WBSim

Cessna 172

Enhancement

Near Study Level

Manual By: Howard Forder

Developed For

Microsoft Flight Simulator

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INTRODUCTION:

Thank you for purchasing this Cessna 172 enhancement to the stock Asobo/Microsoft Cessna 172 in Microsoft Flight Simulator. Our hope is that it will bring you pleasure in handling a more realistic airplane experience and bring you closer to the real operational handling of this classic airplane.

This add-on applies to the stock Cessna 172 on wheels, floats and skis. To other multiplayers in your sim, they see the same Cessna 172 they saw before.

To use this add-on, you must be running the Deluxe or Premium Deluxe version of Microsoft Flight Simulator. This can't apply to the Standard version as the conventional gauges Cessna 172 isn't available in the Standard version. (only the G1000 version)

INSTALLATION:

The installation process from JustFlight is an executable file that will install itself. You will need to verify your account with JustFlight and it will continue to install.

Start up your simulator and you will find it listed with the stock 172s as WB-Sim.
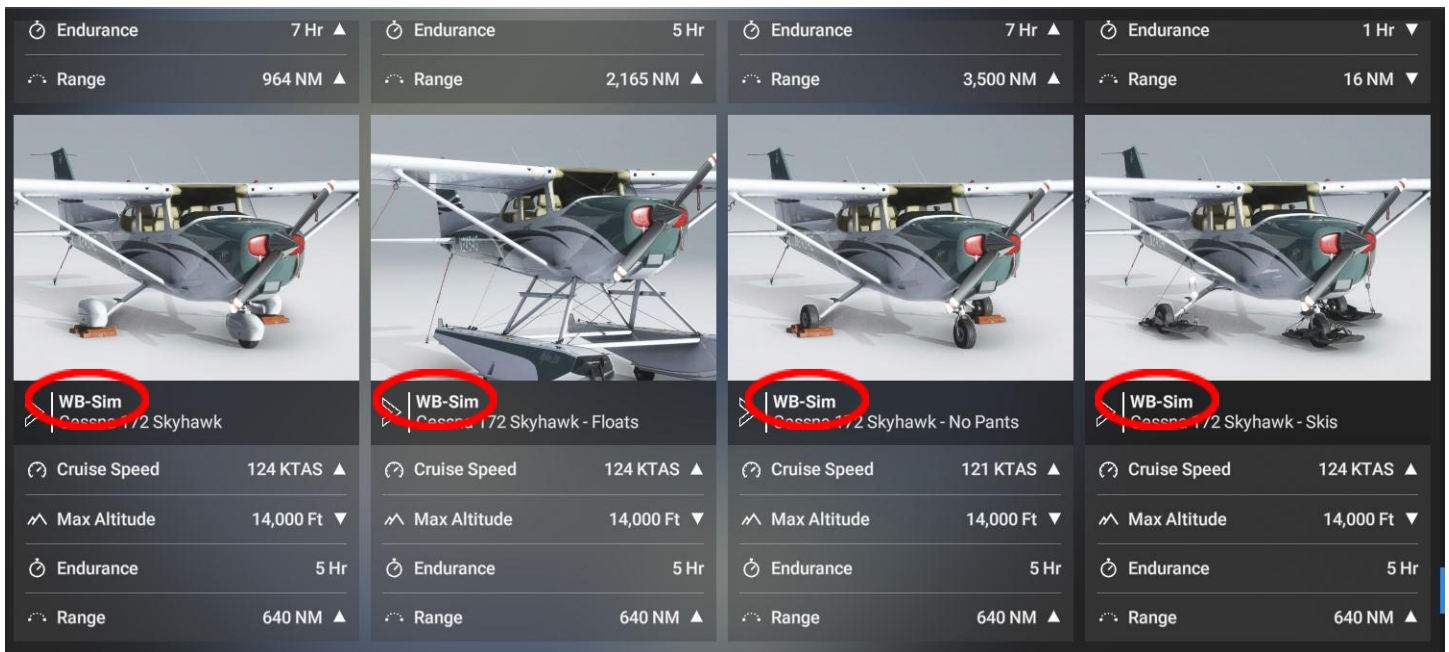
<mark>!!!!! PLEASE NOTE !!!!!</mark>

Effective v1.0.7, the GPS has been defaulted to the Working TItle implementation of the GNS 530/430. This means that some aspects of the AP will no longer work correctly, as well as some of the MD-41s functions. This is all unfortunately out of the devs control, as the WT code of the GPS is dictating how, when, and what the sims AP events do, as well as ignoring cfg file settings.

- WPT and MSG lights on the MD-41 no longer work.
- GPS/APR button will no longer activate a loaded GPS approach.
- The KAP140s UP/DN buttons will no longer affect the APs reference altitude while in ALT mode, in either the 20 FT single press increments/decrements, nor allowing a 500 FPM climb/descent while holding down those buttons, and subsequent new reference altitude upon release of said buttons.
- The APs independent BARO no longer has any effect, and will incorrectly react to the panels baro setting.

However, an optional patch has been included to revert back to the PMS 530/430 for those that wish to. Just unzip (file located in the wbsim-aircraft-c172sp-classic\PMS530_Patch folder) and put it into your community folder. You will also need to have downloaded and installed the PMS 530 mod (v1.0.54 as of this writing) from https://github.com/pimarc/pms50-gns530/releases as this will no longer be included with the plane.

CHECKLIST/POH:

Although you can simply use the checklists in the POH for a 172S, **the next page is a snapshot of a checklist** you can use. (reprinted with permission). The whole idea of making this realistic modification to the systems of this plane is so you can use the real manuals and POH in your studies and practices with the Cessna 172 and learning to fly.

For the Pilot's Operating Handbook, the POH, you can **do a web search** for "POH Cessna 172S" and you will find one you can use. Many flying clubs and schools share their POH online. A typical student and seasoned pilots will study the POH cover to cover and refer to it many times during studies and during normal flights and flight preparation.
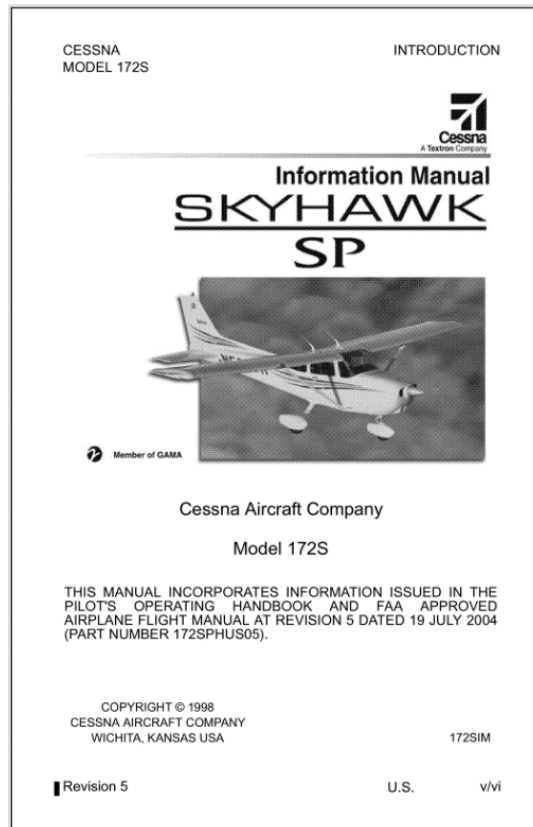
PREFLIGHT C-172S
1. Aircraft Documents - OK.
2. Weather - Suitable.
3. Baggage - Weighed, stowed, secured.
4. Weight and C.G. - CK.
5. Navigation - Planned.
6. Charts and Navaids - CK.
7. Performance - Determined
8. VOR Log (IFR) - CK.

INTERIOR
1. Hobbs / Tach time - CK.
2. P.O.H. - On board.
3. Control Lock - Remove.
4. Avionics - Off.
5. Electrical Switches - Off.
6. Mixture - I.C.O.
7. Master Switch -On/Call.
8. Fuel Quantity - CK.
9. Lights (Night) - CK.
10. Flaps - Down / CK.
11. Master Switch - Off.
12. Flight Controls - CK.
13. Fuel Shutoff - On
14. Fuel Selector - Both.
15. Trim - Neutral.
16. Windows - CK Clean.

EXTERIOR
AS PER MANUAL

BEFORE START
1. Preflight - Complete.
2. Passenger Briefing - Done.
3. Cabin Doors - Closed .
4. Seats - Adjusted / Locked.
5. Belts / Harnesses - Secure
6. Circuit Breakers - CK In.
7. All Switches - Off.
8. Brakes - Set and Test.
9. Flaps - Up

START
1. Throttle - Full
2. Mixture - Rich
3. Master switch - On/Call
4. Flaps - Up
5. Beacon - on
6. Boost Pump-on 3 secs
7. Throttle - in 1/2"
8. Mixture - ICO
9. Starter - Engage
10. Mixture - rich when running
11. Throttle - 700 RPM
12. Oil Pressure - CK
13. Mixture - Lean for taxi

HOT START
1. Throttle in 1/2 "
2. Mixture - ICO
3. Master - on
4. Flaps - up
5. Beacon - on
6. Mixture - rich when running
7. Oil Pressure - CK
8. Mixture - Lean for taxi

PRE - TAXI
1. Nav Lights - as req.
2. Radios - On / Set.
3. Transponder - Sby.
4. Flaps - Up.
5. Radio Calls - As Req.
6. Taxi Area - Clear.
7. Throttle - Apply Smoothly
8. Brakes - CK.

TAXI
Controls - Position for wind
Instruments - Ck on taxi

RUN - UP
1. Brakes - Set.
2. Fuel Selector - Both.
3. Mixture - Rich.
4. Throttle - 1800 RPM.
5. Magnetos- Max Drop 150 - Max Diff 50
6. Engine Instruments - CK.
7. Suction Gauge - CK.
8. Ammeter - CK.
9. Throttle - 700 RPM.

BEFORE TAKEOFF
1. Flight Instruments - Set.
2. Radios / Avionics - Set.
3. Engine Gauges - CK.
4. Mixture - Set.
5. Belts / Harnesses - CK.
6. Flaps - As Req.
7. Trim - Set for takeoff.
8. Controls - CK.
9. Doors / Windows - Latch.
10. Brakes - Recheck.

CROSSING HOLD LINE
Transponder – Altitude
Strobes - On.

TAKEOFF
Normal Vr - 55 KTS
Short / Soft - Per Manual

CLIMB
Vx - 62 KTS
Vy - 74 KTS
Cruise Climb - 85 KTS.

CRUISE
1. Power - Per Manual.
2. Trim - Adjust.
3. Mixture - Set.
4. Landing Light - Off.
5. Engine Instruments - CK.
6. Flight Instruments - Set.

PRE - DESCENT
1. Fuel Selector - Both.
2. Power - As Req.
3. Mixture - Enrichen.
4. Flight Instruments - Set.
5. Engine Gauges - Monitor.

45 ENTRY / Downwind CK
Fuel Selector - Both.
Mixture - Full Rich.
Throttle - As Req (85 KTS)
Landing Lts / Strobes-As Req.
Ignition – Both
Master Switch - On.
Belts / Harnesses - CK.

LANDING
Normal, Short, and Soft field As per manual.
Normal Final - 65 KTS.

ON FINAL
G. U. M.P.S.

AFTER LANDING
1. Throttle - 1000 RPM.
2. Mixture - Lean for Taxi.
3. Flaps - Up.
4. Trim - Neutral.
5. Landing / Strobes - As req.
6. Transponder - Sby / Off.
7. Unnecessary Avionics - Off.
8. Radio Calls - As Req.

SHUTDOWN / SECURING
1. Avionics / Electrical - Off.
2. Mixture - I.C.O.
3. Ignition - Off / Key on dash.
4. Master - Off.
5. All Switches - Off.
6. Windows - Close/Latch.
7. Seatbelts - Stow.
8. Control Lock - Install.
9. Name, Date, Hobbs, Tach times - Record
10. Aircraft - Properly Secure.
11. Discrepancies - Write Up.

V - SPEEDS

| C – 172S	
Vso	40 KTS
Vs	48 KTS
Vr	55 KTS
Vx	62 KTS
Vy	74 KTS
Va (2550)	105 KTS
Vfe	85 KTS
Vno	129 KTS
Vne	163 KTS
Final approach	65 KTS
Final (short field)	62 KTS
Best Glide	65 KTS

ENGINE STARTUP:

Engine start can be done completely using the checklist or POH checklists. Fuel switch on the floor pushed in and fuel selector on both.

Then prime the engine before you start it unless you flew it already and it is still warm:

Mixture and Throttle all the way in, fuel pump switch on for 3 seconds to show a positive fuel flow, then fuel pump off.
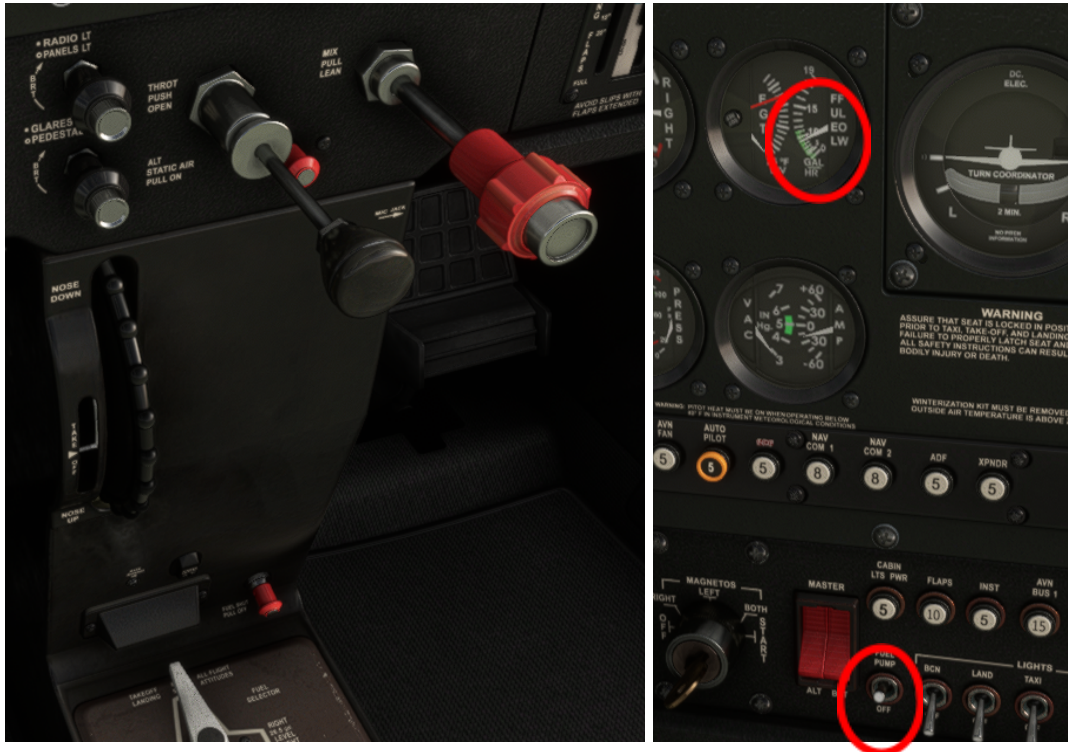
Now set everything for your engine start: *(modified for this sim for now)*

1. Throttle -- ~~OPEN 1/4 INCH.~~ Open closer to 1/4 of the way, about the length of the knob. (pull all the way out, then in a ¼ of the way.)

2. Mixture -- IDLE CUTOFF. (all the way out, then ¼ of the way in)

3. Propeller Area -- CLEAR.

4. Master Switch -- ON.

5. Flashing Beacon -- ON.

6. As you turn the key, push the Mixture all the way in to start the engine.

7. Set RPM to around 1000 to 1200 rpm to see a positive charge.

MAINTENANCE/STATUS:

The developers of this modification have added a useful, hidden screen for us to see the status of our engine, turn state saving and realism on or off, interact with the external elements, and two DME readouts. This is located inside the ADF screen and you access it by clicking the screen. This ADF works as it should otherwise.

Turning either of the knobs will step you through the various screens.

Pressing any of the three rightmost buttons or cycling the power will return it to the normal ADF screen. The ADF will still be fully functional in the background and this won't impact the state of the ADF.

This convenient maintenance and status screen uses standard green, yellow and red letters to show severity levels of each area. Engine health is a very long running failure of 300 – 500 hours, however excessive abuse can shorten the engines lifespan. Being fouled, running with low oil, and even over revving can have a detrimental effect.

Clicking on ENG HLTH will prompt you to repair the engine, and a second click will then restore the engine.

Clicking OIL LVL will prompt you to add 1 quart of oil. This can be done once you are at 7qts or less.

Fouling is caused by the fuel mixture being too rich: lean it according to the POH, even when taxiing as in real life.

Fouled plugs will reduce performance and have rough engine running.

To clear the spark-plugs of any buildup, increase throttle and lean the mixture until the engine almost cuts off, then push mixture slightly. You should be at a very high throttle and very lean mixture while still maintaining

about 1500 RPM. Do this for 30 - 45 seconds. In this configuration, you should be able to clear the heaviest of buildup fairly quickly. NOTE: Clicking FOULING on the screen will not do anything.

IMPORTANT TIP: The engine must be off and the plane parked to perform any maintenance. Any items that are grey have either been disabled, or are unable to be serviced at the moment.

EXTERNAL ELEMENTS:

The selection of the external elements can be done here. Red means that that element is in place. Anything left on will have an impact on your flight. From not being able to taxi because you're tied down, to overheating the engine because you took off with the cowl plugs still in.

The next screen, you can turn state saving on or off, change the LCD color, and adjust the ground trim tab.

LCD COLOR:

Just for fun, selectable LCD colors have been added. There are five colors. The last one, seen here in purple, can easily be changed by editing the value listed in wbsim-aircraft-c172sp-classic\Config\C172X\config.json to the HEX color value of your choice. https://htmlcolorcodes.com/color-picker/

STATE SAVING:

The state saving is quite comprehensive, with 90+ points being recorded. From all the switches, the lighting knobs, radio frequencies, if the plane was left running, even the breakers and battery voltage. ALL will be restored as you last left your plane.

Please be aware there is a few seconds delay from the time the plane loads, and the time the saved state is loaded. Wait for it.

TRIM TAB:

Turning the outer knob will adjust the rudders ground adjustable trim tab.

Lastly are the two DME readouts, one for each radio as indicated by the number in the top left of the screen.

THE ELECTRICAL SYSTEM:

Extensive modifications have been done to make the electrical system more realistic. When the POH states the engine starter cycle of 10 seconds on and 20 seconds off to ensure cooling of the starter, you can be sure if you continuously crank the engine without fuel, the temperature will continually rise and smoke will eventually happen to the starter.

In addition, if the outside temperature is cold, the available "cold cranking amps" of the battery are less. The battery voltage on the clock/timepiece has been modified according to the POH and it correctly displays the battery voltage.

Switches operate relays, which can handle higher currents. This has been modified in the sim too so when the battery voltage drops below a certain level, relays don't kick in and electrical functions won't toggle. Additionally, as a battery wears down, say, due to the alternator switch not being on or an alternator malfunction, eventually the relays that operate the various electrical functions will "kick out" meaning that electrical functions will turn off on their own, regardless of switch position.

This is like the real thing. The Ammeter reflects the realistic gauge too.

Refer to the POH for more descriptions of the electrical system.

Press the top button to toggle between Outside Air Temperature and battery voltage

CIRCUIT BREAKERS:

As a student pilot, you learn very quickly that your startup checklist and your downwind checklist always runs your thumb across the circuit breakers to ensure they are all "pushed in". This has been modelled in this upgrade with a visual indication that a circuit breaker has "popped" for no apparent reason. You reset it by clicking it with the mouse.

Additionally, you can manually pop a breaker to reset an electronic device such as the autopilot or a radio unit. As in real life, when a circuit breaker pops, you can reset it as advised in the POH. But you might have to continually reset it and as in real life, it could eventually not work at all. These older planes could have faulty electrical equipment or maybe a "loose wire" that has rubbed against something for too long causing shorts and tripping a breaker from time to time.

Another great feature is when your battery is drained too low to turn anything on, you can "hookup to outside power". When you are parked at an airport, and IN a parking spot, you can click the "INOP" breaker to initiate the battery charger. The charger will be visible on the outside whilst the battery is charging. With your power switch on, hovering over this breaker will show you the battery voltage as it charges (assuming the sims tooltips are on). Eventually, your clock will show voltage too and your annunciator will come to life, as in real life.

With the ability to "pop" or pull any breaker gives us the realism we experience with a flight instructor who will randomly pull a break and announce that you have "lost your flaps...now what do you do?" or other similar tests of partial panels or failures. This is a normal progression of flight training to prepare you for failures of any sort. Again, use your POH Emergency section to correct or compensate for the problem with the correction flow.

Another example could be the autopilot breaker. It is a normal procedure to pull that breaker when your autopilot isn't doing what you expect and somehow the AP disengage isn't working either. We simply pull the breaker to recycle and reset it. (it's the orange breaker in the first row)

The ALT and BAT switches below those breakers now energize relays, as in the real plane. If your battery voltage is too low to hold a relay, an electrical malfunction could occur even if your switch is in the on position.

The System Annunciator:

This small but needed feedback device advises the pilot of malfunctioning or warning conditions of the airplane, such as low voltage, low oil pressure, low fuel or low vacuum: all systems that are crucial to flight.
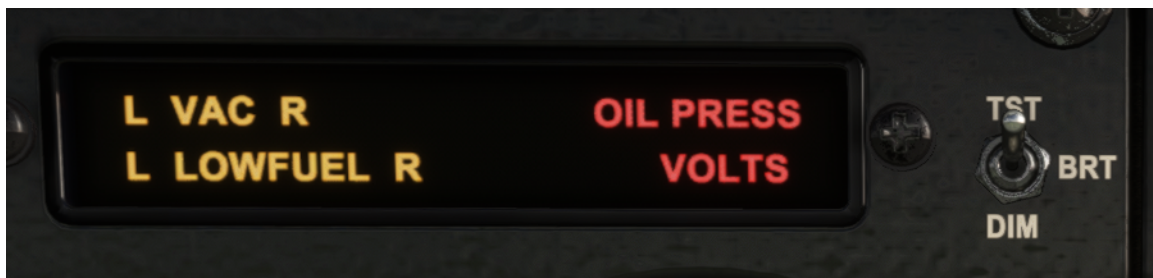
The switch works as it should with the TST (test) to show all lights are working and the bright/dim functionality that is needed in day or night flight. The test function purpose is to ensure all the light bulbs behind that screen work properly before flight. (similar to turning the key in your car and seeing the dashboard light up before you start the engine)

Avionics:

This is a big area of the modifications done to the airplane. Each electronics unit in the airplane had to be modified to display the realistic behavior according to the POH or the electronics unit manual. As an example, if the manual for the transponder says that the "Test" function will show all readouts available, it has been reprogrammed to do this in this modification. We will have to step through the various electronics units (or the "radio stack" as it is sometimes referred to so we can highlight some of the modifications done. For more detailed operation of each unit, refer to the POH, as in real life or the manual from the manufacture of the unit. (see Additional Study Manuals)

The most prominent units are the GNS 530/430 units at the top that make up the COM1&2 and the NAV1&2. This is also the GPS moving map and all the wonderful functions that come with these units. This manual will not describe them, nor will your POH. You will need to consult the manuals for these devices to fully understand them.

But the rest of the radio stack, including the ADF and the ELT to the right are all "radio devices", that is, they receive or transmit radio signals. These units have been modified to act like their real-life counterparts. The following pages will describe what has been done.

The Transponder:

Let's start at the bottom as this unit can also tell us the version of this modification we have installed.

The Bendix/King XPDR model KT 76C TSO has an accompanying operations manual included in our "Additional Study Materials" section near the end of this manual.

At its core, the transponder receiver/transmitter sends a code from your plane so that ATC radars can identify you and determine your speed, altitude etc. For new pilots in VFR training, we use code 1200 unless otherwise directed by ATC. There is a convenient VFR button on the lower right to quickly change to this code. Otherwise you punch the appropriate buttons. All the functions work as they should, including the TST position of the dial. This tests that all readouts work. This mod also includes the version number of this modification software in the lower left corner for your convenience.

THE AUTOPILOT:

This unit has been redone from the ground up to work just as the manual says it should. The Bendix/King KAP 140 autopilot unit is common in many older Cessna 172s and so it may be that the plane you use for real flight lessons has one and you need to know how to use it. Labels on this unit are familiar in other autopilot systems, such as HDG, NAV, APR, REV and ALT.

The UP/DN buttons are used when setting your vertical speed while in VS mode and the inner/outer dial is used for setting the Altitude Reference.

When you first power up your plane, the standard pressure (North America) is flashing on this unit until you press the BARO button. If you long-press the BARO button, it will change to HPA. Use the inner/outer dial to set the barometric pressure here anytime you adjust it on your Altimeter.

Once you have set that, the AP unit will work as it should. Consult the "Additional Study Materials" near the end of this manual for links to this unit's operating manual.

Here, the APR button has been pressed as indicated by the GS ARM mode in the lower left of this display. This AP unit connects to the GNS 530/430 flight plan and changes their screens from GPS mode to VLOC mode for you.

As a hint, to aid in reducing confusion, use the ALT button to toggle between VS mode and ALT mode and the ARM button when setting these parameters if it doesn't auto-arm for you.

THE AUTOMATIC DIRECTION FINDER (ADF) UNIT:

We have already covered the special functions on this unit. The normal ADF functions work as they should, even if you are using the maintenance menus.

The Emergency Locator Transmitter:

The ELT can activate when you have a hard landing or a crash and that has been modeled to do so properly and with the correct sound and flashing light.

You will also notice that it also has the inspection date updated too, just to confirm you have this modified version. Your added livery might change this panel.

A pilot is taught to monitor the guard frequency 121.5 at all times, usually through COM2 and as a quick check after every landing to ensure we haven't triggered it.

The test function works as well, as you would do in a typical real plane.

Keep in mind that it will not broadcast to other multiplayer users as some simulation users would then use it as a prank on a continual basis. Only you will hear this.

THE ANNUNCIATOR PANEL:

This is an important device in your airplane and it has been modeled according to the manual. It works in conjunction with the systems annunciator described earlier.

You can see the two push buttons that work with your autopilot and the GNS systems. The GPS APR button will activate the loaded approach.

You can test all the lights using the TST switch at the same time you test the system's light bulbs. If your power switch is on and the avionics are powered up, all lights should be on when you use the TST switch in the up position as shown here.

THE AUDIO PANEL:

The audio panel has been tweaked by the developers to work as it should according to the POH. With it, you can transmit and receive on either COM radio, you can listen to morse code to confirm radio nav tuning and radio markers. The volume control works so ensure you have it up full before you need to count on it. Remember that the actual COM/NAV radios are in the GNS 530/430 radios in your stack.

THE GNS 530/430 UNITS:

The two main GPS and COM/NAV radio units are the heart of your navigation system.

This manual won't go into a tutorial on how to use them but they each use an avionics power bus independently meaning that the Avionics BUS1 turns on the top unit, the 530, and the Avionics BUS2 switch turns on the lower unit, the 430. This is a tweak in this mod. Realistically, use the top unit for COM1/NAV1 in case a power bus fails.

You still have to turn the small power/volume dial to turn them on individually and adjust their volume, as in the real units. They are connected to your annunciator panel and the autopilot KAP 140 unit and work together as they should. (PMS 530 only)

CLOCK/TIMER FUNCTIONS:

You will notice the 4 timer functions in the lower left of the display. These have been modified to work according to the Davtron 803 Clock Operation Manual, including a FT alarm, an ET countdown mode with alarm, FT reset, and screen test. The ability to also set LT to 12 or 24 hour formats is also included, and is done by holding down the CONTROL button for 3 seconds while in LT mode.

For VC use, the ability to push both the SELECT and CONTROL buttons at the same time has been simulated by clicking on the clock display.

Please refer to the manual and learn how to use these important functions for your cross-country flights as you would expect in the real plane.

AIRFRAME DAMAGE & ELT:

An added set of realism settings have been implemented to help with your experience in learning to fly and handle an airplane properly. These modifications come in the form of:

1. *ELT activation on hard landing*
2. *Wear and tear on the main landing gear to the point where they eventually break.*
3. *Collapse of the front steerable wheel gear assembly and subsequent prop strike and smoke. Very dramatic and something you never want to witness in real life.*

Ensure you have damages enabled in your settings so that hard crashes actually work. Having these damage settings enabled is essential for the correct operation of some of the failure items, as well as proper engine priming.
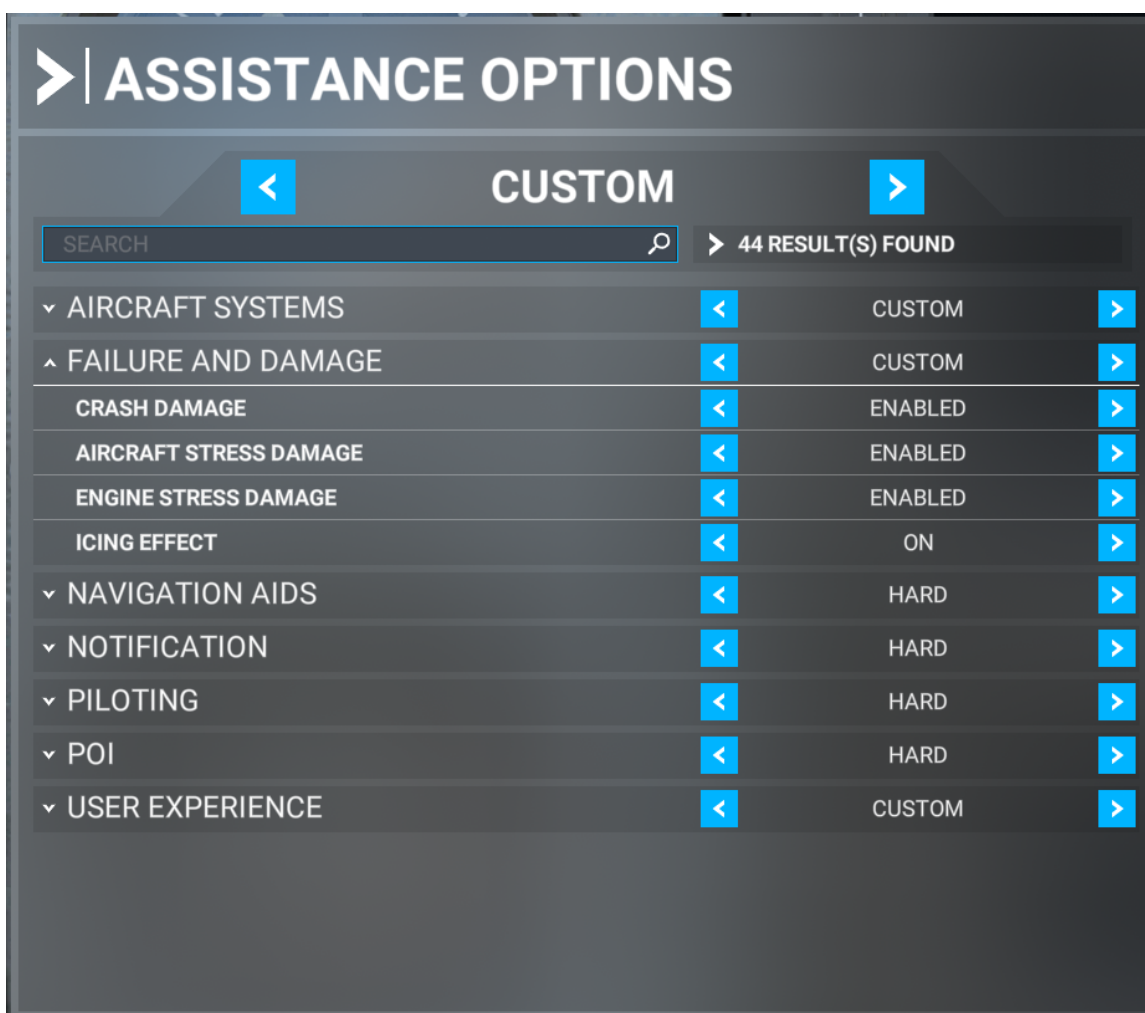
Although entertaining on live session channels, there is no fix or Y key to continue. Restart the flight and try not to do it again (unless you are testing the plane's limits)

The main gear can collapse as metal fatigue increases over time, as in real life. With that bent propeller, you will need a new engine too. Ouch!

Additional Study Manuals:

You have been reading all along that you can learn more by referring to the actual manuals that relate to each of the electronic units described. These manuals were the basis for the developers to modify this airplane; so it will act like the manuals say it will act. Here are the links for manuals you can use for reference when learning more and studying this airplane in your flight endeavors.

Further information about the plane's systems can be found online and in your POH.

You can do a web search to find a POH to use. For copyright reasons, we don't include one in this package. Search for "Cessna 172S POH". Plenty of clubs and schools share them.

The supplements section of the POH also contains useful information. Here are some publications published for the real thing:

KAP 140 Autopilot

KT 76C Transponder

KR 87 ADF

M803 Clock

Garmin 530

Garmin 430

PMS GNS 530/430 Mod

SUPPORT:

The most effective way to get support is to join the [WB-SIM discord server](). There you will find text chat information and direct support.

#updates

#faq

#the-library

#how-to-convert-a-livery

#we-love-vfr

#general

#feedback

#bug-report

#liveries

#hardware-setup

And a voice channel if it should be needed.

LIST OF VARIABLES:

** SETUP DETAILS FOR SOME BUTTONS MAY ALSO BE FOUND IN THE #HARDWARE-SETUP CHANNEL

AUTOPILOT
H:KAP140_Push_AP   AND   L:AUTOPILOT_PUSH_AUTOPILOT_1
H:KAP140_Push_HDG   AND   L:AUTOPILOT_PUSH_HEADING_1
H:KAP140_Push_NAV   AND   L:AUTOPILOT_PUSH_NAVIGATION_1
H:KAP140_Push_APR   AND   L:AUTOPILOT_PUSH_APPROACH_1
H:KAP140_Push_REV   AND   L:AUTOPILOT_PUSH_BACKCOURSE_1
H:KAP140_Push_ALT   AND   L:AUTOPILOT_PUSH_ALTITUDE_1

H:KAP140_Push_UP   AND   L:AUTOPILOT_PUSH_VERTICALSPEED_UP_1
H:KAP140_Push_DN   AND   L:AUTOPILOT_PUSH_VERTICALSPEED_DOWN_1
H:KAP140_Push_UP_short_press   AND   L:AUTOPILOT_PUSH_VERTICALSPEED_UP_1
H:KAP140_Push_DN_short_press   AND   L:AUTOPILOT_PUSH_VERTICALSPEED_DOWN_1

H:KAP140_Push_ARM   AND   L:AUTOPILOT_PUSH_VERTICALSPEED_DOWN_1
H:KAP140_Push_BARO   AND   L:AUTOPILOT_PUSH_FLIGHTLEVELCHANGE_1   AND   L:KAP140_ButtonBaroPress
H:KAP140_Long_Push_BARO - HANDLED INTERNALLY, BARO EXAMPLE BELOW
H:KAP140_Knob_Outer_INC
H:KAP140_Knob_Outer_DEC
H:KAP140_Knob_Inner_INC
H:KAP140_Knob_Inner_DEC
   ALONG WITH THE H:EVENTS FOR THE KNOBS, L:VARS CAN ALSO BE ADDED TO DRIVE THE ANIMATION OF THE KNOBS. SET THESE TO INCREMENT
   OR DECREMENT BY 10, WITH A RANGE DEFINED 0-350, AND WITH A ROLLOVER.
L:KAP140_INNER_KNOB
L:KAP140_OUTER_KNOB
L:KAP140_RightBlock - OPTIONAL DISPLAY OF THE RIGHT SIDE INFO IE. ALTITUDE ALERTER ALTITUDE, VERTICAL FPM, OR BARO MATCHING THE VC.

ADF
H:ADF_ANTADF (AND L:ADF_Push_ADF_1, HOWEVER THIS IS NOT NEEDED AS ITS BUILT IN ALREADY)
H:ADF_BFO (AND L:ADF_Push_BFO_1, HOWEVER THIS IS NOT NEEDED AS ITS BUILT IN ALREADY)
H:ADF_FRQTRANSFERT   AND   L:ADF_Push_FRQ_1
H:ADF_FLTET   AND   L:ADF_Push_FLT_1
H:ADF_SETRST   AND   L:ADF_Push_SetReset_1
K:ADF_VOLUME_INC
K:ADF_VOLUME_DEC
   OR K:ADF_VOLUME_SET 0 - 100
A:ADF ACTIVE FREQUENCY:1 DISPLAY VAR FOR THE ACTIVE
A:ADF ACTIVE FREQUENCY:2 DISPLAY VAR FOR THE STANDBY
H:ADF_FREQUENCY_OUTER_KNOB_INC   AND   L:ADF_LARGE_KNOB (INCREMENT BY 10)
H:ADF_FREQUENCY_OUTER_KNOB_DEC   AND   L:ADF_LARGE_KNOB (DECREMENT BY 10)
H:ADF_FREQUENCY_INNER_KNOB_INC   AND   L:ADF_SMALL_KNOB (INCREMENT BY 10)
H:ADF_FREQUENCY_INNER_KNOB_DEC   AND   L:ADF_SMALL_KNOB (DECREMENT BY 10)
L:XMLVAR_ADF_FREQUENCY_10_KHZ SET 1/0 (KNOB PUSH VAR)

TRANSPONDER
H:TRANSPONDER0   AND   L:TRANSPONDER_Push_0_1
H:TRANSPONDER1   AND   L:TRANSPONDER_Push_1_1
H:TRANSPONDER2   AND   L:TRANSPONDER_Push_2_1
H:TRANSPONDER3   AND   L:TRANSPONDER_Push_3_1
H:TRANSPONDER4   AND   L:TRANSPONDER_Push_4_1
H:TRANSPONDER5   AND   L:TRANSPONDER_Push_5_1

H:TRANSPONDER6   AND   L:TRANSPONDER_Push_6_1
H:TRANSPONDER7   AND   L:TRANSPONDER_Push_7_1
H:TRANSPONDERVFR   AND   L:TRANSPONDER_Push_VFR_1
H:TRANSPONDERCLR   AND   L:TRANSPONDER_Push_CLR_1
H:TRANSPONDERIDT   AND   L:TRANSPONDER_Push_IDT_1
L:172X_XPNDR_KNOB 0-4   0-OFF 1-SBY 2-TST 3-ON 4-ALT

BREAKERS
L:172X_AVFAN_BREAKER_PULLED
L:172X_AP_BREAKER_PULLED
L:172X_BATTERY_CHARGE - 1/0 AUTO TURNS OFF WHEN FULL
L:172X_NAVCOM1_BREAKER_PULLED
L:172X_NAVCOM2_BREAKER_PULLED
L:172X_ADF_BREAKER_PULLED
L:172X_XPNDR_BREAKER_PULLED
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L:172X_LTSPWR_BREAKER_PULLED
L:172X_FLAPS_BREAKER_PULLED
L:172X_INST_BREAKER_PULLED
NO VARS FOR AVN BUS 1/2 BREAKERS
L:172X_TURNCOORD_BREAKER_PULLED
L:172X_INSTLTS_BREAKER_PULLED
L:172X_ALT_BREAKER
L:172X_WARN_BREAKER_PULLED

AUDIO PANEL
L:172X_TRANSMISISON KNOB   SET 0-5

M803 CLOCK
L:172X_M803_TOP - DISPLAYS VOLTS, TEMP C OR F
H:OCLOCK_OAT   AND   L:INSTRUMENT_PUSH_CLOCK_OAT_1
H:OCLOCK_SELECT   AND   L:INSTRUMENT_PUSH_CLOCK_SELECT_1
H:OCLOCK_SELECT_LONG
H:OCLOCK_CONTROL   AND   L:INSTRUMENT_PUSH_CLOCK_CONTROL_1
H:OCLOCK_CONTROL_LONG

MD41 ANNUNCIATOR
K:TOGGLE_GPS_DRIVES_NAV1 WITH L:172X_NAVGPS - SET TO 1 FOR THE ANIMATION
H:AS430_GPSAPR_PUSH WITH L:172X_GPSAPR - SET TO 1 FOR THE ANIMATION

MISC
K:VOR1_OBI_INC
K:VOR1_OBI_DEC
K:VOR2_OBI_INC
K:VOR2_OBI_DEC
K:HEADING_BUG_INC
K:HEADING_BUG_DEC
LIKE THE EXAMPLE FOR THE KNOBS ON THE AP, THERE ARE ADDITIONAL L:VARS THAT CAN BE USED FOR THE KNOB ANIMATIONS. SETUP IS THE SAME.
  L:INSTRUMENT_CDI_KNOB_SOURSE_1_1
  L:INSTRUMENT_CDI_KNOB_SOURSE_2_1
  L:INSTRUMENT_HEADINGINDICATOR_KNOB_HEADING_1

ADVANCED EXAMPLES

Most of the Bendix buttons can be set up in the same manner. Everything EXCEPT the APs UP/DN and Baro buttons, as well as the ADFs Set/Rst button can be done this way. We'll cover those in a moment.

For all the other ones, the easy way is to set up a short press, sending the H:event, and its matching L:var, setting the L:var to 2. An advantage of this method is that it keeps a "long press" available for a separate function. In this example on the left, a long press of the HDG button will set the heading bug to the plane's current heading.

The harder way is to set up a 3 event press. What it does when you press the button, what it does WHILE it's being held in, and what happens once you release the button. This is done so that the button in the VC will stay pushed in as long as you are holding the button in on your hardware. This method is purely cosmetic and will match what clicking with the mouse would do. The downside is that you will lose the long press event for an additional function.

BUTTON_1 (AP HDG Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed for a longer time (> 1s)		Set **AUTOPILOT HEADING LOCK DIR** to [HEADING INDICATOR (DEGREES)]	0	0
Button pressed for a short time (< 1 s)		Send **KAP140_Push_HDG**-Event Set **AUTOPILOT_PUSH_HEADING_1 (LVAR)** to 2	0	0

BUTTON_1 (AP HDG Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed		Send **KAP140_Push_HDG**-Event Set **AUTOPILOT_PUSH_HEADING_1 (LVAR)** to 10	0	3
Button held		Increment **AUTOPILOT_PUSH_HEADING_1 (LVAR)** by 1	0	133
Button released		Set **AUTOPILOT_PUSH_HEADING_1 (LVAR)** to 0	0	3

The other buttons mentioned, WILL need to be done the more complicated way, as these actually do have different functions depending on if it was as short press, or holding the button in.

For the AP UP/DN buttons:

BUTTON_6 (AP V/S Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed		Set **AUTOPILOT_PUSH_VERTICALSPEED_UP_1 (LVAR)** to 10 Send **KAP140PushUPshortpress**-Event	0	3
Button held		Increment **AUTOPILOT_PUSH_VERTICALSPEED_UP_1 (LVAR)** by 1	0	224
Button released		Send **KAP140_Push_UP**-Event Delay execution for 100 ms. Set **AUTOPILOT_PUSH_VERTICALSPEED_UP_1 (LVAR)** to 0	0	3

For the BARO button:

BUTTON_8 (Auto Pilot Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed		Set **AUTOPILOT_PUSH_FLIGHTLEVELCHANGE_1 (LVAR)** to 10 Send **KAP140_Push_BARO**-Event	0	16
Button held		Increment **AUTOPILOT_PUSH_FLIGHTLEVELCHANGE_1 (LVAR)** by **1**	0	2357
Button released		Set **AUTOPILOT_PUSH_FLIGHTLEVELCHANGE_1 (LVAR)** to 0 Set **KAP140_ButtonBaroPress (LVAR)** to 0	0	10

For the CLOCK OAT button:

BUTTON_1 (AP HDG Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed for a short time (< 1 s)		Set **INSTRUMENT_PUSH_CLOCK_OAT_1 (LVAR)** to 2 Send **oclock_oat**-Event	0	0

For the CLOCK SELECT and CONTROL buttons:

BUTTON_2 (AP NAV Button)

Event	Condition	Action(s)	Prio	Ct
Button pressed		Set **INSTRUMENT_PUSH_CLOCK_SELECT_1 (LVAR)** to 10 Send **oclockselectlong**-Event	0	0
Button held		Increment **INSTRUMENT_PUSH_CLOCK_SELECT_1 (LVAR)** by **1**	0	0
Button released		Set **INSTRUMENT_PUSH_CLOCK_SELECT_1 (LVAR)** to 0 Send **oclock_select**-Event	0	0