



Pilatus PC-12  
powered by  
Reality Expansion Pack

v4.8.11

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## AIRCRAFT GENERAL DESCRIPTION

Pilatus announced the PC12 in 1989 and eventually the Swiss Federal Office of Civil Aviation issued the type certificate for in March 1994.

Since entering service, Pilatus developed a large number of improvements and options upon the original PC-12 model:

- Increases in the maximum takeoff weight
- Use of increasingly powerful engines
- New avionics
- Noise-reduction measures
- New propellers
- Speed and range increases
- Additional interiors
- New inflight entertainment systems.

Other aviation firms, such as inoff Aviation Products, have also produced their own independent products and aftermarket enhancement packages for the PC-12.

Pilatus announced the PC-12NG (Next Generation) in 2006 and the first one was delivered in 2008. The NG features a more powerful Pratt & Whitney PT6A-67P engine that brings better performance to the climb and cruise profile. The PC-12 was the only high-end single-engine turboprop that lacked a full glass cockpit option. The NG was then designed to fill this gap, featuring a full glass Honeywell Primus Apex cockpit.

The PC-12M (M for Multipurpose) is based on the PC-12 NG. It is equipped with a powerful electrical generator. It allows additional power-consuming equipment to be used onboard. This enables the PC-12M to perform missions such as flight inspection, air ambulance, aerial photography, and aerial surveillance. An optional utility door accommodates parachute drops of people and cargo. This version is marketed in the United States as the PC-12 Spectre paramilitary special missions platform.



## INSTALLATION & CONFIGURATION

### System requirements

This software requires X-Plane 11.00 or superior.

The minimum hardware requirements are the same of X-Plane:

- Dual Core, 2.5 GHz or faster
- 2 GB of RAM
- A video card with at least 500 MB of VRAM.

This software is designed to run on Windows, MacOS and Linux.

### Linux

If you use REP on Linux, there are some additional requirements:

- libstdc++6
- libgcc6
- libcurl
- libssl
- libcrypto

On Steam: Right-click on X-Plane 12, select Properties, navigate to Compatibility, check the box for "Force the use of a specific Steam compatibility tool," and choose "Steam Linux Runtime 3.0 Sniper" or "Legacy Runtime 1.0" from the dropdown menu.

### Base Airplane

In order to install this software, the **Pilatus PC-12 for X-Plane 11 by Carenado** must be installed on your system.

### Install the software

**Note:** A video tutorial is available on [our YouTube Channel](#)

To install the software please follow this procedure.

1. Install the PC-12 in your X-Plane.
2. Clone the PC-12 folder and call it "PC-12 REP".
3. Extract the contents of this REP package into a temporary folder
4. Move **the contents** of "**into-aircraft-plugins-folder**" into the "**PC-12 REP/plugins**" folder
5. Move **the contents** of "**into-aircraft-main-folder**" into the "**PC-12 REP**" folder
6. Run X-Plane and load the PC-12.
7. Follow the onscreen instructions



## Automatic Update of the Software

The Reality Expansion Pack support the automatic updates via the [SkunkCrafts Updater](#) plugin. In order to activate the automatic updates you shall:

1. Install the SkunCrafts Updater plugin as stated in its user manual
2. Inside REP's zip, inside the "into-aircraft-main-folder", you find a file called **skun-crafts\_updater.cfg**. Copy such file into the PC-12 main folder.

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### NOTE

- Always install REP's skunkcrafts\_updater.cfg file even when the airplane already comes with its own cfg. REP updates will automatically install the base airplane updates whenever available.
  - Load a non-REP airplane - such as the default Cessna 172 - before applying the automatic updates. Applying the updates on the aircraft that is currently loaded in the sim will not guarantee a successful update.
  - After updating the plane, close and relaunch X-Plane to make sure that all the files are unloaded and updated correctly.
- 

## Manual Update of the software

NOTE: It is not necessary to remove the older REP files. The software will take care of the update procedure.

1. Copy the "REP" folder contained in this package inside the "plugins" folder of the PC-12, overwriting the existing one.
2. Run X-Plane and load the PC-12.
3. Reload the aircraft when the automatic update is finished (click on Developer > Reload the Current Aircraft and Art).

## Remove the software

To remove the software follow this procedure:

1. In the menu bar click on "Plugins"
2. Click on "SimCoders.com - REP" and choose "Disable Package"
3. Click "Ok" in the confirmation message
4. Reload the aircraft when the uninstallation procedure ends (click on Developer > Reload the Current Aircraft and Art).

At the end of the uninstallation procedure, the original aircraft will be restored to its mint conditions.

## Recommended sound settings

To better enjoy the Reality Expansion Pack on the PC-12, you should setup your sound settings like the following screenshot.

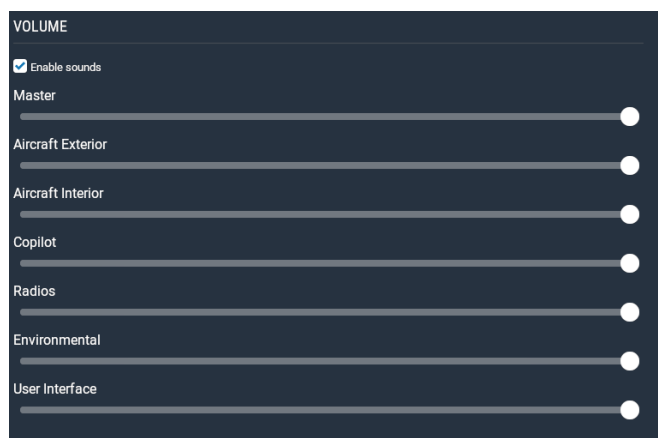


Figure 1: Recommended sound settings

For more information about the sounds, see the [Sounds System](#) chapter.

## Recommended control settings

To have a better control over the airplane axis, you should setup your control sensitivity as follows.

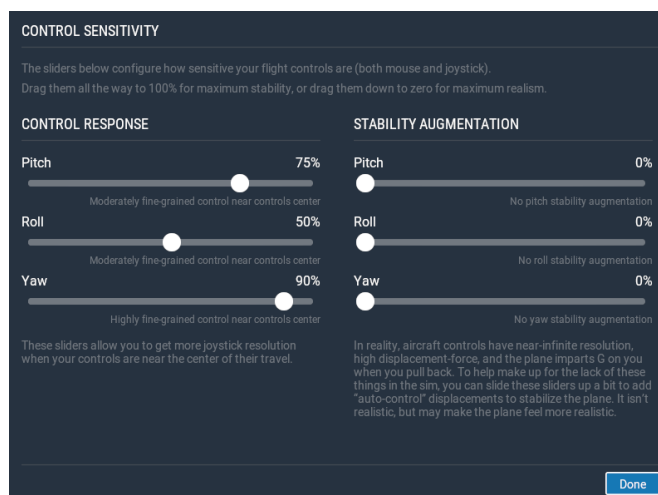


Figure 2: Recommended control settings



## HARDWARE & SOFTWARE COMPATIBILITY

### Headshake

If [HeadShake](#) v1.5 or higher is installed in your system, it will communicate with REP to improve the simulation realism.

REP will drive HeadShake to simulate the vibrations of the real engine. Using this, you will be able to run the engine at the most comfortable RPMs by simply checking the vibrations it produces.

In the same way, HeadShake will simulate the stall buffeting if the airplane in use shows that kind of behavior.

### Saitek Panels

This software is compatible with Saitek Panels. In order to use them, you should install the [XSaitekPanels](#) free plugin from Sparker.

This package already includes a INI configuration file for XSaitekPanels. Make sure you copy it inside the main folder of your PC-12.

### XPREalistic

The Reality Expansion Pack can be used together with XPREalistic.

You might need to disable XPREalistic's wind, touchdown and brakes sound effects as REP already provides them.

### Differential and progressive brakes for X-Plane 11

The Reality Expansion Pack detects if [Differential and progressive brakes for X-Plane 11](#) is installed in your system.

If so, REP's differential braking algorithm is disabled in favor of the custom differential brakes algorithm of the third party plugin.



## USER INTERFACE

### Lateral Menu

When loaded, REP shows a lateral menu on the left-side of the screen. The menu consists of a set of small icons.

By default, the menu partially hides itself until the mouse pointer gets near it.



Figure 3: The menu is partially hidden by default



Figure 4: The menu is shown when the mouse pointer gets closer to it

You can choose to completely hide the menu when the mouse pointer leaves it. To do so, go to “Plugins -> SimCoders - REP -> Settings” menu and tick the “Show side menu on mouse over only” option.

The lateral menu entries are available in the “Plugins -> SimCoders - REP” menu as well.

## Maintenance Report

This window is the primary way you have to check the status of your airplane and to fix all the systems that need the mechanic attention.

The report is divided on more pages. Each page relates to a different group of systems.

To act on a system, click on the entry in the "Action" column.

To switch to the previous/next page click over the flipped page corners at the bottom of the report.

Reality Expansion Pack - Maintenance Report

SC SimCoders.com  
Aircraft Maintenance Division Maintenance Report Form

Model: Pilatus PC-12 10A No: 655 Time (hr): 0:00

ENGINE STATUS

Model: Pratt & Whitney PT6A-67B Time (hr): 00:00/3600

Item	Status	Action
Compressor	OK - 00:00/3600 Runtime	
Fuel Nozzles	OK	
Igniters	OK - 00:00/3600 Runtime	
Combustor	OK - 00:00/3600 Runtime	
Turbine	OK - 00:00/3600 Runtime	
Bearings	OK - 00:00/3600 Runtime	
Reduction Gearbox	OK - 00:00/3600 Runtime	
Fuel Pump	OK	
Oil Pump	OK	
Starter	OK	
Main Generator	OK	
Stbdy Generator	OK	

The Economy System is not enabled.

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Figure 5: The Maintenance Report window

## Kneeboard

The software come with a complete kneeboard window that contains the aircraft normal and emergency checklists together with the performance reference tables.

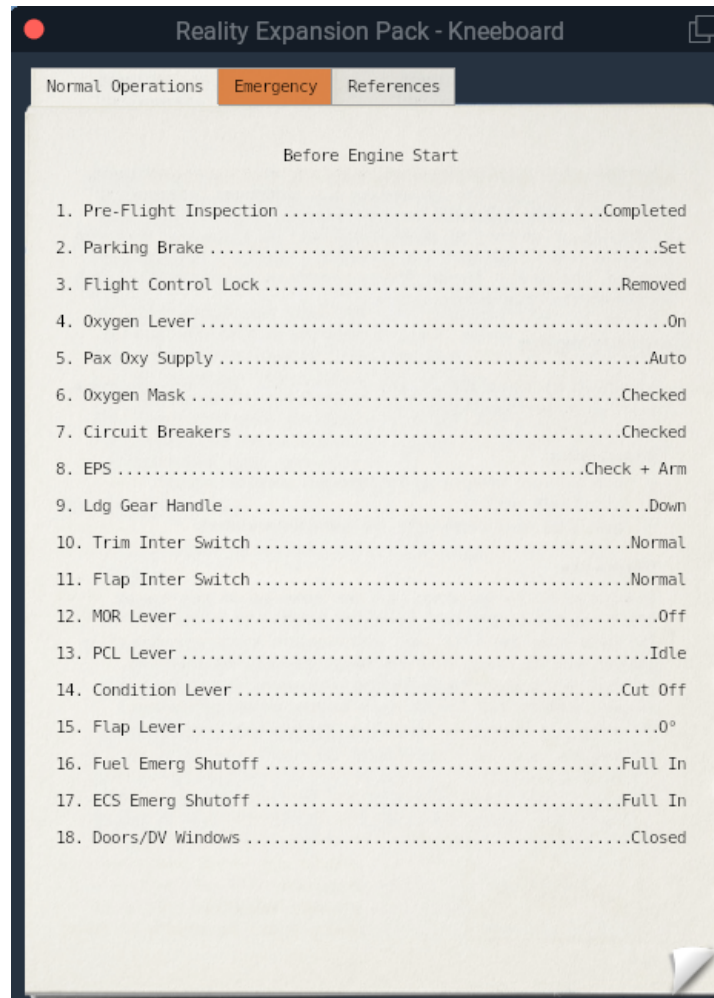


Figure 6: The Kneeboard window



### Show the kneeboard using the plugins menu

The kneeboard window may be shown by clicking on the “Plugins” menu, then “SimCoders – REP” then “Show kneeboard”.

### Manage the kneeboard using the custom commands

You can also use five different custom commands at which you can assign your custom keys or joystick buttons. The custom kneeboard commands defined by REP are the following:

Command	Description
simcoders/rep/kneeboard/toggle	Show or hide the kneeboard
simcoders/rep/kneeboard/next_section	Show the next kneeboard section
simcoders/rep/kneeboard/prev_section	Show the previous kneeboard section
simcoders/rep/kneeboard/next_page	Show the next kneeboard page
simcoders/rep/kneeboard/prev_page	Show the previous kneeboard page

## Mass & Balance

The Reality Expansion Pack provides a Mass & Balance tool to precisely load the plane.

While loading the plane, the goal is to keep the crosses inside the plot section delimited by the blue area, like shown in the screenshot below.

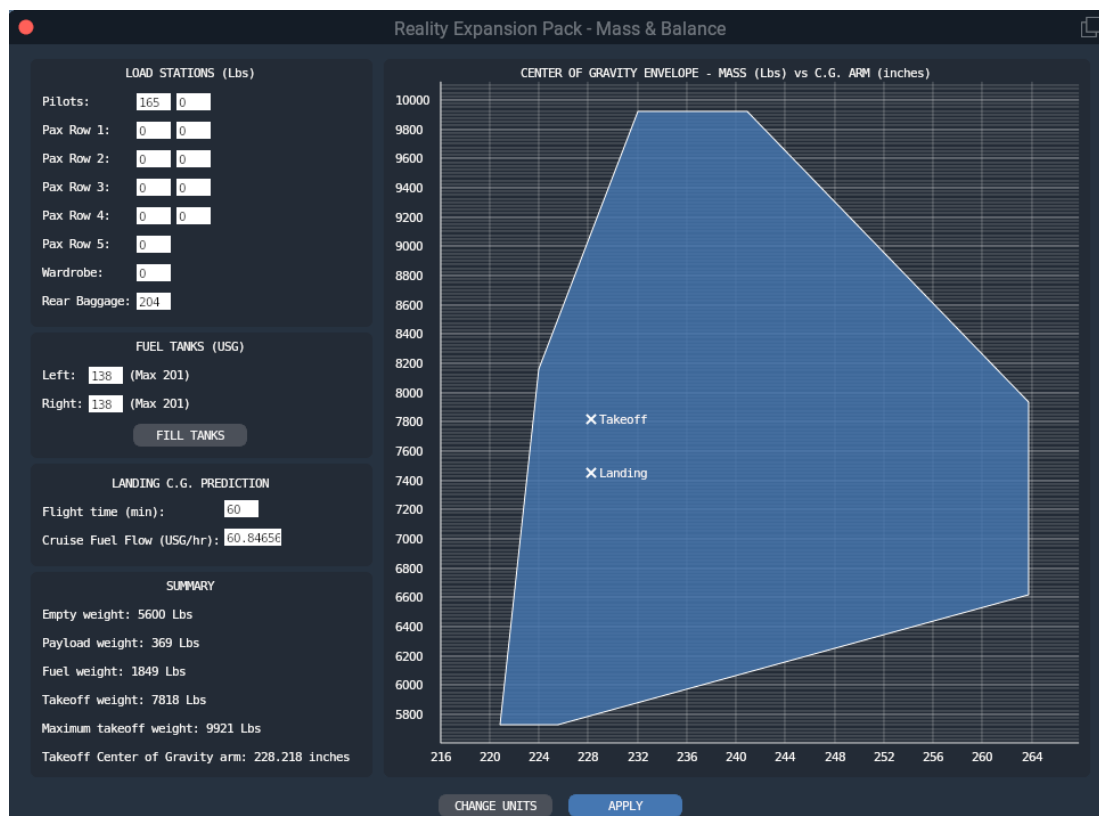


Figure 7: The Mass & Balance window

The blue area is the Center of Gravity Envelope. The mass is reported on the Y axis, the Center of Gravity Arm is reported on the X axis.

If the cross is towards the left side of the plot, it means that the center of gravity will be towards the front of the airplane, that is, the airplane will be nose heavy.

On the other hand, if the cross is on the right side of the plot, the airplane will be tail heavy.

If you overload the airplane and the cross goes outside the blue envelope, the cross becomes red, indicating that the plane is not allowed to fly.

Clicking on the "Apply" button, the selected passengers mass and fuel load will be applied to X-Plane.

The unit of measure for the airplane mass and the C.G. arm can be changed by clicking the "Change Units" button.



## Walkaround

Click on the Walkaround icon in the lateral menu to enter walkaround mode. Click again on the same icon on close the walkaround window to return in the cockpit.

During walkaround you can interact with some external systems of the aircraft using the walkaround window. Click the "Next" and "Prev" buttons at the bottom of the pre-flight checklists to move along the different pre-flight stations.

Always do the walkaround and the pre-flight inspection before each flight.

If you do not remove the tie-down and the chocks, you are not able to taxi and takeoff properly.

If you do not remove the pitot cover, you will incur an airspeed indicator failure.

Since version 3.4.5, it is possible to toggle all the static elements - such as the pitot cover and the tiedowns - using a single entry in the plugins menu or a keyboard command.

Since version 3.3, the following keyboard/joystick commands are available to control the walkaround mode.

Command	Description
simcoders/rep/walkaround/toggle	Toggle the walkaround mode
simcoders/rep/walkaround/next	Next walkaround station
simcoders/rep/walkaround/previous	Previous walkaround station
simcoders/rep/walkaround/action	Execute current action
simcoders/rep/walkaround/static_elements/toggle	Static elements toggle

## Move the viewpoint while doing the walkaround in 2D

It is possible to move the viewpoint during towing by using the default camera commands of X-Plane. To pan the view using the mouse, keep pressed the **simcoders/rep/view/pan\_with\_mouse** command.

## Walkaround in VR

REP provides a series of hotspots around the airplane useful to check the plane during the pre-flight, post-flight and lights-check checklists.

Start the walkaround using the **simcoders/rep/walkaround/toggle** command and then move from station to station using your VR controller. Make sure you bring the walkaround window with you while moving from a station to another.

## Towing

REP comes with a complete towing simulation. To activate it, click on the towing icon in the lateral menu. Click the icon again to exit from the towing mode.

The towing features a 3D towing bar that will help you driving the airplane on the tarmac.

To move the airplane, push or pull the pitch axis of your joystick. Use the roll axis to turn.



Since REP simulate the force applied by a single man placed in front of the airplane, you may not be able to tow the airplane on the grass, just like in real life.

You won't be able to tow the airplane if it's tied-down or if chocks/brakes are applied.

### **Move the viewpoint while towing in 2D**

It is possible to move the viewpoint during towing by using the default camera commands of X-Plane. To pan the view using the mouse, keep pressed the **simcoders/rep/view/pan\_with\_mouse** command.

### **Towing in VR**

REP provides an hotspot in front of the airplane (tricycle gear) or close to the tail (taildragger) useful to drive the airplane in VR mode.

Toggle the towing mode using the **simcoders/rep/towing/toggle** command and then move the airplane using your joystick as described above.

## **Engine Autostart**

The Reality Expansion Pack provides you a way to automatically start the engines.

Click on the engine autostart icon in the side menu and wait until the startup procedure is completed.

During the automatic start, REP shows a series of tips that describe the action being done.



## Settings Window

The settings windows is shown by clicking over the "Plugins -> SimCoders - REP -> Settings" menu.

### Enable the plane damages

When ticked, this option enable the plane damages.

### Show generic messages

If ticked, REP will show generic messages related to systems status, when available.

### Show failure messages

If ticked, REP will show a message in case of a system failure. The message will explain why the failure happened and what course of action should be taken.

### Show tip messages

If ticked, REP will show a tip message. The message will give some hints related to the current pilot actions.

### Show side menu on mouse hover only

When ticked, REP will completely hide the **lateral menu** when the mouse pointer leaves it.

### Save and restore the plane status between sessions

If ticked, REP will save the airplane status when unloaded. When the same plane and livery are loaded again, the status will be restored.

The status includes all the switches position, the fuel on-board, the loaded weights, the engine fluids quantity and quality and all the possible values that play part to the systems simulation.

The engine temperatures - such CHT and Oil Temperature - are restored accordingly to the elapsed time since the values where stored.

The status files are backed up before being overwritten. You find the backup in the output/preferences/REP folder.

### Save and restore the windows position between sessions

If checked, the Maintenance Hangar and the Keyboard windows positions are saved and restored between sessions.

### Enable hypoxia effect

When ticked, the default hypoxia effect is replaced by REP's custom algorithm. See the **Hypoxia chapter** to get more information about the custom hypoxia effect.





### **Roll axis drives ground steering**

When ticked, the joystick roll axis will steer the nosewheel on the ground.

### **Use US Customary**

When ticked, REP will use the US Customary units of measure (pounds and inches).

### **Wind sound level**

Control cabin the wind sound setting the level between 0 (mute) and 100 (full).

### **Main Monitor Index**

This option is visible only if X-Plane is running on two or more fullscreen monitors. Type the index of the monitor over which REP must show its menus and windows. The minimum number you can set here is 1. The maximum number is your monitors count. Each number addresses a different monitor.

### **Enable ITT Limiter**

When ticked, REP will automatically limit the ITT to 800°C to avoid engine damages.

### **Use Advanced Steering**

Enable this option to use REP's advanced steering algorithm. You may need to disable this option if you have issues with steering with your hardware pedals.

### **Use Advanced Braking**

Enable this option to smooth the brakes and to enable the automatic differential brakes. Instead of applying the brakes all at once, they will go from 0 to 1 in two seconds, smoothing the braking action. Automatic differential braking is applied if brakes are pressed while steering. Disable this option if you use hardware toepedals.

### **Use VR Walkaround and Towing**

When enabled, this option allows to use the new VR walkaround and towing modes.

### **Wait for real weather at startup**

When this options is enabled together with the simulator real weather, REP waits for the real weather to be correctly loaded before loading the plane status and update the systems' temperatures. This option is not needed in X-Plane 12 therefore it is not shown.

### **In flight tips vertical offset**

Set the vertical offset of the in-flight window. By default, the tips are shown at the top of the main screen.



## Economy System

The Reality Expansion Pack (REP) introduces a custom Economy System that rewards you for your flight time and allows you to manage maintenance and repair costs for your aircraft.

### Modes of Operation

The Economy System offers three modes of operation:

- **Standalone:** Maintains a local bank account and maintenance records on your PC, shared among all your REP aircraft. Rewards are provided for flight time and landing skills.
- **FSEconomy:** Connects to your [FSEconomy](#) account, deducting maintenance costs directly from your FSEconomy balance. Flight time rewards are excluded, as they are handled by FSEconomy.
- **X-CPL-Pilot:** Integrates with your [X-CPL-Pilot](#) account to deduct maintenance costs. Flight rewards are not included, as they are managed by X-CPL-Pilot.

### Enabling the Economy System

To activate the Economy System:

1. Open the [Maintenance Report](#) and navigate to the last page.
2. Click the “Enable” button for your chosen system.

#### FSEconomy: Aircraft Key Setup

If enabling the FSEconomy mode, an **Aircraft Key** is required. This key is a 15-character identifier unique to your aircraft within the FSEconomy environment.

Steps to find your Aircraft Key:

1. Log in to the [FSEconomy website](#).
2. Select the “**Aircraft**” button from the main menu.
3. Locate your aircraft in the list and click “**Edit**” under the “Action” column.
4. Generate or copy the Aircraft Key from the lower-left corner of the page.

When enabled, the Economy System saves your aircraft state to a separate file. This allows for two independent aircraft states—one for when the Economy System is active and another for when it is disabled. Switching between modes will load the corresponding state.

Your bank account is shared across all REP aircraft, enabling you to use funds earned with one aircraft to repair or maintain another.

### How It Works

Once activated, the Economy System displays your bank account balance and transaction history (expenses for maintenance and fuel, and income from flights) in the [Maintenance Report](#).

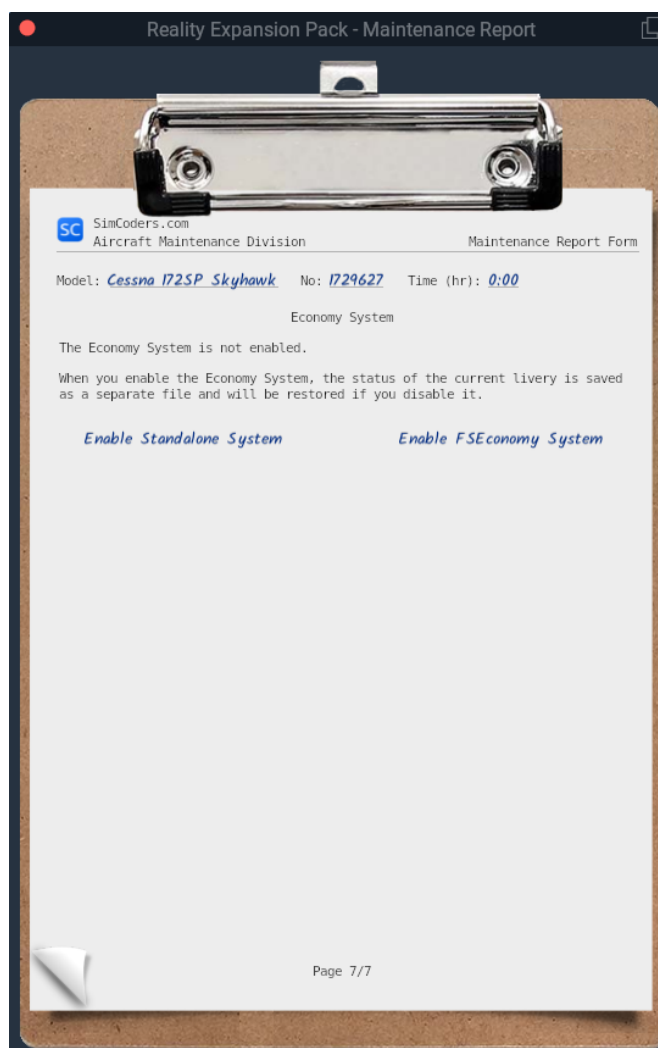


Figure 8: Enable the Economy System



Reality Expansion Pack - Maintenance Report

SC SimCoders.com  
Aircraft Maintenance Division

Maintenance Report Form

Model: Cessna 172SP Skyhawk No: 1729055 Time (hr): 0:00

Economy System

This page will show your maintenance quotation once you select the fixes and changes to make to this aircraft. To add an item to the quotation, scroll to the previous pages and click over an "Action" cell that contains text.

Bank Account

Current balance: 8940.50\$

12 Dec 2018 16:35	Maintenance	-119.88\$
12 Dec 2018 16:32	Maintenance	-31.10\$
12 Dec 2018 16:13	Maintenance	-908.52\$

When you disable the Economy System, the status of the current livery is saved as a separate file and will be restored if you enable it again.

When you reset the Economy System, your career, the bank account and the airplane are reset.

[Disable the Economy System](#) [Reset the Economy System](#)

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Figure 9: Economy System Overview

## Maintenance and Repairs

1. Navigate to the **Maintenance Report** to view available maintenance tasks.
2. For each task, the table lists the cost and required work time.

Reality Expansion Pack - Maintenance Report

SC SimCoders.com  
Aircraft Maintenance Division

Maintenance Report Form

Model: Cessna 172SP Skyhawk No: 1729055 Time (hr): 0:00

ENGINE STATUS

Model: Lycoming IO-360-L2A Time (hr): 00:00/2000

Item	Status	Action	Price (\$)	Time
Cylinders	OK			
Cyl. Compression (PSI)	80/80 80/80 80/80 80/80			
Oil Fluid	SAE 30, clean, 50 hrs before change			
Oil Fluid Quantity	8/4 USG (5/4 - 8/4)			
Available Oil Types	SAE 20W50	Use	120	1:00 hr
	SAE 30	Use	120	1:00 hr
	SAE 50	Use	120	1:00 hr
Oil Filter #1	Clean, 100 hrs before change			
Oil Pump #1	Ok			
Electric Fuel Pump #1	Ok			
Fuel Filter #1	Clean			
Spark Plugs #1 Type	Fine Wire (More effective)	In Quote	290	20 mins
Plugs tip	Clean			
Starter #1	Ok			
Vacuum Pump #1	OK			
Bank Account (\$):	8940.50		View Quotation	Quotation (\$): 290.00

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Figure 10: Maintenance Report Example

3. Add tasks to your **Quotation** by clicking the "Action" cell for each item. The cell will update to show "In Quote".
4. To remove a task, click the "Action" cell again.

Once you've selected the necessary actions, view your Quotation by clicking "View Quotation" or



scrolling to the last page of the **Maintenance Report**.

Item	Price (\$)	Time
Change Spark Plugs #1	290.00	20 mins
Oil Change	120.00	1:00 hr
Normal Price Totals	410.00	1:20 hr
Quick Fix Totals	820.00	0 mins

Figure 11: Quotation Example

The Quotation provides two pricing options:

- **Normal Price:** Maintenance is completed **one task at a time** in real-time, even if multiple aircraft require attention. The mechanic will continue working even if the simulator is closed.
- **Quick Fix Price:** All tasks are completed instantly at a higher cost.

Accept a price to proceed with maintenance, or decline to cancel the Quotation.



## Buying and Selling Fuel

### Standalone Mode Only

In the Weight and Balance window, you can add or remove fuel:

- **Adding Fuel:** Deducts money from your account based on local prices.
- **Removing Fuel:** Sells fuel back to the airport at a slightly lower rate than the purchase price.

Fuel prices vary by region, airport, and time, but can be customized via the `fuel_prices.cfg` file in the `Output/preferences/REP` directory of X-Plane. Note that custom prices are only applied after the next scheduled recalculation (every 4–8 days).

To check fuel prices at a specific airport, use the plugin menu: `SimCoders - REP -> Check fuel price at an airport`.

## Earning Money: Rewards

### Standalone Mode Only

Earn money for flight time, with bonus rewards for smooth landings. The softer the landing, the higher the bonus. Flight earnings are logged in your bank account transaction history at the end of each flight.



## VR Support

REP supports the native VR implementation since version 3.4.0. VR support was further improved in version 4.5.0.

### How to open the plugin windows in VR

REP provides a set of commands to control the plugin windows.

- **simcoders/rep/vr/open\_menu**: open REP's main menu
- **simcoders/rep/fuelmenu/show**: show the fuel menu when using the economy system
- **simcoders/rep/maintenancereport/show**: show the maintenance report
- **simcoders/rep/settingsmenu/show**: show the settings menu
- **simcoders/rep/weightandbalance/show**: show the weight and balance (if supported)
- **simcoders/rep/towing/toggle**: toggle the tow mode
- **simcoders/rep/kneeboard/toggle**: toggle the kneeboard
- **simcoders/rep/walkaround/toggle**: toggle the walkaround mode

For more information about how to assign the commands above please read [X-Plane's user guide about assigning commands to buttons](#).

---

#### NOTE

Make sure you loaded a REP airplane before looking for the command in X-Plane's settings window.

---





Figure 12: The Tech Report shown in VR mode

## SOUNDS SYSTEM

The Reality Expansion Pack features a custom sound system that provides immersive 3D sounds throughout the entire flight experience.

A custom sounds system has been preferred over the usage of FMOD for the following reasons:

- FMOD could be rather cumbersome from the developer's point of view, requiring more time to produce new features
- A custom engine is more flexible and can be expanded in no time providing new features
- A custom engine is more efficient as it's tailored to our needs

REP's sounds system provides advanced sounds such:

- Engine ignition
- Engine pings
- Engine exhaust effects
- Fuel pumps
- Electric Gyros
- Avionics effects
- Dynamic touch down
- Dynamic ground roll
- Dynamic wind



## PERSISTENT AIRCRAFT AND COMPONENTS WEARING

### Reality Expansion Pack – Wear & Tear System

The **Reality Expansion Pack** features a comprehensive **wear and tear system** that applies to the **entire aircraft**. Every component experiences wear over time, and after extended use, it may develop issues or even fail completely. The condition of each part is continuously saved and updated, even when the simulator is not running.

This applies to key aircraft systems such as engine components, the electrical system, airframe, and landing gear.

Each component is affected by both **time and user handling** in different ways.

For example, if you push the engine beyond its operational limits, it will degrade faster, leading to startup difficulties, combustion irregularities, and a noticeable loss of power. If neglected, it will eventually fail.

The precision of cockpit instruments also diminishes over time—a **newly calibrated gauge** will be far more accurate than one that has been in service for years.

---

### Loading a Worn-Out Aircraft

With REP, you have the option to start with an aircraft that already has a **wear history**.

To do so, navigate to:

**Plugins** → **SimCoders.com - REP** → **Wear out to >**

and select one of the following presets:

- **Brand New:** A factory-fresh aircraft, just off the production line. The engine and all onboard systems are in perfect condition.
  - **Privately Owned (New):** A well-maintained aircraft with low flight hours. Some usage is logged, but no issues are present.
  - **Privately Owned (Old):** A privately owned aircraft with significant flight hours. While well cared for, wear is visible on various components.
  - **Flying Club:** A well-used aircraft that has passed through many hands—some careful, others less so. Expect worn-out systems and degraded instrument performance.
- 

### Checking Component Status

To inspect, repair, or calibrate individual components, refer to the **Maintenance Report**.

This report provides a **detailed overview** of all aircraft components that can be checked and serviced by a mechanic.



## Hobbs Time and Tach Time

Within the **Maintenance Report**, you will also find:

- **Hobbs Time** – The total airframe time.
- **Tach Time** – The total engine time.

After flying a new aircraft for a while, you may notice a **slight difference** between these two values due to how they are calculated.

### Hobbs Time

In most aircraft, the **Hobbs meter** is triggered by an oil pressure switch, meaning it starts counting when the engine is running and stops when the engine shuts down.

It measures time in **real-world clock intervals**, ticking off **0.1 hours** every **6 minutes**, regardless of whether the aircraft is idling or in cruise flight.

### Tach Time

Unlike Hobbs time, the **tachometer clock** does not track actual time; instead, it records **engine revolutions**.

- When the engine runs at **cruise RPM**, the tachometer records time at the same rate as the Hobbs meter.
- If the engine operates at a lower RPM (e.g., idling on the ramp), the tach time accumulates **more slowly** than Hobbs time.
- This means that **the faster you run the engine, the faster the tach time increases**.

---

By understanding and managing wear and tear, you can extend the life of your aircraft's components and maintain peak performance throughout your flights.



## SYSTEMS DESCRIPTION

Within the Reality Expansion Pack, each system has its own life-cycle and can be damaged depending on many factors, including the pilot's behavior.

All systems can be fixed individually using the Maintenance Report or all at once using the **simcoders/rep/systems/fix\_all** command.

The following is a brief description of each system onboard.

### Powerplant

This airplane is powered by the Pratt & Whitney PT6A-67B, which is a light weight, reverse flow, free turbine engine. In addition to the gas generator section, the PT6A-67B incorporates a power section with the power turbine and propeller reduction gearbox, an integral oil system, and an accessory gearbox for mountings for various accessories.

Air enters the compressor through an annular plenum chamber. The compressor consists of four axial stages and a single centrifugal stage. Stator vanes between each stage of compression diffuse the air, raise its static pressure, and direct it to the next stage of compression. From the centrifugal compressor, air flows through a diffuser tube, then changes direction 180 degrees as it flows into the combustion chamber. A compressor bleed valve is installed on the gas generator case at the 3 o'clock position. It automatically opens to spill interstage compressor air to prevent compressor stall.

The combustion chamber consists of two perforated annular sections bolted together with a large exit duct. Compressed air enters the combustion chamber through the perforations, where it is mixed with fuel and ignited. The rapidly expanding gas is directed through another 180 degree direction change into the turbine.

The turbine consists of a single stage compressor turbine and a two-stage power turbine. As the gas exits the combustion chamber, it is directed onto the compressor turbine, which powers the compressor. From the compressor turbine, the gas is directed to the two-stage power turbine which drives the propeller via the propeller reduction gearbox. Engine inter turbine temperature (ITT) is measured between the compressor and power turbines.

Gas flow is directed into the exhaust duct from the turbine. The exhaust duct has an annular inlet which leads exhaust gas to a bifurcated duct connected to two opposed exhaust ports. The exhaust duct is made from heat resistant nickel alloy metal and incorporates mounting flanges for the exhaust nozzles.

### Throttle System

#### Power Control Lever (PCL)

The POWER CONTROL lever (PCL) selects the required engine power (Ng) and in certain conditions it directly controls the propeller pitch. The PCL has a flight and a ground operating range separated by an idle detent. The flight operating range is forward of the detent. As the PCL is moved forward of the idle detent the minimum propeller pitch (6° to 12°) is directly controlled by the PCL while the propeller is in an underspeed condition during low engine power at a low airplane speed. When the PCL is moved further forward, engine power and airplane speed



increase until each are high enough for the propeller to operate in a constant speed mode. In this mode, the Constant Speed Unit (CSU) selects the propeller pitch to maintain a propeller speed of 1700 rpm.

When the PCL is at the idle detent, the gas generator is at idle and the propeller is at minimum pitch. A lifting action to raise the PCL over the detent is required to move the PCL into the ground operating range.

Aft of the idle detent is the ground operating range or beta mode. The Nf governor limits the propeller speed to an underspeed condition to give the beta valve full authority in controlling the propeller pitch. The engine power and propeller pitch are directly controlled by the PCL. Initial PCL movement aft of the idle detent adjusts the propeller pitch while the gas generator remains at idle and can be used to control taxi speed. Further aft movement causes the propeller to move into the reverse range followed by an increase in engine power.

Aft of the idle detent is the ground operating range or beta mode. The Nf governor limits the propeller speed to an underspeed condition to give the beta valve full authority in controlling the propeller pitch. The engine power and propeller pitch are directly controlled by the PCL. Initial PCL movement aft of the idle detent adjusts the propeller pitch while the gas generator remains at idle and can be used to control taxi speed. Further aft movement causes the propeller to move into the reverse range followed by an increase in engine power.

### **Manual Override Lever (MOR)**

The MANUAL OVERRIDE lever (MOR) is located on the center console to the left of PCL. The MOR controls the engine power in case of a pneumatic failure of the engine fuel control or in case of a PCL system failure. The MOR lever is an emergency device and it is possible to exceed engine limits if the MOR lever is operated too fast. However, even if the engine limits have been momentarily exceeded, the MOR will allow the crew to continue safe flight and landing if the Engine Failure in Flight - Partial Power Loss emergency procedure is followed.

The MOR directly operates the fuel metering valve by mechanically compressing the pneumatic bellows (Py pressure) in the FCU. There is a gap between the MOR mechanism and the pneumatic bellows. This gap must first be taken up before the pneumatic bellows start to compress, this results in a dead band when starting to operate the MOR lever. In case of a Py leak, the engine spools down to minimum fuel flow with no response to PCL inputs. Minimum fuel flow is 90 lb/h and results in 35% Ng on the ground to 70% Ng at 30,000 ft. The higher the altitude and the faster the forward speed the longer the engine spool down time to 50% (spool down times of 15 secs are possible). At high altitudes it is possible to achieve full engine power when operating the MOR system. At low altitudes with the MOR lever fully forward the MOR system may not give full engine power (min. 30 psi torque). When the MOR system is in operation the torque limiter and Ng governor are inoperative.

### **Operation**

During normal engine operation the MOR lever is in the full aft or OFF position. In the case of a possible PCL or pneumatic failure, the PCL should be exercised to check engine response. If not successful the PCL should be set to the idle position and the MOR lever operated slowly forward (at least 4 secs to the mid position) to take up the dead band until the engine responds (fuel flow above 90 lb/h and Ng/ITT stable or increasing), then wait until the engine stabilizes.



If the engine stalls and/or ITT reaches 870° C, operate the MOR lever slightly rearward then forward again with an even slower movement. If the engine is allowed to drop below 50% Ng, starter assistance may be required to recover Ng above 50%. Once the engine has stabilized adjust the required power setting with the MOR lever. Observe the engine limitations by making adjustments with the MOR lever. Do not permit the Ng to fall below 65% as ITT may then be exceeded, this will also maintain better engine acceleration. In descent and until touch down adjust Ng to 75% or above. After touch down select cut-off feather to avoid exceeding ITT limits. On the ground with no forward speed it is not possible to recover low Ng with the MOR lever.

### **Condition Lever**

The Condition Lever has three positions and is used to select the gas generator idle speed, shut down the engine, and feather the propeller. The GROUND IDLE position (G.I.) is for ground operation only. This setting ensures that the propeller speed remains above the prohibited range (350 rpm to 950 rpm) for ambient conditions up to a temperature of approximately 45°C. The FLIGHT IDLE position (F.I.) is selected for flight operation which provides sufficient bleed air flow to maintain cabin pressurization at minimum Ng and to give smooth engine response to PCL movement during approach and landing. The CUT-OFF/FEATHER position mechanically stops the fuel flow to shut down the engine and energizes the overspeed governor solenoid valve, which feathers the propeller at the same time. The low fuel pressure switch is inoperative when the Condition Lever is in the CUT-OFF/FEATHER position.

### **Engine Care Tips**

#### **Avoid a Hot Start**

If the ITT goes above the 800°C limitation during engine start, the engine may be seriously damaged and we call it a Hot Start.

To prevent this from happening be sure to:

- Do not introduce fuel until Ng is above 12% (better over 13%)
- Do not move the condition lever from cutoff to flight idle until the engine has stabilized unless the OAT is below 5°C
- Do not introduce fuel if the ITT is above 40°C)
- Do not attempt an engine start if the battery voltage is below 25V. Use external power is available.
- Since the condition lever manipulator is really sensible to mouse movements, it's highly recommended to use keyboard commands or joystick to control it



## Electrical Systems & Avionics

The airplane is equipped with a 28-volt, direct-current electrical system.

The system uses a battery as the source of electrical energy. An alternator maintains its state of charge.

### Battery

The default battery is replaced with a battery that keeps its charge between sim sessions and discharges at a realistic rate. The battery state is updated even when the simulator is not running. This means that if you leave your battery on, it will discharge even if X-Plane is closed.

In the "Electrical System & Avionics Status" page of the Maintenance Report you can:

- Check the battery **charge**
- **Recharge** the battery
- **Disconnect** the battery poles from the electrical system

If you plan not to fly the airplane for a while, you should disconnect the battery via the Maintenance Window. This will avoid self-discharging and extend the battery life during storage.

### Alternator

The alternator switch position is saved through all X-Plane sessions. Make sure it is switched in the correct position according to the checklists throughout the entire flight.

The alternator switch operation may affect the avionics. Check the Avionics paragraph below to get more information.

### Lights

The light switch positions are saved through all X-Plane sessions.

If the airplane is not provided with strobe lights fmod sounds, the Reality Expansion Pack adds the strobe lights sounds when the lights are switched on.

### Electrical Gyros

The Reality Expansion Pack replaces the default X-Plane electrical gyros with custom ones with a more realistic spin up/down dynamics.

The typical spin up/down sounds are reproduced when the battery switch is turned in the "On" position. The instruments provided with an electrical gyro and therefore depending on the electrical supply are the turn/slip indicator, the standby attitude indicator and the HSI, if they are provided.

### Radio Stack

The radio components save their own state - such as frequencies and knobs position - during X-Plane sessions.



In the “Electrical System & Avionics Status” page of the Maintenance Report you can:

- Check the **status** of each radio
- **Fix** a faulty radio

---

### CAUTION

Never turn on or off the engine or the alternator when the avionics switch is in the “On” position. Doing so may trigger a overvoltage spike that could damage one or more avionics components.

The newer avionics such as the Garmin GNS430/530 are better protected from overloads but they are not totally immune from them.

---

## Landing Gear

The airplane is equipped with a tricycle, hydraulically actuated, retractable landing gear. When in good shape, the landing gear requires from 6 to 8 seconds to fully extend or retract.

The Reality Expansion Pack introduces the following changes to the default landing gear:

- **Improved ground roll physics:** REP corrects the default behavior of X-Plane on ground in cross wind conditions, when the airplane tended to steer against the wind.
- **Custom touchdown sounds:** The touchdown sounds tone and volume are related to the touchdown speed. A harder touchdown will produce different sounds than a soft landing.
- **Brakes sounds:** Actuating the brakes produces the typical whining sound. Also the classic squeaking sounds are reproduced when the brakes are not in perfect shape.

In the “Landing Gear & Brakes Status” page of the Maintenance Report you can:

- Check the **status** of the landing gear struts
- **Fix** a faulty strut

### Tires

The Reality Expansion Pack simulates the tire status and failure based on the landings done in the past.

A flat tire can cause the plane to yaw during the landing run or get it stuck on the ground before taxi.

In the “Landing Gear & Brakes Status” page of the Maintenance Report you can:

- Check the **status** of each tire
- **Fix** a faulty tire

### Brakes

The PC-12 has a single-disc, hydraulically-actuated brake on each main landing gear wheel. Each brake is hydraulically connected to a cylinder attached to each of the pilot’s rudder pedals.





The brakes are operated by applying pressure to the top of the rudder pedals, which are interconnected. When the airplane is parked the brakes may be activated using the parking brake switch located under the pilot's yoke.

To avoid brake failures, keep the brake system properly maintained and minimize brake usage during taxi operations and landings.

Do not apply the brakes for a long time. If the runway is long, let the plane slow down by itself.

In the "Landing Gear & Brakes Status" page of the Maintenance Report you can:

- Check the **status** of the braking system
- **Fix** a faulty brake



## Oxygen System

The PC-12 is a pressurized plane and an emergency oxygen system is then provided.

The oxygen system is operated using the View -> Oxygen Mask X-Plane command.

The oxygen flow pressure varies with the oxygen tank pressure. It lasts about 25 minutes.

In the "Oxygen System Status" page of the Maintenance Report you can:

- Check the **quantity** of oxygen in the tank
- **Refill** the oxygen tank
- Calculate how long will the oxygen last based on the number of people on-board



## HUMAN FACTOR

### Hypoxia

Hypoxia is a condition in which the body or a region of the body is deprived of adequate oxygen supply at the tissue level.

As altitude is gained, the partial pressure of Oxygen gets lower and lower to the point that the human body is unable to absorb enough quantity of it to sustain life.

The symptoms of hypoxia are:

- Apparent personality change
- Impaired judgement
- Headache
- Tingling
- Increased rate of breathing
- Muscular impairment
- Memory impairment
- Visual sensory loss
- Tunnel vision
- Impairment of consciousness
- Cyanosis
- Unconsciousness
- Death

The Reality Expansion Pack simulates some of the symptoms above, such as the tunnel vision, the increased rate of breathing and the muscular impairment.

### TUC & EPT

Time of Useful Consciousness (TUC) is the time available for the development of hypoxia and the pilot to do something about it. It is not the time to unconsciousness but the short time from a reduction in adequate oxygen until a specific degree of impairment, generally taken to be the point when the individual can no longer take steps to help him/herself.

Effective Performance Time (EPT) is always within and shorter than TUC. Its quantification however depends on the individual.

The following is a table that represent the EPT simulated by REP.

Altitude (ft)	EPT
10000	Few hours
15000	40 minutes
20000	10 minutes
30000	30 seconds
40000	15 seconds
45000	1-2 seconds



Figure 13: Hypoxia effect



## HOME COCKPITS/CUSTOM DATAREFS

In order to work properly, REP uses a set of custom datarefs instead of default X-Plane ones.

Here you find a list of datarefs that you can use for your home cockpit.

This list includes all REP's datarefs. Some of them might not be present on some REP, depending on the systems depicted by the package.

---

**Dataref:** simcoders/rep/stallwarning/on

- Type: int
  - Writable: No
  - Contents: 0 = off, 1 = on
- 

**Dataref:** simcoders/rep/stallwarning/level

- Type: int
  - Writable: No
  - Contents: 1 = low, 2 = high
- 

**Dataref:** simcoders/rep/cockpit2/gauges/indicators/vacuum

- Type: float
  - Writable: No
  - Contents: Vacuum gauge value
- 

**Dataref:** simcoders/rep/cockpit2/gauges/indicators/attitude\_indicator\_0\_pitch

- Type: float
  - Writable: No
  - Contents: Main attitude indicator pitch
- 

**Dataref:** simcoders/rep/cockpit2/gauges/indicators/attitude\_indicator\_0\_roll

- Type: float
  - Writable: No
  - Contents: Main attitude indicator roll
- 

**Dataref:** simcoders/rep/cockpit2/gauges/indicators/attitude\_indicator\_1\_pitch

- Type: float
  - Writable: No
-



- Contents: Stdbby attitude indicator pitch
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/attitude\_indicator\_1\_roll

- Type: float
  - Writable: No
  - Contents: Stdbby attitude indicator roll
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/airspeed\_kts\_pilot

- Type: float
  - Writable: No
  - Contents: Pilot airspeed
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/airspeed\_kts\_copilot

- Type: float
  - Writable: No
  - Contents: Copilot airspeed
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/altitude\_ft\_pilot

- Type: float
  - Writable: No
  - Contents: Pilot altitude
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/altitude\_ft\_copilot

- Type: float
  - Writable: No
  - Contents: Copilot altitude
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/vvi\_fpm\_pilot

- Type: float
  - Writable: No
  - Contents: Pilot VSI
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/vvi\_fpm\_copilot

- Type: float
-



- Writable: No
  - Contents: Copilot VSI
- 

**Dateref:** simcoders/rep/cockpit2/switches/avionics\_power\_on

- Type: int
  - Writable: Yes
  - Contents: Avionics switch
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_0

- Type: float
  - Writable: No
  - Contents: Fuel kg in tank 0
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_ratio\_0

- Type: float (ratio 0..1)
  - Writable: No
  - Contents: Fuel ratio in tank 0
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_1

- Type: float
  - Writable: No
  - Contents: Fuel kg in tank 1
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_ratio\_1

- Type: float (ratio 0..1)
  - Writable: No
  - Contents: Fuel ratio in tank 1
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_2

- Type: float
  - Writable: No
  - Contents: Fuel kg in tank 2
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_ratio\_2



- Type: float (ratio 0..1)
  - Writable: No
  - Contents: Fuel ratio in tank 2
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_3

- Type: float
  - Writable: No
  - Contents: Fuel kg in tank 3
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_quantity\_ratio\_3

- Type: float (ratio 0..1)
  - Writable: No
  - Contents: Fuel ratio in tank 3
- 

**Dateref:** simcoders/rep/engine/fuelline/electrical\_feed\_0/switch\_on

- Type: int
  - Writable: Yes
  - Contents: L tip pump switch (1 = on)
- 

**Dateref:** simcoders/rep/engine/fuelline/electrical\_feed\_1/switch\_on

- Type: int
  - Writable: Yes
  - Contents: R tip pump switch (1 = on)
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_flow\_0

- Type: float
  - Writable: No
  - Contents: L FF indicator
- 

**Dateref:** simcoders/rep/indicators/fuel/fuel\_flow\_1

- Type: float
  - Writable: No
  - Contents: R FF indicator
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/engine\_0\_rpm

---





- Type: float
  - Writable: No
  - Contents: L RPM indicator
- 

**Dateref:** simcoders/rep/cockpit2/gauges/indicators/engine\_1\_rpm

- Type: float
  - Writable: No
  - Contents: R RPM indicator
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/fuel\_pump\_0

- Type: int
  - Writable: Yes
  - Contents: L pump (0 = off, 1 = on)
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/fuel\_pump\_1

- Type: int
  - Writable: Yes
  - Contents: R pump (0 = off, 1 = on)
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/low\_fuel\_pump\_0

- Type: int
  - Writable: Yes
  - Contents: L LO speed pump
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/low\_fuel\_pump\_1

- Type: int
  - Writable: Yes
  - Contents: R LO speed pump
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/high\_fuel\_pump\_0

- Type: int
  - Writable: Yes
  - Contents: L HI speed pump
- 

**Dateref:** simcoders/rep/cockpit2/engine/actuators/high\_fuel\_pump\_1

---



- Type: int
  - Writable: Yes
  - Contents: R HI speed pump
- 

**Dateref:** simcoders/rep/engine/electrical\_fuelump/switch\_on\_0

- Type: int
  - Writable: Yes
  - Contents: L pump (0 off, 1 LO, 2 HI)
- 

**Dateref:** simcoders/rep/engine/electrical\_fuelump/switch\_on\_1

- Type: int
  - Writable: Yes
  - Contents: R pump (0 off, 1 LO, 2 HI)
- 

**Dateref:** simcoders/rep/engine/cowl/handle\_ratio\_0

- Type: float (ratio 0..1)
  - Writable: Yes
  - Contents: L cowl flaps handle
- 

**Dateref:** simcoders/rep/engine/cowl/handle\_ratio\_1

- Type: float (ratio 0..1)
  - Writable: Yes
  - Contents: R cowl flaps handle
- 

**Dateref:** simcoders/rep/engine/oil/temp\_f\_0

- Type: float
  - Writable: No
  - Contents: L oil temp (F)
- 

**Dateref:** simcoders/rep/engine/oil/temp\_f\_1

- Type: float
  - Writable: No
  - Contents: R oil temp (F)
- 

**Dateref:** simcoders/rep/engine/oil/temp\_c\_0



- Type: float
  - Writable: No
  - Contents: L oil temp (C)
- 

**Dataref:** simcoders/rep/engine/oil/temp\_c\_1

- Type: float
  - Writable: No
  - Contents: R oil temp (C)
- 

**Dataref:** simcoders/rep/engine/oil/press\_psi\_0

- Type: float
  - Writable: No
  - Contents: L oil press (PSI)
- 

**Dataref:** simcoders/rep/engine/oil/press\_psi\_1

- Type: float
  - Writable: No
  - Contents: R oil press (PSI)
-



## RESOURCES & HOW-TOs

[SimCoders.com blog](#) contains tons of resources that you will find very useful when using REP.

Moreover, this is a list of How-Tos available.

- [How to lean the mixture](#)
- [How to keep the spark plugs clean](#)
- [How to choose the right oil for your engine](#)
- [How to quickly startup the engine with REP](#)
- [How to manage an emergency](#)
- [How to calculate the required fuel for your flight](#)

## SUPPORT & CONTACTS

Before requesting support, please check [our FAQs](#), where you'll find answers to common questions about installation issues and general usage.

If you experience any technical problems with our software, feel free to contact us at [support@simcoders.com](mailto:support@simcoders.com). To help us assist you efficiently, please provide a detailed description of the issue and include your X-Plane Log.txt file.



## VERSION CHANGELOG

### V4.8.11

No change for this aircraft

### V4.8.10

No change for this aircraft

### V4.8.9

No change for this aircraft

### V4.8.8

No change for this aircraft

### V4.8.7

### V4.8.6

No change for this aircraft

### V4.8.5

1. Fix: inertial separator button sound played continuously

### V4.8.4

1. Fix: the Settings menu was not managed properly in VR

### V4.8.3

1. No changes for this airplane.

### V4.8.2

1. Fix: the system time was not always read correctly, therefore some features (like the time-based maintenance actions may not always work properly on some systems)

### V4.8.1

1. Fix: engine vibrations at startup were not visible anymore

### V4.8.0

1. Support for time and ground speed multiplier



#### **V4.7.14**

1. No change for this airplane

#### **V4.7.13**

1. No change for this airplane

#### **V4.7.12**

#### **V4.7.11**

1. Improvement: the tie downs should better lock the plane to the ground

#### **V4.7.10**

Fix: after loading a saved flight, the alternator may not work properly

#### **V4.7.9**

1. Fix: in some engine configuration and bus loads, the alternator could not charge the battery completely

#### **V4.7.8**

1. Fix: In X-Plane 12 the plugin forces could bump the plane at engines stop
2. Fix: memory leak in datarefs handling

#### **V4.7.7**

#### **V4.7.6**

1. Fix: some sounds would not stop playing after plane crash
2. Fix: fuel totalizer fix in XP12

#### **V4.7.5**

No changes for this airplane

#### **V4.7.4**

No changes for this airplane

#### **V4.7.3**

1. Fix: Some components of the maintenance window were misplaced
2. Fix: Mass And Balance could not be applied correctly if the flight was started with the engines running



#### **V4.7.2**

1. Fix: crash after replay

#### **V4.7.1**

1. Fix: crash after pause

#### **V4.7.0**

1. Improvement: better alternator voltage simulation at low RPM
2. Improvement: support for Apple M\* processors
3. Improvement: better compatibility of the Mass and Balance system with X-Plane 12
4. Improvement: it is now possible to vertically move the in-flight tips windows (no VR support for this feature at the moment)
5. Fix: missing library link if XP12

#### **V4.6.6**

1. Improved REP sound compatibility with internal X-Plane sound sliders

#### **V4.6.5-h2**

1. Fixed broken plugin reset

#### **V4.6.5-h1**

1. Fixed broken dataref

#### **V4.6.5**

1. Improved OpenAL errors log
2. Improved braking system compatibility with hardware toe pedals
3. Improved static elements compatibility with third-parties addons

#### **V4.6.4**

1. No changes for this plane

#### **V4.6.3**

1. No changes for this plane

#### **V4.6.2**

1. Improvement: MAP behavior at low RPM



#### **V4.6.1**

1. Fix: the model name depicted in the maintenance report was incorrect
2. Fix: the serial number depicted in the maintenance report may be off

#### **V4.6.0**

1. Change: "Smooth Brakes" and "Automatic Differential Brakes" options merged into the "Advanced Braking" option
2. New: REP now includes TXT format checklists too
3. Improvement: Experimental Flight Model Support
4. Improvement: more realistic elevator trim authority
5. Improvement: flaps extension time has been raised to 22s
6. Fix: Ng could not go higher than 100%
7. Improvement: better LOP cut-out behavior in piston engines
8. Improvement: more realistic piston engine power response when running ROP
9. Improvement: more realistic manifold pressure behavior at high RPM
10. Improvement: running oversquare when LOP does not damage the piston engines
11. Improvement: REP waits for the real weather to load (if enabled) before updating the engine temperatures at startup
12. Improvement: improved hypoxia recover at low altitude
13. Fix: the manifold pressure was too low at idle
14. Fix: The REP update loop was not always executed correctly in certain configurations
15. Fix: The avionics is less prone to damage if the alternator is turned on/off with the avionics master on

#### **V4.5.12**

1. Improved towing behavior
2. Added engine cooling down sounds (exhaust ticks)
3. No changes for this plane

#### **V4.5.10-h1**

1. Fix: on Linux the plugin could crash the sim on startup because of a bad library link

#### **V4.5.10**

1. A cancel window is shown before beginning the engine autostart procedure
2. Fix: the instrument wear could not save its state properly on some systems
3. Fix: the propeller could go in overspeed under certain power conditions
4. The HSI map line is now disabled to match real world avionics behavior
5. TO/GA Pitch Up set to 7.5 degrees

#### **V4.5.9**

1. Improved the FSEconomy implementation reliability





#### **V4.5.8**

1. Improved the hardware rudder pedals compatibility (it is now possible to disable the automatic differential braking)

#### **V4.5.7**

#### **V4.5.6**

1. New: REP Economy System now supports X-CPL-Pilot
2. Fix: in the maintenance window, some text could overflow from the borders
3. Fix: in some configurations, the installer may not properly modify the FMOD .snd files

#### **V4.5.5**

1. The static elements are not visible anymore during replay
2. REP reports in X-Plane's log when a damage/failure is taking place

#### **V4.5.3**

#### **V4.5.2**

#### **V4.5.1**

1. Fix: the oil pump failure message was missing

#### **V4.5.0**

1. New: improved VR support in walkaround and towing modes
2. The magnetos are forced to "both" when starting the flight with engines running
3. The tiedowns and chocks are removed when starting the flight with engines running
4. It's not possible to begin the autostart procedure if the engine is already running
5. Fix: CTD when trying to connect to FSE
6. Fix: Typos in Maintenance Window
7. Fix: excessive oil consumption when a cylinder is partially worn out

#### **V4.4.6**

1. Fix: the O2 lever did not work as expected

#### **V4.4.5**

1. Fix: typo in final checklist
2. The in-flight tips window now resize correctly in VR
3. Optimizations for XP11.50
4. Some sounds (very few) were played using the wrong equalizers resulting in too high or too low volume in relation to their position in the cockpit



#### **V4.4.4**

1. Fix: XP10 crash on reload
2. Fix: CTD on plugin disable
3. Fix: The Oxygen System did not support the Economy System properly
4. The Basic Empty Weight is raised to 6200lbs and the CG is moved aft accordingly to new data obtained
5. Fix: engine total time reporting was incorrect

#### **V4.4.3**

1. New: dataref to control the wind volume: simcoders/rep/settings/wind\_volume
2. Fix: in some cases the ITT was not restored properly from the previous session
3. Fix: memory leak

#### **V4.4.2**

1. New: the standalone fuel market support USA airport codes 3 chars long
2. Fix: large windows did not fit the screen properly
3. Fix: the PT-6 engine did not show failures using in-flight tips

#### **V4.4.1**

#### **V4.4.0**

1. The simulator<->REP interface has been reworked to accommodate future improvements

#### **V4.3.5**

1. FSEconomy: fix for HTTPS protocolo update

#### **V4.3.4**

1. FSEconomy: fixed connection issue (HTTP 301 not followed properly)

#### **V4.3.3**

#### **V4.3.2**

1. Fix: the com radio status was not properly restored

#### **V4.3.1**

1. Added the option in the settings window to enable or disable the ITT limiter
2. New option to show or hide the generic messages
3. Improved the Nav/Com radios status feedback in the maintenance window
4. Fix: the maintenance window could crash during the FSEconomy data update



#### V4.3.0

1. Introduced the Pilot Emergency O2 System
2. Improved ITT evolution on plane loading (the ITT is restored from the previous flight, taking into account the elapsed time)
3. Improved the flaps flight dynamics behavior
4. Fix: the Economy System status could be loaded only partially in some situations
5. Fix: the in-flight tips were not visible in VR. Thanks to [sparker](#) for helping debugging the issue.
6. Fix: workaround CTD
7. Fix: message boxes did not support VR
8. Improved the engine negative torque model

#### V4.2.3

1. Fix: solved some windows positioning issues
2. Fix: in XP10 REP did not recognize opening a window as a paused sim state
3. Fix: the pressurization system broke too easily
4. Fix: the fuel color was wrong during ground checks
5. Fix: some engine components were not worn out using the "Wear to..." menu option
6. The standalone economy system rewards were too low for this kind of aircraft
7. Improved checklists
8. The ECS Switch position is now saved and restored between session
9. Improved oil pressure behavior
10. Improved battery behavior

#### V4.2.2

1. Fix: vr\_config.txt error message at startup
2. Fix: the torque and ITT limiter is now smoother than before, letting engine parameters to stabilize
3. Fix: the pressurization system did not track the usage time properly
4. Fix: the lights check UI did not set the landing lights switch properly
5. Fix: the "Reset Economy System" button did not fix part of the PT6 turbine components
6. Improved the condition lever behavior
7. Improved the ground roll sounds
8. Fix: the kneeboard and maintenance windows did not save their position properly, therefore they were not shown correctly after being popped out
9. Fix: and X-Plane 11.35 bug prevented REP from reading the proper airspeed

#### V4.2.1

1. No changes for this aircraft

#### V4.2.0

1. **New:** Simulation of Factory and Tuned exhaust effects
2. **New:** The status file are backed up before being overwritten
3. **New:** It is now possible to save the windows position between sessions



4. Improved manifold pressure behavior

#### **V4.1.8**

1. New: it is now possible to set the wind sound volume in REP's settings window

#### **V4.1.7**

1. CTD fix

#### **V4.1.6**

1. Minor Networking fix

#### **V4.1.5**

1. Increased the debug log for the Economic System

#### **V4.1.4**

1. No changes for this aircraft

#### **V4.1.3**

1. No changes for this aircraft

#### **V4.1.2**

1. No changes for this aircraft

#### **V4.1.1**

1. Fix: an alternator did not save its status properly
2. Minor fixes

#### **V4.1.0**

1. **New:** FSEconomy integration with the maintenance system
2. Fix: X-Plane crashed in case of airplane crash
3. Fix: the systems' damages were updated during replay as well
4. Fix: on XP10 some message windows were not shown properly
5. Fix: on multimonitor setups the in-flight tips were shown on the wrong monitor



#### **V4.0.3**

1. Fix: the aircraft serial number is now more randomized
2. Fix: the weight and balance traded "0Lt" of fuel when changing the passengers' masses
3. Fix: the initial status of the aircraft could not be reset properly
4. The spark plugs fouling in-flight tip is now easier to understand
5. Improved instruments behavior once weathered
6. The Tachometer Time is now only based on RPMs

#### **V4.0.2**

1. **New:** it is now possible to deactivate the brakes smoothing
2. Fix: fixed a crash when closing a plugin's window
3. Better gyros behavior

#### **V4.0.1**

1. Fix: some mouse clicks were not captured properly in the Maintenance Report window
2. Fix: it was not possible to properly change the oil filter using the Maintenance Report window

#### **V4.0.0**

1. **New:** Economic System
2. Improved multimonitor support

#### **V3.5.11**

1. Vacuum Pump: the pump failure can be triggered using X-Plane failures menu
2. Attitude Indicator: the indicator failure can be triggered using X-Plane failures menu
3. Fix: changing livery or airport could not allow the aircraft to load its status properly

#### **V3.5.10**

1. Minor fixes

#### **V3.5.9**

1. The Hypoxia warning is shown only when the TUC is lower than 20 minutes

#### **V3.5.8**

1. Minor fixes

#### **V3.5.7**

1. Fix: the state loading could load incomplete data on some systems
2. Minor fixes



#### **V3.5.6**

1. Better fuel flow at startup
2. It's now possible to paste the text in the licence box
3. Fix: saving a state file could have caused a crash on some specific system configurations
4. Fix: the static elements are better managed after leaving the replay mode
5. Fix: in some cases REP was unable to retrieve the correct system time

#### **V3.5.5**

1. Fix: In some cases the plugin was unable to recognize if the sim was paused or not. This could lead to some major issues, such airplane crash after leaving replay mode
2. Fix: the prop governor did not react correctly when controlled using a joystick axis
3. Fix: minor fixes to the sound engine
4. Fix: in some cases the engine temps were not updated correctly if the airplane was loaded in flight, causing the oil pump to seize
5. Fix: in some cases the liveries status were not loaded properly when changing from a livery to another of the same aircraft
6. It is now possible to disable the advanced steering algorithm
7. Minor fixes

#### **V3.5.4**

1. Minor Fixes

#### **V3.5.3**

1. Fix: fixed a compatibility issue with the sound engine
2. Fix: the parking brake lever was not properly set when parking brake was toggled using X-Plane default commands.

#### **V3.5.2**

1. Fix: the new OpenAL equalizer showed some incompatibility with 3rd party plugins. This update will try to work around them and prevent crashes. A better fix will be provided in future releases.
2. Fix: the parking brake lever was not properly set when parking brake was toggled using X-Plane default commands.

#### **V3.5.1**

1. Fix: the flaps handle did not move when the battery was off
2. Fix: the flaps motor sound was heard while checking the flaps during the walkaround
3. XP11.30 new hypoxia effect is now overridden and REP's more precise hypoxia effect is used instead

#### **V3.5.0**



1. **New:** It is now possible to load a worn out airplane. Checkout the [Persistent Aircraft and Components Wearing](#) chapter.
2. **New:** The cockpit instrumentation wears out with time and can be fixed using the Maintenance Report
3. **New:** [Hobbs Time](#) and [Tach Time](#) are now counted separately for the airframe and the engines
4. **New:** It is now possible to move the viewpoint while in walkaround or towing mode. VR not supported yet. See the [Towing](#) and [Walkaround](#) sections for more information.
5. The static elements, such chocks and tie-downs, are now managed during replay
6. The propeller governor dynamics at low RPMs are much improved
7. Improved starter algorithm
8. Fix: under certain conditions, the fuel pump sounds where not stopped with the pump itself
9. Fix: a bug prevented the cylinders to fail properly and to report their compressions in the Maintenance Report
10. Fix: the hypoxia message was shown when the hypoxia was disabled
11. Fix: the oil filter get less clogged when it's past TBO
12. Fix: the autostart broke if the weight and balance configuration was changed while it was running
13. Fix: The Maintenance Report and the Kneeboard were not dimmed correctly at night

#### V3.4.6

1. **New:** Automatic updates via [SkunkCrafts Updater](#) plugin
2. **New:** REP is now compatible with the [Differential and progressive brakes for X-Plane 11](#) plugin
3. Improved documentation
4. Improved gyros spin-down behavior
5. Fix: failures and damages were triggered while in replay mode
6. Fix: the oil pressure needle was not visible if the airplane was loaded with the engines running
7. Minor improvements

#### V3.4.5

1. **New:** It is possible to manage the static elements from the plugins menu
2. **New:** Command to toggle the static elements
3. **New:** Command to fix all systems
4. **New:** REP correctly recognizes the engine failures triggered by X-Plane
5. Fix: In the latest X-Plane versions the in-flight tip messages may have been not shown correctly
6. Fix: Some entries in the tech report were not clickable
7. Fix: Minor typos in kneeboard
8. The installer has been improved to work with all the airplane mods available over the Internet
9. More realistic hypoxia effect at lower altitudes
10. Improved documentation

#### V3.4.4



1. Minor fixes

### V3.4.3

1. **New:** Improved engine torque algorithm
2. **New:** Improved sparkplugs fouling algorithm
3. **New:** Removed the mouse gestures to open the kneeboard
4. **New:** The checklists/mass and balance/towing mode/autostart are now accessible from the plugins menu as well as the lateral menu
5. **New:** a new command has been added to switch on the HI fuel pump
6. Improved multimonitor compatibility
  
7. Fix: oil pressure was sometimes too low
8. Minor fixes

### V3.4.2

Internal test build – not released to the public

### V3.4.1

1. Fix: missing input chars in textbox
2. Fix: input on multimonitor setup was not working as expected
3. Minor fixes

### V3.4.0

1. **New:** Experimental VR Support
2. **New:** SDK 3.0 (Detachable) windows
3. Improved engine model
4. Minor fixes

### V3.3.1:

1. Fix: Too rich mixture at full power
2. Minor fixes

### V3.3.0

1. **New:** 100% custom engine model to replace the internal X-Plane piston engine
2. **New:** Engine monitor enables engine fine tuning during flight
3. **New:** Improved drag model
4. **New:** Improved walkaround oil system check
5. **New:** Improved ground roll sounds
6. **New:** Improved ADI spoolup model
7. **New:** Walkaround keyboard commands
8. Minor fixes





### V3.2.1

1. Fix: Loading and unloading the plugin more times caused a crash
2. Fix: If the flight was started with engine running, the mixture was set to idle-cutoff
3. Minor fixes

### V3.2.0

1. **New:** 3D sounds
2. **New:** Advanced gyro wander
3. **New:** You can now check the pitot probe temperature during walkaround
4. **New:** Postflight walkaround
5. **New:** Lights check during walkaround
6. **New:** More information about the cylinders status
7. **New:** The hobbs hour are now saved in the airplane state file and restored the next session
8. Improved steering algorithm
9. Better startup sounds
10. Fixed a bug that caused the cylinders to not being fixed correctly after an engine seizure
11. The landing gear failures are based on actual gravity acceleration. Now the landing on sloped strips are more realistic.
12. Fix a bug that may caused the engine to not fail when it should have
13. Minor fixes and improvements

### V3.1.1

1. **New:** The chocks and tie downs are checked before automatic start
2. **New:** The lateral menu can now be completely hidden (see the plugin settings window)
3. Improved flooded engine message
4. Better compatibility with the "Start with engine running" setting
5. Fix: the label colors in some walkaround views were incorrect
6. Fix (XP11 only): the wind sound volume is controlled by the environment sounds volume
7. Minor fixes

### V3.1.0

1. **New:** Dynamic ground roll sounds
2. Minor fixes

### V3.0.0

1. **New:** reworked user interface and graphics
2. **New:** automatic startup procedure
3. Improved flight dynamics in X-Plane 11
4. Fix: some throttle quadrants did not work correctly with REP
5. Minor fixes and improvements

### V2.6.4

1. **New:** Flight dynamics improvements in both X-Plane 10 and 11



2. Fix: Minor fixes

### V2.6.3

1. Fix: The right toebrake did not couple properly with external rudder pedals
2. Fix: The oil system "Refill" button was not clickable

### V2.6.2

1. Fix: Minor fixes

### V2.6.1

1. Fix: Checklists typos
2. Fix: Improved fuel pump sounds
3. Fix: The wheel brakes may be stuck after towing
4. Fix: Improved engines doppler and distance sounds
5. Fix: Damages disabled during replay
6. Fix: Improved the joystick compatibility with the new propeller governor

### V2.6.0

1. **New:** Custom propeller governor

### V2.5.1

1. Fix: Corrected the toe brakes algorithm

### V2.5.0

1. **New:** Improved torque effect
2. **New:** Improved CHT and Oil Temperature algorithm
3. **New:** Oil temperature tips
4. **New:** Improved hypoxia effect & algorithm
5. **New:** Fuel & Oil check in walkaround mode
6. Minor Fixes

### V2.4.0

1. **New:** Spark plugs dynamics:
  - The spark plugs get fouled when the engine runs at low RPMs
  - The default spark plugs can be replaced with the fine-wire ones
2. **New:** Hypoxia can now be disabled in the settings panel
3. **New:** The engine may be damaged by wrong ROP/LOP operations
4. Minor Fixes



### V2.3.0

1. **New:** Hypoxia simulation
2. **New:** Oil filter simulation: need to replace it at every oil change
3. **New:** Oil pump damage simulation
4. **New:** Fuel filter simulation: need to replace it after TBO
5. **New:** Vacuum pump casual failure simulation
6. **New:** More realistic engine priming dynamics
7. **New:** Improved W&B simulation during flight
8. **Fix:** Minor bug fixes

### V2.2.1

1. **Fix:** the installer did not apply some changes correctly

### V2.2.0

1. **New:** Simplified installation
2. **Fix:** The analog and digital fuel flow gauges were not reporting the correct fuel flow under certain circumstances
3. **Fix:** Minor fixes

### V2.1.0

1. **New:** Engine pre-heating and winterization kit
2. **New:** The avionics settings are restored after reloading the airplane
3. **New:** Better compatibility with other plugins that manage the state of the airplane (such as X-Bookmark)
4. **New:** The sounds volume is controlled by the Carenado volume knob
5. **New:** The lateral menu is dimmed at night
6. **Fix:** More realistic ground physics
7. **Fix:** The oil system is now reporting the correct oil quantity
8. **Fix:** Minor fixes

### V2.0.3

1. **Fix:** The cowl flaps lever cannot be moved using the mouse wheel
2. **Fix:** The kneeboard images were cutted and not shown correctly

### V2.0.2

1. **New:** Improved cylinders physics
  - The CHT temperature is now provided by a custom algorithm
2. **New:** Improved oil system
  - The oil temperature is now provided by a custom algorithm
  - The oil temperature and pressure depends also on oil quantity an quality
3. **New:** Improved touchdown sounds
4. **Minor Fixes**



### V2.0.1

1. Fix: It was not possible to enter the walkaround mode if the “Cold and Dark” option was disabled
2. Fix: Typos in the towing tips
3. Fix: The Walkaround checklists were not correctly visible on smaller screens.

### V2.0.0

1. **New:** Custom interactive walkaround and pre-flight procedures.
2. **New:** Custom airplane towing system
3. **New:** More advanced engine physics (especially for engine startup)
4. **New:** More complex damages system for the avionics, the engine and the landing gear such as:
  - Oversquare operation of the engine is not always allowed
  - The tire are damaged if the brakes are active on touchdown
5. **New:** More in-flight tips
6. **New:** Custom menu that provides an easy access to REP’s features
7. **New:** Stall buffeting effect (improved if HeadShake 1.5+ is installed)
8. Minor changes to the sounds system
9. Minor changes to the graphics system
10. Bug fixes

### V1.0.2

1. **New:** Correct steering and ground roll physics, especially in cross wind conditions.
2. **New:** The Weight & Balance tool now predicts the C.G. position at landing.
3. **New:** HeadShake and REP integration to better simulate the engine vibrations of the TSIO-520 (Headshake v1.5 or higher required).
4. Fix: Improved compatibility with Saitek products.
5. Fix: Minor fixes.

### V1.0.1

1. **New:** A tip is shown if the pilot is managing the plane’s system in the wrong manner.
2. **New:** Some failures (such as the avionic’s) are behaving in a more realistic way.
3. **New:** The parasite roll moment incorrectly reproduced by X-Plane is reduced.
4. **New:** The flooded engine behavior is now more realistic. If flooded, the engine may actually starts with closed mixture.
5. **New:** Engine manufacturer and model in the Hangar window.
6. **New:** Better oil color report in the Hangar window.
7. **New:** Added the “About” menu.
8. Fix: Sometimes, the joystick mixture axis was not correctly recognized.
9. Fix: Cranking a running engine does not reduce the engine’s RPM anymore.
10. Fix: Cranking a running engine does not cause an avionics failure anymore.
11. Fix: The pilot altimeter’s barometer was rendered incorrectly.
12. Fix: The propeller joystick axis was not working as expected.
13. Fix: The oil pressure was too high during flight.
14. Fix: Minor changes to improve performance and correct typos.



## **V1.0.0**

1. Initial Release



## LICENCE

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