display now shows what timer (FLT for total flight time and ET for elapsed time) is visible instead of the stand-by frequency. The elapsed timer can be set and reset by using the SET/RST button (button 5). The timer is set, the first time this button is pressed and is reset any time the button is pressed again. This is what the display looks like while in timer mode:

9. Davtron M800 Chronometer

The Davtron Chronometer is a sophisticated timekeeping instrument designed for aircraft use. The Green Castle AATD contains the real instrument so for a very detailed user manual, consult the manufacturer's documentation. This chronometer is not integrated with any other avionics in the Green Castle AATD and does not keep time when the Green Castle AATD is turned off. As such, its main use is to measure elapsed flight time, as a countdown timer, and to measure elapsed time from a particular point in time.



9.1. Davtron 800 Operation Summary

9.1.1. Display and Control

SELECT Button: Cycles through UT (Universal Time), Local Time, Elapsed Time, and back to UT on the display.

CONTROL Button: Starts, stops, and resets Elapsed Time with a quick press. Prevents accidental time resets during normal use.

9.1.2. Setting Universal Time (UT)

Press **SELECT** to display UT.

Press **SELECT** and **CONTROL** together to enter setting mode; the hours digit flashes.

Use **CONTROL** to adjust the flashing digit, then **SELECT** to move to the next digit.

After setting all digits, press **SELECT** to exit. The display will flash, indicating UT is running.

9.1.3. Setting Local Time (LT)

Press **SELECT** to choose LT.

Enter setting mode by pressing **SELECT** and **CONTROL** together; the hours digit flashes.

Adjust hours (minutes sync with UT and can only be changed in 15-minute increments).

Press **SELECT** for 5 seconds in LT mode to toggle between 12 and 24-hour formats. Use **CONTROL** to change and **SELECT** to exit.

9.1.4. Test Mode

In UT mode, hold SELECT for 5 seconds to display "88:88" and light all annunciators.

9.1.5. Elapsed Time (ET) Count Up

Select ET. Press CONTROL to start counting from 0 up to 99 hours and 59 minutes.

Press CONTROL to stop; press again to reset to zero.

9.1.6. Elapsed Time Count Down

Select ET and enter set mode with both buttons. Set countdown time.

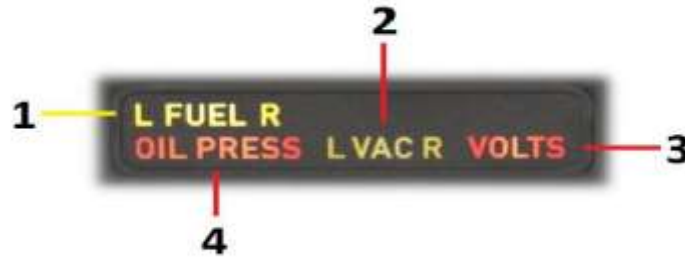
Press CONTROL to start countdown. At zero, displays flash and alarm sounds.

Press SELECT or CONTROL to stop the alarm. Press CONTROL again to stop counting or reset.

10. Annunciator Panel

The annunciator panel serves as a centralized display system that alerts the pilot to various conditions of the aircraft's systems through visual indicators. To test the annunciator panel, the red button to the right of the panel can be used.

The panel itself has 4 indicators:



1. Severity: Caution. Left/Right Fuel Pressure: Signals a decrease in fuel pressure from either the left or right supply, typically due to fuel starvation, a leak, or a fuel pump failure.
2. Severity: Caution. Left/Right Vacuum System Pressure is low, indicating a drop in vacuum pressure from the left or right vacuum pump. This may occur at low engine RPMs or due to an actual vacuum system failure. In the event of a failure, the Attitude Indicator and Heading Indicator will be affected, compromising aircraft attitude and heading information.
3. Severity: Warning. Low Voltage: Signifies the alternator is failing to generate sufficient voltage, potentially indicating an alternator failure. This will lead to gradual battery depletion and eventual electrical system failure.
4. Severity: Warning. Oil Pressure: Indicates low engine oil pressure, usually caused by insufficient oil or an oil pump failure.