



Cirrus SR22  
powered by  
Reality Expansion Pack

v5.0.7

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# Contents

<b>GENERAL INFORMATION</b>	<b>5</b>
Licence	5
Reality Expansion Pack EULA	5
LibCURL EULA	8
Thank You	9
Introducing REP	9
Legal Notice	9
Aircraft General Description	10
<b>INSTALLATION &amp; CONFIGURATION</b>	<b>11</b>
System Requirements	11
Use REP on Linux	11
Base Airplane	11
Install the software	11
Automatic Update of the Software	13
Manual Update of the software	13
Remove the software	13
Recommended sound settings	15
Recommended control settings	15
Hardware and Software Compatibility	16
Headshake	16
Saitek Panels	16
XPRealistic	16
Differential and progressive brakes for X-Plane 11	16
<b>THE REALITY EXPANSION PACK</b>	<b>17</b>
User Interface	18
Lateral Menu	18
Maintenance Report	19
Kneeboard	20
Mass & Balance	22
Walkaround	23
Towing	24
Engine Autostart	24
Settings Window	25
Economy System	27
Modes of Operation	27
Enabling the Economy System	27
FSEconomy: Aircraft Key Setup	27
How the Economy System Works	29
VR Support	33

How to open the plugin windows in VR . . . . .	33
Sound System . . . . .	34
Persistent Aircraft and Components Wearing . . . . .	36
Loading a Worn-Out Aircraft . . . . .	36
Checking Component Status . . . . .	36
Hobbs Time Vs Tach Time . . . . .	37
Human Factor . . . . .	38
Hypoxia . . . . .	38
TUC & EPT . . . . .	38
<b>SYSTEMS DESCRIPTION</b>	<b>40</b>
Powerplant . . . . .	40
Engine Overview . . . . .	40
Starter . . . . .	42
Induction System . . . . .	43
Turbonormalization . . . . .	43
Fuel Injection System . . . . .	47
Spark Plugs . . . . .	48
Exhaust System . . . . .	48
Oil System . . . . .	49
Propeller . . . . .	51
The Red Box . . . . .	51
Engine Monitor . . . . .	52
Preheater & Winterization Kit . . . . .	53
Engine Startup Tips . . . . .	53
Vacuum System . . . . .	53
Electrical System . . . . .	54
Battery . . . . .	54
Alternator . . . . .	54
Lights . . . . .	54
Electrical Gyros . . . . .	54
Avionics . . . . .	56
Status Saving and Avionics Wear and Tear . . . . .	56
Landing Gear . . . . .	57
Free castoring nose wheel . . . . .	57
Tires . . . . .	57
Brakes . . . . .	57
Oxygen System . . . . .	59
<b>RESOURCES</b>	<b>60</b>
Links and How-Tos . . . . .	60
Homecockpits and Custom Datarefs . . . . .	61
<b>TECHNICAL SUPPORT</b>	<b>68</b>
Contacts . . . . .	68



Version Changelog . . . . . 69



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The following statements are applicable **only** to the [LibCURL library](#) used to provide some features of this product.

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## Thank You

Welcome to the ranks of the Reality Expansion Pack users!

Our software has been designed to give you the most in performance and fun. Our desire is that you will find using it a pleasant and profitable experience.

This manual has been prepared as a guide to help you get the most from our software. It contains information about the usage and the features of the Reality Expansion Pack for X-Plane.

## Introducing REP

The Reality Expansion Pack (or REP) is a software developed by real pilots. It is designed to provide the most realistic experience to the X-Plane users. This goal is achieved by providing more realistic flight dynamics, sounds, and on-board systems.

This software is meant to enhance an existing X-Plane aircraft. In this particular case, this REP package is targeting the **Default X-Plane 12 Cirrus SR22**.

## Legal Notice

Before starting using this software please carefully read the [End-User License Agreement](#) at the end of this manual.



## Aircraft General Description

The Cirrus SR22 is a single-engine five-seat composite aircraft built from 2001 by Cirrus Aircraft of Duluth, Minnesota.

It is a development of the Cirrus SR20, with a larger wing, higher fuel capacity, and a more powerful, 310-horsepower (231 kW) engine.

The SR22 series has been the world's best-selling general aviation (GA) airplane every year since 2003. With 6,149 units delivered from 2001–19, and in combination with the SR20, a total of 7,645, it is the most-produced GA aircraft of the 21st century, and is the single most-produced GA aircraft made from composite material, accounting for over 30% of the entire piston aircraft market.

The Cirrus SR22 is equipped with a whole-plane emergency recovery parachute system: the Cirrus Airframe Parachute System (CAPS). This has contributed to its market success and has given it the nickname "the plane with the parachute".



# INSTALLATION & CONFIGURATION

## System Requirements

This software requires X-Plane 12.00 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.

## Use REP on 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 **Default X-Plane 12 Cirrus SR22** 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. Locate the SR22 folder inside your X-Plane installation.



2. Clone the SR22 folder and call it "SR22 REP".
3. Extract the contents of this REP package into a temporary folder
4. Move **the contents** of "**into-aircraft-plugins-folder**" into the "**SR22 REP/plugins**" folder
5. Move **the contents** of "**into-aircraft-main-folder**" into the "**SR22 REP**" folder
6. Run X-Plane and load the SR22.
7. Follow the onscreen instructions

**i Note**

After reloading the airplane, X-Plane may crash reporting an error related to the "master.bank" file. If that's the case, please follow the instructions stated in [this FAQ](#).



## 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 SR22 main folder.

### 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.

### Note

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.

### Note

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 SR22, overwriting the existing one.
2. Run X-Plane and load the SR22.
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 SR22, you should setup your sound settings like the following screenshot.

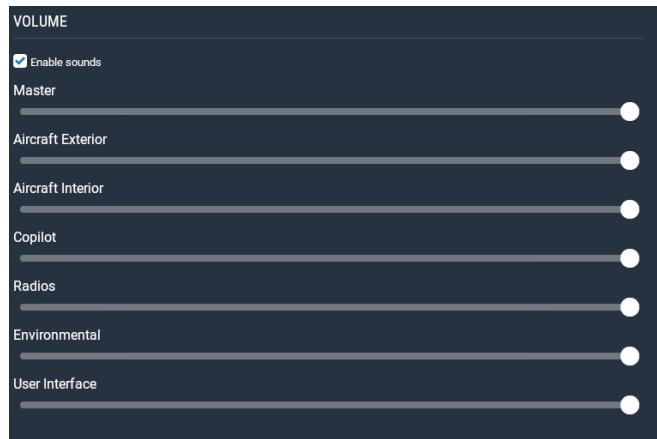


Figure 1: Recommended sound settings

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.

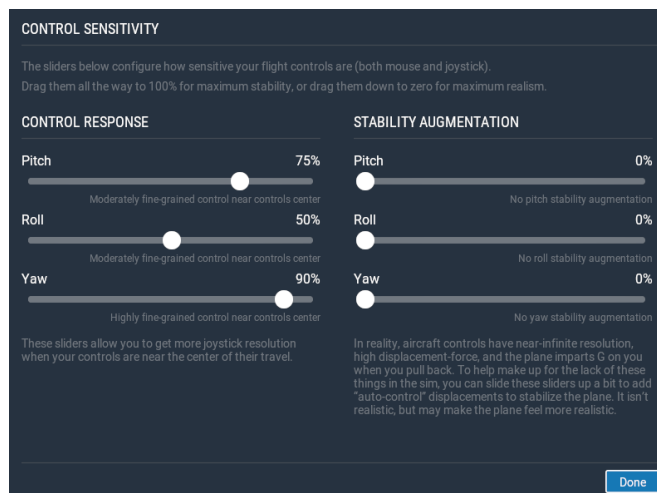


Figure 2: Recommended control settings



## Hardware and 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 SR22.

### XPRRealistic

---

The Reality Expansion Pack can be used together with XPRRealistic.

You might need to disable XPRRealistic'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.



## THE REALITY EXPANSION PACK

This section describes the features of the Reality Expansion Pack and explains how to use them effectively.

## 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: *Cirrus SR22* No: *1729200* Time (hr): *5:03*

ENGINE STATUS

Model: *Teledyne Continental Motors T110-550-N* Time (hr): *03:18/1700*

Item	Status	Action
Cylinders 1	<i>OK</i>	
Cyl. Compression (PSI)	<i>80/80 80/80 80/80 80/80 80/80 80/80</i>	
Oil Fluid	<i>SAE 30, clean, 47 hrs before change</i>	
Oil Fluid Quantity	<i>12/4 USG (8/4 - 12/4)</i>	
Available Oil Types	<i>SAE 30</i>	<i>Use</i>
	<i>SAE 10W30</i>	<i>Use</i>
	<i>SAE 50</i>	<i>Use</i>
Oil Filter #1	<i>Clean, 97 hrs bef. change</i>	
Oil Pump #1	<i>Ok</i>	
Propeller	<i>Ok</i>	
Electric Fuel Pump #1	<i>Ok</i>	
Fuel Filter #1	<i>Clean</i>	
Spark Plugs #1 Type	<i>Massive (Fouling more)</i>	<i>Use Fine Wire</i>
Spark Plugs tip	<i>Clean</i>	
Starter #1	<i>Ok</i>	

The Economy System is not enabled.

Page 1/9

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.

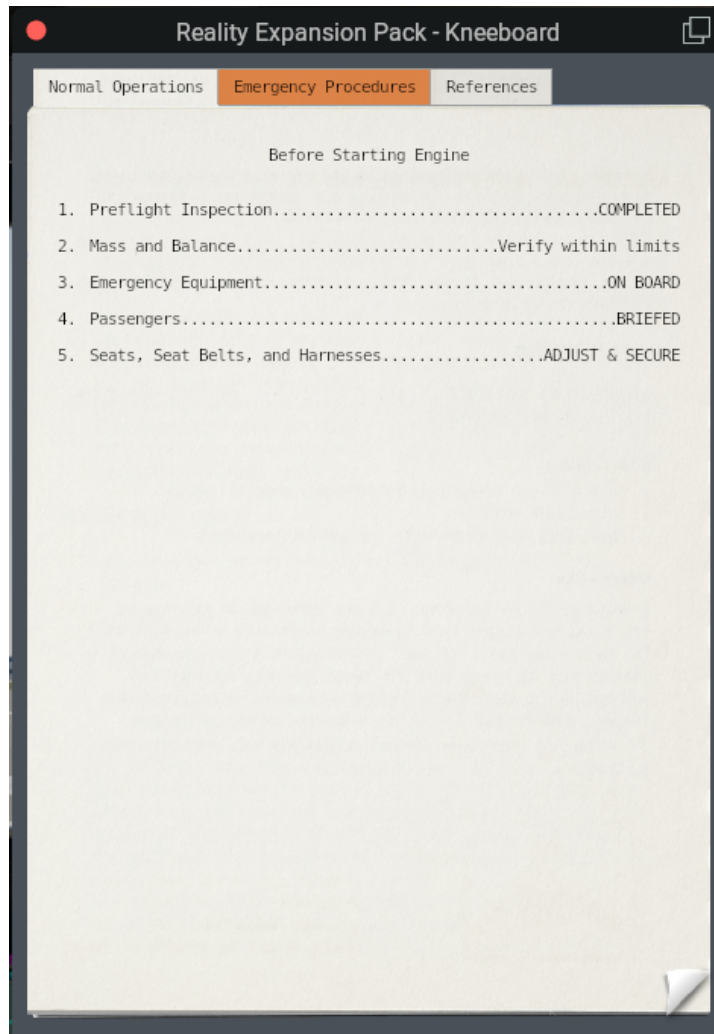


Figure 6: The Kneeboard window

---

## 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.

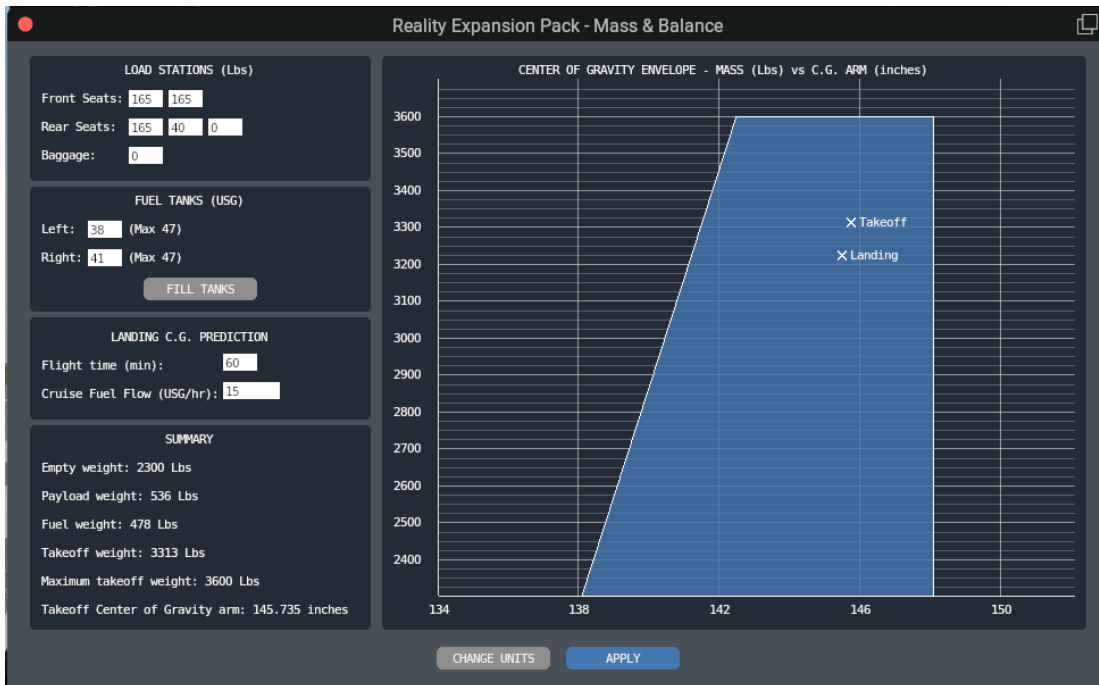


Figure 7: The Mass & Balance window

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
<code>simcoders/rep/walkaround/toggle</code>	Toggle the walkaround mode
<code>simcoders/rep/walkaround/next</code>	Next walkaround station
<code>simcoders/rep/walkaround/previous</code>	Previous walkaround station
<code>simcoders/rep/walkaround/action</code>	Execute current action
<code>simcoders/rep/walkaround/static_elements/toggle</code>	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 air-plane status when unloaded. When the same plane and livery are loaded again, the status will be restored.

### Note

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 nose-wheel 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.

- **Show engine monitor:** When ticked, REP will show the engine's parameters when the power is above 30% and the engine settings - such as Manifold Pressure, Prop RPM or Mixture - are changed by the user.
- **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.

**Important:** You must **own** the aircraft in FSEconomy to generate and use the Aircraft Key. Rented aircraft are not valid for this purpose.

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 owned 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.

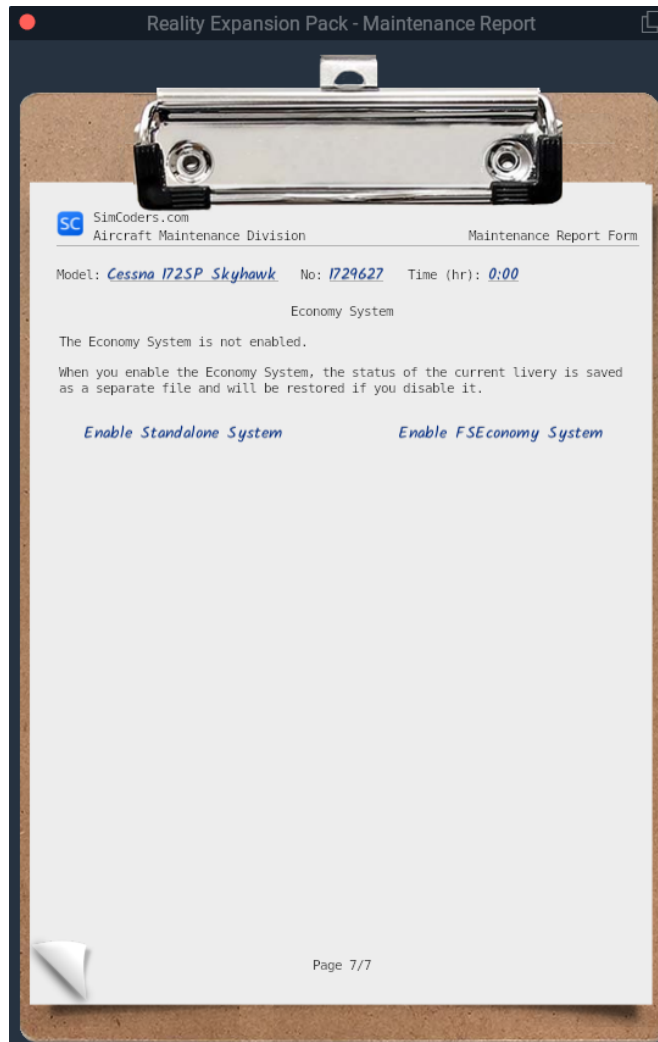


Figure 8: Enable the Economy System

## How the Economy System 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](#).

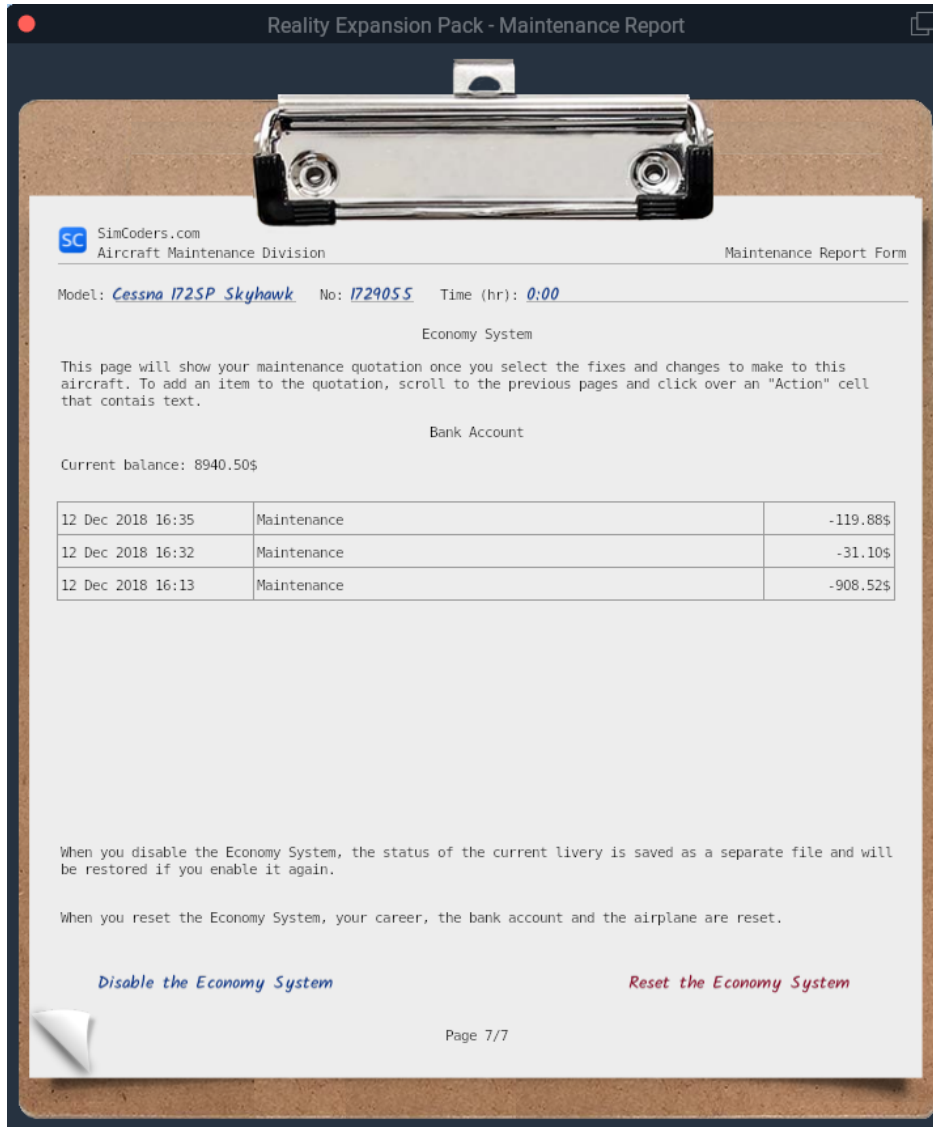


Figure 9: Economy System Overview

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

Page 1/7

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](#).



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

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### 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

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### 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

## Sound 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

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

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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 on-board 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

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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 Vs Tach Time

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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**.

### Note

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

## Human Factor

### Hypoxia

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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.

The SR22 is provided with an oxygen system that can prevent the effects of hypoxia. Make sure that the oxygen system is active whenever you fly above 10.000 feet.

More information about the oxygen system is available in the Systems Description section.

### TUC & EPT

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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

## 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

The SR22 is powered by a six-cylinders Teledyne Continental Motors (TCM) normally aspirated IO-550-N or turbosupercharged TSIO-550-K, direct-drive, air-cooled, horizontally-opposed, fuel-injected engine with 550 cubic inches displacement.

This engine outputs a maximum power of 310HP (normally aspirated) at 29 inches Hg and 2700RPM with no time limitations or 315HP in the turbo version.

### Engine Overview

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The Reality Expansion Pack completely overrides X-Plane's default engine model. REP does not modify or extend the simulator's engine logic: it replaces it entirely. No part of the original engine simulation is used.

In REP, the engine is built from the ground up as a real mechanical system. Every major component is modeled so that all engine behavior emerges naturally from its internal state, not from precomputed tables or cosmetic corrections. Nothing exists simply to show the "right" values on the instruments.

Each piston is simulated individually. Airflow, fuel mixing, combustion, and power generation are computed on a per-cylinder, per-cycle basis. Engine vibrations are a direct consequence of piston motion and combustion events, not an added effect.

All secondary systems – including power output, cylinder head temperature, oil pressure, and engine dynamics – depend on this core combustion model. The engine truly breathes air, mixes it with fuel, and produces power through a physically coherent combustion process.

As a result, engine behavior in REP is consistent, interconnected, and responsive to every operating condition, exactly as in a real engine.

Some of the features include:

- **Correct animations and sounds:** piston motion and cylinder compression are simulated individually and with correct dynamics. Propeller movement and engine vibrations are therefore direct consequences of the real per-piston combustion process, not precom-



puted effects.

- **Correct power output:** the engine outputs the correct power at every MAP/RPM setting.
- **Correct fuel flow:** reaching the correct power output allows X-Plane to provide the right fuel flow at every phase of the flight, right down to the numbers.
- **Realistic startup procedure:** The engine needs to be pre-injected using the electrical fuel pump (see the operating tips)
- **Realistic engine issues:**
  - The engine startup may be prevented by vapour locks or fuel floodings.
  - The oil type, quality and quantity affects the engine behavior.
  - The spark plugs may foul because of carbon deposits
  - Leaning the mixture at the wrong time or in the wrong way may cause damages to the engine
  - Realistic wastegate operations: the turbocharger's wastegate is automatic operated by a mechanical controller that keeps the MAP constant while the airplane climbs or descends.
  - Engine preheater and winterization kit: the engine may be preheated in winter using the provided electric engine heater. If the engine is not heated correctly, it won't start or may be damaged after start.

## Starter

The Reality Expansion Pack replaces the default starter with a fully custom, physically based model.

In REP, the starter draws electrical power from the main bus, exactly like the real system. During engine start, the starter must work against the mechanical resistance of the engine, which is not constant. This resistance varies continuously depending on piston position and on the current phase of the four-stroke cycle. As a result, both the electrical current absorbed by the starter and the mechanical power it delivers are not constant over time.

This behavior directly affects the onboard electrical system. Voltage and current fluctuations during start are therefore a natural consequence of the interaction between the starter, the engine, and the battery.

REP does not simply “simulate” a starter as an on/off device. Instead, it models the starter as a real electromechanical component that applies torque to the engine. Whether the engine successfully starts depends on battery charge, available electrical power, and the resulting starter RPM, which determines how effectively the engine can be cranked.

In the Engine Status page of the Maintenance Report, you can:

- Check the current starter condition
- Replace a worn or faulty starter with a new one

### Caution

The starter will overheat and then damage if engaged for too long. Make sure to engage the starter for no more than 30 seconds. Let it cool down between failed starts.



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## Induction System

The Reality Expansion Pack implements a custom **Manifold Absolute Pressure (MAP)** algorithm, replacing X-Plane's default system to provide enhanced accuracy and realism.

The REP MAP model accounts not only for throttle position and engine operating conditions, but also for the effects of **ram air pressure**, allowing airspeed to influence the indicated manifold pressure as in the real aircraft.

In addition, the geometry and characteristics of the **engine induction system** are taken into account when computing MAP values. Losses and pressure recovery within the intake are modeled to better reflect real-world behavior across different power settings and flight regimes. As a result, the indicated manifold pressure responds more naturally to changes in airspeed, altitude, and engine configuration, closely matching real aircraft performance and pilot expectations.

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## Turbonormalization

The **SR22** comes equipped with a **naturally aspirated Continental IO-550-K** engine, meaning its performance is directly affected by altitude. As the aircraft climbs, the available air density decreases, leading to a reduction in **manifold pressure**, power output, and overall efficiency.

With the **Reality Expansion Pack**, this engine can be **upgraded to a turbo-normalized (TN) configuration** via the **Maintenance Report** window. This modification allows the engine to maintain **sea-level manifold pressure** even at higher altitudes, significantly improving cruise performance and climb efficiency.

Unlike a traditional turbocharged engine, which can generate manifold pressures exceeding standard atmospheric conditions, a **turbo-normalized system** is designed to regulate pressure, ensuring the engine operates within its intended limits while maximizing power retention at altitude. To achieve this, the aircraft is fitted with a **turbocharger and an automatic wastegate**, which carefully manages boost pressure to prevent overboosting and excessive engine stress.

With this upgrade, the **SR22** becomes a more capable aircraft, well-suited for **high-altitude operations, improved fuel efficiency, and enhanced climb rates**, making it ideal for flights over mountainous terrain or extended cross-country journeys.

REP models the turbonormalized **SR22** installation in a highly realistic manner, consistent with typical Tornado Alley Turbo (TAT) STC systems.

A turbonormalized engine is flat-rated: the turbocharger is used to maintain sea-level manifold pressure as altitude increases, rather than boosting manifold pressure above sea-level values. In this configuration, the system is designed to provide stable manifold pressure (approximately 31.0 inHg) up to about 20,000 ft, with available power gradually decreasing above that altitude.

The installation is based on an intercooled turbonormalizing system with automatic wastegate control, allowing consistent engine performance and improved efficiency at higher alti-

tudes.

**Note**

Proper engine oil pressure is essential for normal wastegate operation. A loss of oil pressure (for example due to an oil leak) may also result in an unexpected reduction in manifold pressure. If manifold pressure does not behave as expected, oil pressure should be monitored closely.

## Turbocharger

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A turbocharger consists of a small turbine driven by the engine's exhaust gases. The exhaust flow spins the turbine, which in turn drives a compressor on the opposite side, drawing in ambient air, compressing it, and delivering it to the engine's induction system.

In REP, the turbocharger is modeled according to its **real-world operating principles**, rather than as a simplified pressure multiplier. The system dynamically computes **turbocharger RPM, internal pressure, and temperature** based on actual engine parameters such as delivered power, exhaust gas temperature (EGT), and mass airflow. This results in realistic turbo behavior, including spool-up characteristics, thermal effects, and power response across different operating conditions.

## Automatic Wastegate

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Proper control of a fixed wastegate is complex and, if mismanaged, can lead to reduced engine efficiency or even mechanical damage. For this reason, a turbonormalized engine is equipped with an **automatic wastegate controller**.

The automatic controller modulates the wastegate position to achieve the **target manifold pressure** selected by the pilot via the throttle. With the throttle fully closed, the target manifold pressure is approximately **8 inHg**; with the throttle fully open, the target manifold pressure is approximately **31 inHg**.

Despite the presence of the automatic controller, **rapid throttle application** can still result in a momentary overboost condition. The wastegate system has inherent response time limitations and cannot react instantaneously to abrupt changes in exhaust energy. To minimize the risk of overboost, power should be applied smoothly by **advancing the throttle gradually**, especially at higher power settings.

In addition to simplifying power management, the automatic wastegate improves **exhaust backpressure dynamics**, particularly at altitude. This results in more efficient turbocharger operation and can provide up to **approximately 5% additional power** for the same throttle setting compared to a fixed or manually controlled wastegate.

**⚠ Caution**

Since the wastegate is oil-pressure actuated, cold and highly viscous oil slows its response time. As a result, manifold pressure limits may be exceeded more easily during rapid power changes when the oil is not yet at normal operating temperature. For this reason, the engine should be properly warmed up and all engine instruments should be within the green arc before proceeding to the active runway.

**i Note**

Proper engine oil pressure is essential for normal wastegate operation. A loss of oil pressure (for example due to an oil leak) may cause the wastegate to move toward the open position, resulting in an unexpected reduction in manifold pressure. If manifold pressure does not behave as expected, engine oil pressure should be monitored closely.

## Manifold Pressure Variation with Engine RPM

---

When the **wastegate is open**, a turbocharged engine behaves similarly to a normally aspirated engine with respect to changes in engine RPM. Increasing RPM results in a slight **decrease in manifold pressure**, while decreasing RPM causes a slight **increase in manifold pressure**.

When the **wastegate is closed**, the relationship is reversed. In this condition, an **increase in engine RPM** results in an **increase in manifold pressure**, while a **decrease in RPM** leads to a **decrease in manifold pressure**. This occurs because higher engine RPM increases exhaust mass flow, driving the turbocharger faster and increasing compressor output.

## Manifold Pressure Variation with Altitude

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At **full throttle**, the turbocharger is capable of maintaining a maximum continuous manifold pressure of **35 inHg** to well above **17,000 feet**, depending on engine condition and atmospheric parameters. However, engine operating limitations define the maximum allowable manifold pressure. Above **17,000 feet**, manifold pressure must be reduced in accordance with the aircraft operating placard, typically by **subtracting 1 inHg from 35 inHg for each additional 1,000 feet**.

At **partial throttle**, the turbocharger can maintain **climb power settings of 2,500 RPM and 30 inHg** from sea level up to approximately **20,000 feet** under standard atmospheric conditions. Under hot-day conditions, this same power setting can typically be maintained from sea level to approximately **8,000 feet** without throttle adjustment once established after takeoff. Above this altitude, maintaining 30 inHg requires **progressive throttle advancement**, in a manner similar to climb operations in a normally aspirated engine.

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## Manifold Pressure Variation with Airspeed

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When the **wastegate is closed**, manifold pressure varies with changes in **airspeed**. The compressor section of the turbocharger operates at pressure ratios of up to **3:1**, meaning that even small variations in inlet pressure caused by changes in airspeed are amplified at the compressor outlet. These pressure changes affect exhaust flow and turbine speed, resulting in corresponding variations in manifold pressure.

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## Fuel Flow Variations with Changes in Manifold Pressure

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The engine-driven fuel pump output is regulated by **engine speed** and **compressor discharge pressure**. Fuel flow is then metered by the throttle and mixture controls.

When the **wastegate is open**, fuel flow varies directly with **manifold pressure, engine RPM, mixture setting, and throttle position**. In this condition, manifold pressure is primarily controlled by throttle position and wastegate operation, while fuel flow responds directly to throttle movement and pressure changes.

When the **wastegate is closed** and changes in manifold pressure are driven by turbocharger output rather than throttle movement, **fuel flow follows manifold pressure automatically**, even if the throttle position remains unchanged. As a result, pilot fuel-flow management is typically limited to:

1. Initial mixture adjustment for proper rich climb after takeoff,
2. Leaning during cruise,
3. Returning the mixture to full rich for approach and landing.

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## Manifold Pressure Variation with Increasing or Decreasing Fuel Flow

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When the **wastegate is open**, movement of the mixture control has little or no effect on manifold pressure in a turbocharged engine.

When the **wastegate is closed**, any change in fuel flow results in a corresponding change in manifold pressure. Increasing fuel flow increases exhaust mass flow, which drives the turbocharger faster, increases induction airflow, and raises manifold pressure. Conversely, reducing fuel flow decreases exhaust energy, slows the turbocharger, and results in a reduction in manifold pressure.

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## System Limitations

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1. Maximum MAP: 31 InHg

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## Fuel Injection System

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The Reality Expansion Pack fully recreates the TCM Continuous Flow Fuel Injection System that powers the real world SR22.

This fuel injection system is as simple as it can be. That is, the throttle position controls the amount of fuel that goes into the engine. It does not compensate for altitude or density changes, nor does it correct for MAP.

It's then really important to properly lean the mixture, especially at altitude.

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## Tuned Fuel Injectors

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The cylinders and air induction positions lead to a different amount of air being sucked in each cylinder for a given throttle position.

That is, more air goes into the #1 and #2 cylinders than in #3 and #4. In a 6 cylinders engine, the spread between #1 and #6 is quite wide.

Factory fuel injectors deliver the same amount of fuel to each cylinder. That is, cylinder #1 runs leaner than #2. The richer cylinder is usually #5 or #6.

This spread affects the engine performance, especially when running lean of peak with only one EGT probe. Usually, leaning LOP for the hottest cylinder (#5 or #6 in a 6 cylinders, #3 or #4 in a 4 cylinders) means being widely LOP for the #1 cylinder, thus experiencing a loss of power together with a rough running engine.

In the [Maintenance Report](#), it is possible to replace the factory injectors with tuned ones, made to properly release the correct amount of fuel based on the cylinder number. Tuned injectors allow for:

- Smoother LOP operations
- Fewer vibrations
- **Lower fuel burn of about 1 GPH**

General Aviation Modifications, Inc. is a real world manufacturer of tuned fuel injectors for many different type of fuel injected engines. For more information, please visit [GAMI's web-site](#).



## Spark Plugs

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Each cylinder is equipped with two spark plugs, one powered by the left magneto and the other by the right magneto.

In REP, spark plug behavior follows real-world physics. When the engine is operated at low RPM with a rich mixture, carbon deposits gradually build up on the spark plug electrodes. As fouling increases, spark efficiency degrades and combustion becomes less reliable.

To reduce the risk of fouling, avoid prolonged operation below 1000 RPM and aggressively lean the mixture during ground operations. These procedures help maintain proper combustion temperatures and keep the spark plugs clean.

During the magneto check, an excessive RPM drop is a clear indication of one or more fouled spark plugs.

Spark plugs can often be cleaned by running the engine at a high power setting while aggressively leaning the mixture. Maintain this condition for approximately 20 seconds, then repeat the magneto check to verify proper operation.

In the Engine Status page of the Maintenance Report, you can:

- Check the spark plugs status
- Manually clean the spark plugs
- Fine-wire spark plugs are less susceptible to fouling than standard plugs, but they are not immune and can still foul under unfavorable operating conditions.

## Exhaust System

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The main goal of the Exhaust System is to emptying each cylinder of spent exhaust gases.

Factory exhaust usually aren't length-tuned. That is, the length from the cylinder's outlet valve to the end of the exhaust is not the same for each exhaust tube. This causes the formation of shock waves when the exhaust gases from one cylinder hit those from another cylinder. That is, the emptying effect is lower than desired.

Using the [Maintenance Report](#) it is possible to replace the factory exhaust with tuned ones. Tuned exhaust allow for:

- ~10% more power
- Fewer vibrations
- Lower fuel burn
- Lower CHTs

## Oil System

The oil system has the main role to lubricate the engine thus reducing the friction between engine components. It also helps reduce the engine temperature.

The oil system is made by:

- An **oil tank**
- A **screening filter**
- A set of **oil lines** that go to the cylinders
- An engine-driven **scavenging pump** that moves the oil from the bottom of the oil sump - below the engine - back to the oil tank
- An **oil radiator**.

The Reality Expansion Pack simulates all these components as well as the oil fluid properties.

The pilot must check the quantity and quality of the oil before each flight. This should be done during the walkaround.

In the "Engine Status" page of the Maintenance Report you can:

- Check the **type of oil fluid** in use
- Check the **quantity of oil fluid** in the oil tank
- **Change the oil** fluid type
- Check the **status of the oil filter**
- **Change the oil filter** with a new one
- Check the **oil pump status**
- Overhaul the **oil pump**

A higher grade oil - such SAE50 - is thicker than a lower grade - such SAE30 - and meant to be used in hotter climates.

The following article is a guide to choose the correct oil grade depending on the type of flight operations in progress: <https://www.simcoders.com/2016/04/18/how-to-choose-right-oil-engine>

If the oil is not changed regularly (about every 40 hours) it may get dirty and have a lower lubricant action. That is, the engine will run hotter and wear more than before.

### Caution

Using a higher-viscosity oil in cold climates may cause excessive oil pressure, potentially damaging oil system components.



**i Note**

Oil pressure may approach its maximum limit during initial engine start when the engine is cold. This is normal and does not cause any harm, provided that oil pressure decreases as the engine warms up.

Allow the engine to warm up to ensure proper oil temperature and pressure before applying full power for takeoff.

## Propeller

The Reality Expansion Pack replaces the default propeller governor with a custom one.

The propeller governor controls the propeller blades pitch in order to maintain a constant propeller speed.

The governor drives the blades pitch using the engine oil pressure. Make sure to properly warm up the engine before takeoff to ensure a faster response of the governor.

The Reality Expansion Pack simulates the SR22 “power lever”. That is, a single lever controls both the propeller RPM and the Manifold Pressure.

When the normally aspirated engine is selected in the maintenance window, the upper part of the throttle controls the RPM. Full throttle selects 2700RPM. Reducing throttle, the selected RPM is lowered down to 2500RPM. After that, further reducing throttle will keep 2500RPM while reducing the manifold pressure.

### Note

If the engine is provided with a turbonormalizer, the propeller speed is automatically fixed to 2500RPM.

## The Red Box

When the big bore engines like the IO-550, IO-540 and the IO-520 were designed, there were many misconceptions about how to actually manage the engine throughout the normal operating range.

The most common tip was to run 100°F ROP during high power operations, such climb, and 50°ROP during cruise, with the extra rule to almost never run LOP.

When engine monitors started to be normal equipment on most high-end GA aircrafts, pilots finally had some data on which they could base they engine management decisions.

It turned out that the 50/100°ROP rule is – generally speaking – not the best way to take care of your engine.

In fact, the best ranges turned out to be the following:

- Above 80% of power: richer than 200°F ROP or leaner than 60°F LOP
- Between 75% and 80% of power: richer than 180°F ROP or leaner than 40°F LOP
- Between 70% and 75% of power: richer than 125°F ROP or leaner than 25°F LOP
- Between 65% and 70% of power: richer than 100°F ROP or leaner than peak EGT
- Below 65% of power: no restrictions, lean as you like

The ranges outside the one suggested above form what is called the ‘red box’.

Running the engine in the red box is not really damaging it, but if you take care of it and stay away from the red box, you may extend the engine life and get an engine that run smoother.



An extensive explanation of how and why you should keep the red box rule in mind is in this article: [https://www.avweb.com/news/savvyaviator/savvy\\_aviator\\_59\\_egt\\_cht\\_and\\_leaning-198162-1.html](https://www.avweb.com/news/savvyaviator/savvy_aviator_59_egt_cht_and_leaning-198162-1.html)

## Engine Monitor

---

The Reality Expansion Pack provides an engine monitor that shows the engine parameters such as the Fuel Flow, the EGT and the BHP whenever the engine control levers are moved.

To activate the engine monitor, open the plugin settings and check the “Show Engine Monitor” option.

## Preheater & Winterization Kit

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To engage the engine preheater, open the Maintenance Report window and activate the electrical heater by going into the “Engine Tools” section.

The electrical heater will warm up the engine (CHT) and the oil to a temperature that is suitable for startup is 30/60 minutes, depending on the outside air temperature.

A “Fast Warmup” button is available in the Maintenance Report window. Once clicked, the engine will be warmed up instantly.

Keeping the cowl plugs mounted will provide a faster and better warmup. To mount the cowl plugs, enter the walkaround mode and move to the engine checks.

If operating in very cold climates, keep the engine preheater on until the walkaround is completed and startup the engine as soon as the preheater is turned off.

The engine preheater state is kept between X-Plane sessions. If you turn on the heater and then close X-Plane, the engine will be warmed up even when the simulator is not running.

## Engine Startup Tips

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- Before starting the engine, always apply full mixture and full throttle and then switch the electrical fuel pump on for a variable time between half (warm engine) and two seconds (cold engine). After this pre-injection phase, close the throttle and proceed with the normal engine startup.
- If the engine “pops” during the startup it means it’s flooded. Just close the mixture and set the throttle full open, then engage the starter. The engine should start in a few revolutions. If not, repeat the normal startup procedure.

## Vacuum System

The engine is provided with a vacuum pump used to power up the vacuum gyros.

A vacuum pump is connected to the engine via a quick-break shaft. In case of vacuum pump seizure, the shaft breaks and no harm is done to the engine.

Use the vacuum gauge to check that the vacuum pump is properly working. A normal vacuum reading is about 4 to 6 when the engine is running at cruise power.

In the “Engine Status” page of the Maintenance Report you can:

- Check the vacuum pump status
- Repair a broken vacuum pump

## Electrical System

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 section below to get more information.

### Lights

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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

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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.

## Avionics

### Status Saving and Avionics Wear and Tear

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 avionics component
- **Fix** a faulty radio

#### Caution

Never switch the engine or alternator on or off while the avionics master switch is ON. This may cause voltage spikes and damage avionics components. Even modern systems, such as the Garmin GNS 430/530, include protection against electrical overloads, but they are not fully immune.



## Landing Gear

The airplane is equipped with a tricycle fixed landing gear.

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

## Free castoring nose wheel

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The nose wheel will freely turn right or left.

The airplane direction on ground should be maintained using the brakes as well as the steering pedals.

## 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 SR22 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 aircraft is equipped with an oxygen system that supplies oxygen to the pilot and passengers through dedicated oxygen masks.

The system is operated using a switch located in the cockpit. An oxygen pressure indicator is positioned near the switch.

When flying above 12,000 feet, the switch must be set to ON and the pressure indicator must show positive pressure.

Oxygen flow pressure depends on the remaining tank pressure.

The total oxygen duration varies depending on the number of passengers on board. The Mass and Balance tool sets the number of occupants. The more people on board, the shorter the oxygen supply will last.



## RESOURCES

### Links and 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](#)



## Homecockpits and 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: Stdby attitude indicator pitch
- 

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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



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

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

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

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

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

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

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

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

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

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

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

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

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

- Type: float
  - Writable: No
-



- Contents: R FF indicator
- 

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

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

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

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

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

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

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

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

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

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

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

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

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

---



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

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

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

**Dataref:** simcoders/rep/engine/electrical\_fuelpump/switch\_on\_0

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

**Dataref:** simcoders/rep/engine/electrical\_fuelpump/switch\_on\_1

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

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

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

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

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

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

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



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

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

**Dataref:** 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)
-



## TECHNICAL 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

### V5.0.7

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### V5.0.6

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1. Fix: the fuel pump could drain fuel even when the fuel selector was off.

### V5.0.5

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1. Fix: The FSEconomy system could cause a crash in X-Plane 12.4.

### V5.0.4

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1. Fix: Fixed fuel tanks size.

### V5.0.3h1

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1. Fix: hot-fix to solve an X-Plane 11 compatibility issue.
2. Fix: hot-fix to solve an illegal call to SDK functions from threads.

### V5.0.3

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1. Improvement: REP text-based engine monitor now displays TIT when a turbosuper-charger or turbonormalizer system is active.
2. Improvement: when possible, REP writes it own data to the default engine indicators datarefs.
3. Improvement: more realisti oil pressure at very low RPM.
4. Fix: Hypoxia visual effect was not always displayed correctly.

### V5.0.2

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1. Improvement: Overall improvement of engine sounds.
2. Improvement: Overall improvement of the HeadShake integration.
3. Improvement: Overall improvement of the plane vibrations at low engine RPM.

### V5.0.1

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1. Improvement: The user manual has been reorganized with a new structure and enhanced graphics.
2. Improvement: Fine tuned cylinders compression.

### V5.0.0

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1. Improvement: All piston engines now feature an enhanced model with significantly refined cylinder data (CHT, EGT, compression, power output, position, vibration, firing order, and more).
2. Improvement: All piston-engine aircraft now benefit from an improved electrical system model, eliminating several quirks found in previous REP versions.
3. Improvement: Improved gyroscopic sound effects for greater realism.
4. Improvement: Better compatibility with macOS, including sound handling and font loading.
5. Fix: Resolved a configuration loading issue that could prevent the package from starting correctly on some systems.

### V4.8.13

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1. Fix: Starter sound now plays correctly
2. Fix: Fuel pump sound now stops as expected

### V4.8.12

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No change for this aircraft

### V4.8.11

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1. Fix: the TKS system would not refill if the economy system was enabled and the sim stopped

### V4.8.10

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No change for this aircraft



#### V4.8.9

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1. Fix: tanks size match default SR22.
2. Fix: the avionics switch did not work properly

#### V4.8.8

---

No change for this aircraft

#### V4.8.7

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#### V4.8.6

---

No change for this aircraft

#### V4.8.5

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#### 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 propely on some systems)

#### V4.8.1

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



#### V4.8.0

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1. Support for time and ground speed multiplier
2. Improvement of the super charger behavior at high RPM

#### V4.7.14

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1. No change for this airplane

#### V4.7.13

---

1. No change for this airplane

#### V4.7.12

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#### V4.7.11

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1. Fix: more realistic fuel flow with boost pump on
2. Fix: in the documentation and UI the turbo engine was shown as TNIO-550-N. REP now shows TSIO-550-K.
3. Improvement: more realistic CHT values
4. Improvement: automatic yaw damper
5. Improvement: the tie downs should better lock the plane to the ground

#### V4.7.10

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1. New: the TKS system page in the hangar window uses the customary units when the option is activated by the user
2. Fix: the turbonormalized version has a higher empty weight
3. Improvement: pitch trim authority Fix: after loading a saved flight, the alternator may not work properly

#### V4.7.9

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



### V4.7.8

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1. Fix: In X-Plane 12 the plugin forces could bump the plane at engines stop
2. Fix: memory leak in datarefs handling
3. Improvement: more realistic CHT temps
4. Fix: the CHT in-flight tip was mentioning the cowl flaps

### V4.7.7

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1. Default XP12 Cirrus SR22 support