



SimCoders.com

Reality Expansion Pack  
for  
JustFlight Piper Turbo Arrow III/IV

v4.8.9

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## AIRCRAFT GENERAL DESCRIPTION

The PA-28 series competes with the high-winged Cessna 172 and the similarly low-winged Grumman American AA-5 series and Beechcraft Musketeer designs.

In 1967, Piper introduced the PA-28R-180 Cherokee Arrow. This aircraft was based on the previous Cherokee versions and featured a constant-speed propeller, retractable landing gear and was powered by a 180-horsepower (134-kW) Lycoming IO-360-B1E engine. A 200-hp (149-kW) version powered by a Lycoming IO-360-C1C was offered as an option beginning in 1969 and designated the PA-28R-200. The 180-hp model was dropped after 1971.

The Arrow II came out in 1972, featuring a five-inch fuselage stretch to increase legroom for the rear-seat passengers.

In 1977, Piper introduced the Arrow III (PA-28R-201), which featured a semi-tapered wing and longer stabilator to provide better low-speed handling. It also featured larger fuel tanks, increasing capacity from 50 to 77 gallons. Lately, Piper introduced the Turbo Arrow III powered by the Continental TSIO-360F. After a year, it introduced the Turbo Arrow IV with an improved TSIO-360-FB engine and the iconic T-Tail.

This is the version depicted by the Reality Expansion Pack.

## 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.

### Mac

REP requires the FreeType library to render fonts and graphics correctly.

FreeType is an open-source software library used to render text in graphics and applications. It is a critical dependency for many programs, including REP. If FreeType is not installed or not detected on your Mac, REP will fail to load properly.

To install FreeType on your Mac, follow these simple steps:

1. Install Homebrew (if not already installed): Homebrew is a package manager for macOS that simplifies the installation of software like FreeType.

Open the Terminal (search for "Terminal" in Spotlight or find it in the Applications > Utilities folder). Run the following command to install Homebrew:

```
/bin/bash -c "$(curl -fsSL https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
```

2. Install FreeType using Homebrew:

After Homebrew is installed, run this command in the Terminal: bash

```
brew install freetype
```

3. Verify FreeType Installation:

Once FreeType is installed, verify its presence by typing:



```
freetype-config --version
```

In order to install this software, the **JustFlight Piper PA-28R-201 Turbo Arrow III/IV** 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 Turbo Arrow III/IV in your X-Plane.
2. Make sure the airplane is updated to its latest version before installing REP (you can check using the SkunkCrafts Updater plugin)
3. Clone the Turbo Arrow III/IV folder and call it "Turbo Arrow III/IV REP".
4. Extract the contents of this REP package into a temporary folder
5. Move **the contents** of "**into-aircraft-plugins-folder**" into the "**Turbo Arrow III/IV REP/plugins**" folder
6. Move **the contents** of "**into-aircraft-main-folder**" into the "**Turbo Arrow III/IV REP**" folder
7. Run X-Plane and load the Turbo Arrow III/IV.
8. 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 Turbo Arrow III/IV 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.
- 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.

---

### NOTE

The Turbo Arrow III/IV already comes with a skunkcrafts\_updater.cfg file. You must replace that cfg with REP's one. By replacing it with REP's cfg, **you will still get the plane's updates as well as REP's**. Simcoders and the plane author will coordinate in order to provide updates via REP's skunkcrafts\_updater.cfg.

---

## 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 Turbo Arrow III/IV, overwriting the existing one.
2. Run X-Plane and load the Turbo Arrow III/IV.
3. Reload the aircraft when the automatic update is finished.

## 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

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 Turbo Arrow III/IV, you should setup your sound settings like the following screenshot.

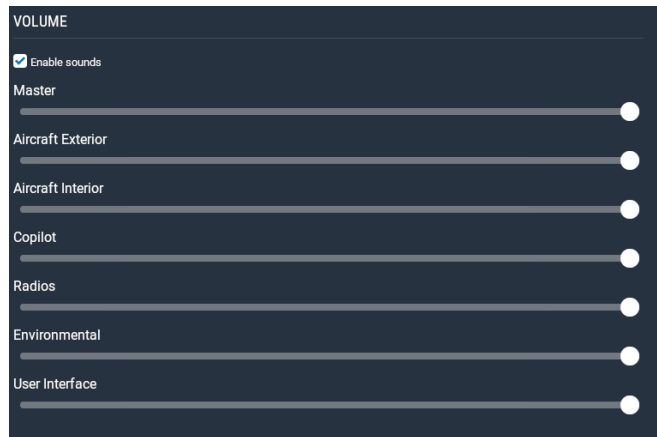


Figure 1: Recommended sound settings

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.

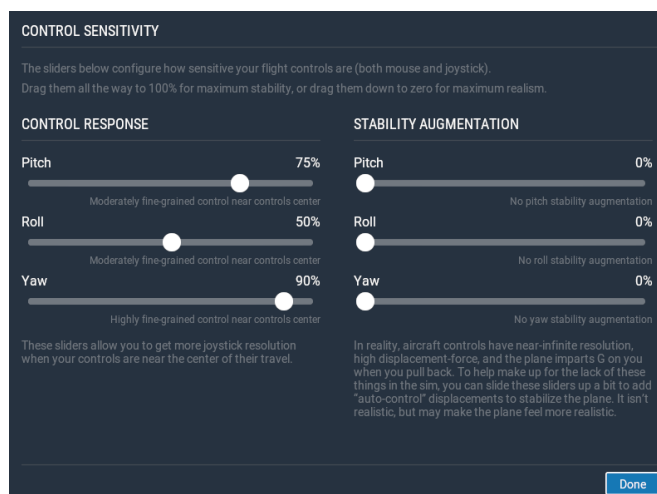


Figure 2: Recommended control settings

## 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 Turbo Arrow III/IV.

### 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.

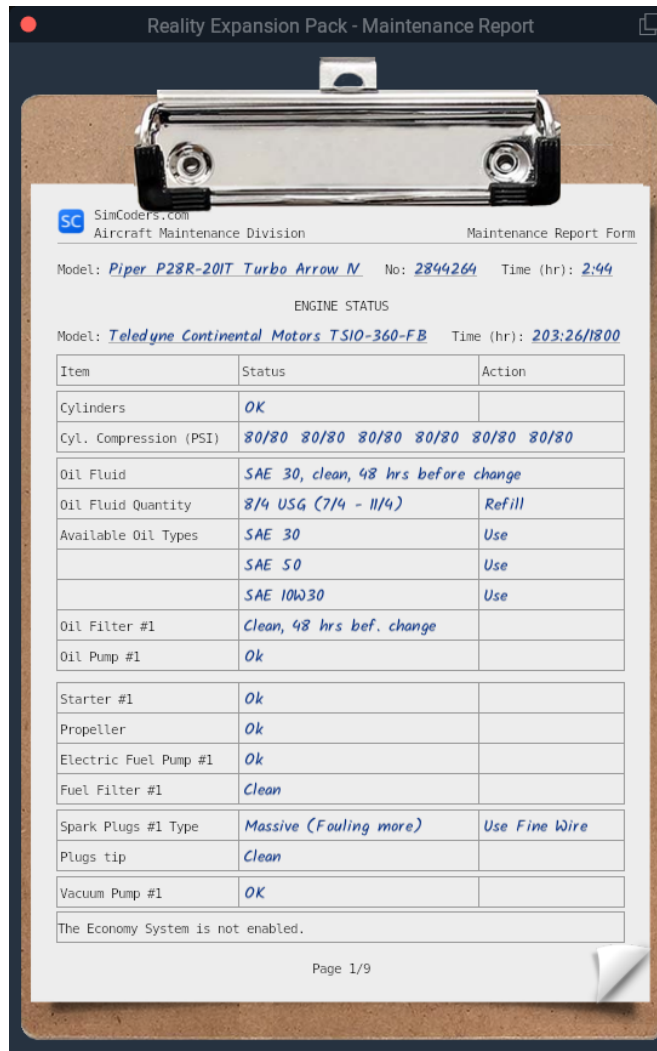


Figure 5: The Maintenance Report window

## Kneeboard

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

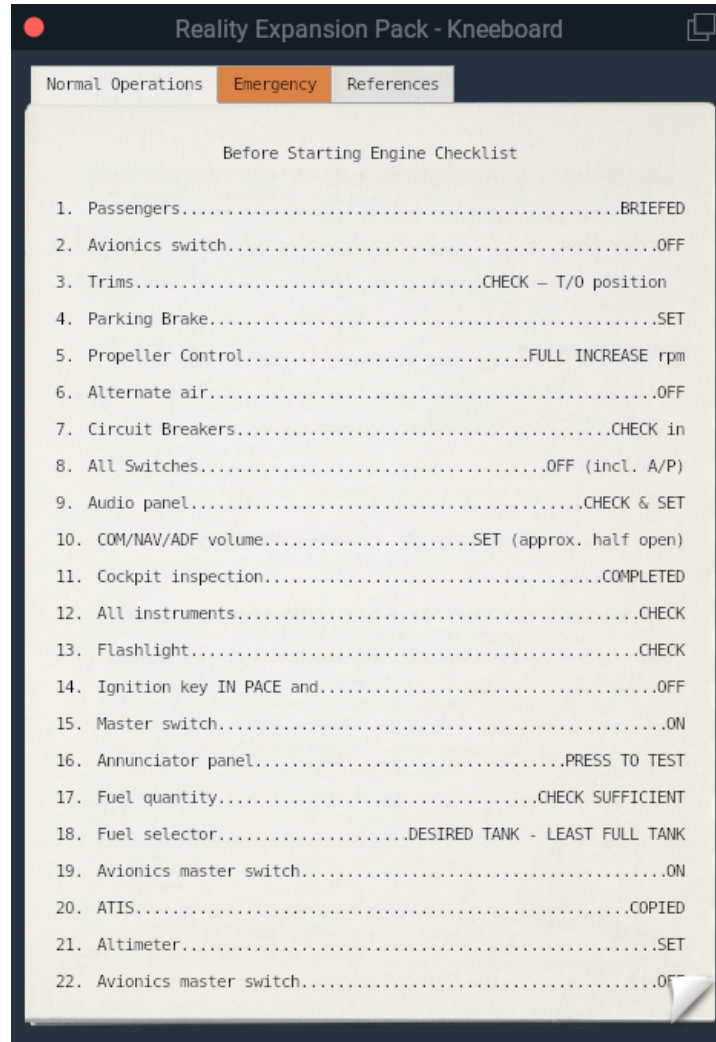


Figure 6: The Kneeboard window

### 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 Turbo Arrow III/IV uses the author's mass and balance system as it provides all the necessary features that would be otherwise duplicated by REP. However, the lateral menu provides access to the Fuel Management Window. This window is meant to allow the user to buy and sell fuel at the correct currency change while using REP coupled to an **Economy System**.



## 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 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).

### **Lateral menu vertical offset**

Control the vertical offset of the side menu. Change this number if REP's vertical menu position conflicts with other side menus.

### **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.

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](#).

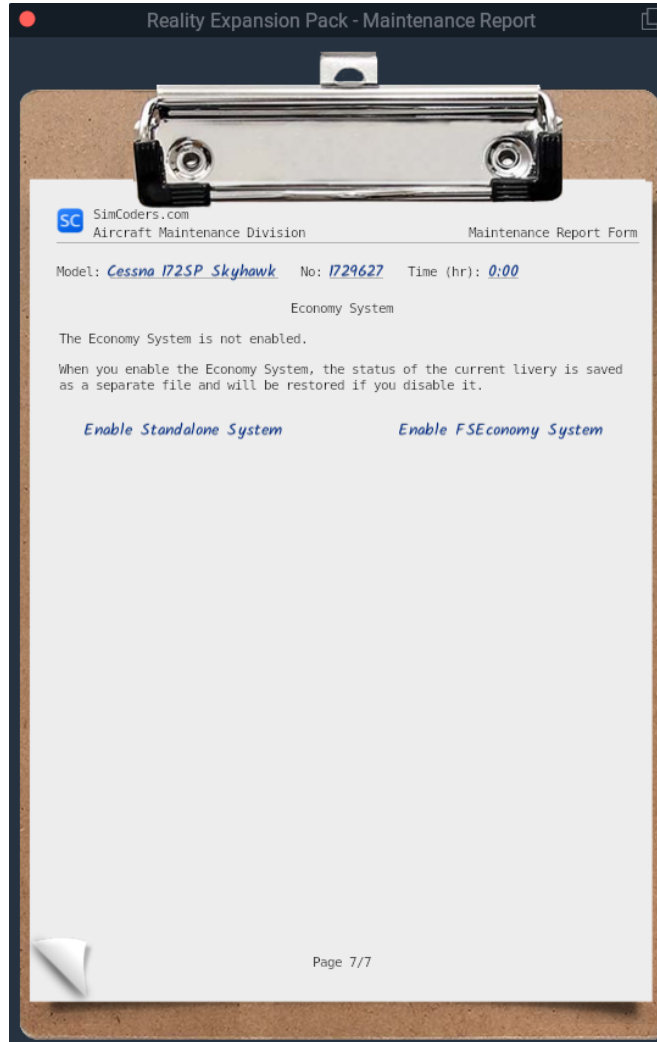


Figure 7: Enable the Economy System



Figure 8: 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>3940.50</i>	<a href="#">View Quotation</a>		Quotation (\$): <i>290.00</i>	

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Figure 9: 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 10: 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 11: 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

The Reality Expansion Pack features a complete **wearing system** for the **entire airplane**. That is, each component of the airplane wears out when in use and, after a certain amount of time, it may start to show some issues or fail completely.

The status of each component is saved and updated even if the sim is not running.

This is true for things such as engine components, electrical system parts, airframe, and landing gear.

Every component will be affected by time and by **user's handling** in different ways.

If you mistreat the engine by running it above its limits, it will get worn out, showing startup issues, combustion problems and providing less power than expected. It will completely fail over time.

The cockpit instrumentation needles will be more precise in a newly calibrated gauge rather than in an old one.

### How to load a worn out aircraft

REP gives you the chance to load an aircraft that is already worn out by its past history.

To do so, go to "**Plugins -> SimCoders.com - REP -> Wear out to >**" and choose one of the following items.

- **Brand New:** this is the status of an aircraft that just left the production line. The engine is brand new and all the onboard systems were just tested.
- **Privately Owned (new):** this is an almost new aircraft that has been privately owned with care. The engine as well as the other systems will have some hours logged but no issues are in place.
- **Privately Owned (old):** this is an aircraft that has been owned privately for years. The engine as well as the other systems will have many hours logged but no issues are in place as the private owner kept the plane with good care.
- **Flying Club:** this plane has been in the hands of many pilots, some of them careless. The systems are wore out quite much and some gauges are not working as good as you would like them to do.

### How to check the components status

To check each component and fix/replace/calibrate it, use the **Maintenance Report**.

In there are listed all the aircraft components that can be checked by a mechanic.

### Hobbs Time and Tach Time

In the **Maintenance Report** you find the airframe total time (Hobbs Time) and the engine's total time (Tach Time). The two value may slightly differ after loading a brand new airplane and then flying it for a while. This is because there's an important difference in how the two times are calculated.



### **Hobbs Time**

In most planes, the Hobbs clock is started and stopped based on an oil pressure switch, so it starts when the engine starts, and stops when the engine is shut-down. While it's running, it just ticks off a tenth of an hour every 6 minutes, based on "regular wall clock time". So a tenth of idling on the ramp is the same as a tenth at cruise.

### **Tach Time**

The tach clock isn't really a clock at all, it doesn't actually measure time, it really measures engine revolutions. But it's calibrated such that a tenth of an hour of tach time is clicked off when the engine is at cruise RPM for 6 minutes. In other words, if the plane is at cruise RPM, the tach clock will be clicking off tenths of an hour at the same rate as the Hobbs clock. But if the engine is idling at an RPM speed that's half of what cruise RPM is, then the tach clock will be running at half the speed of the Hobbs clock.



## 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 Turbo Arrow III/IV is powered by a Continental TSIO-360-FB turbosupercharged, direct-drive, air-cooled, horizontally-opposed, fuel-injected engine with 360 cubic inches displacement.

This engine outputs a maximum power of 200HP at 41 inHg of manifold pressure and 2575RPM with no time limitations.

### Engine Overview

The Reality Expansion Pack totally replaces the engine simulated by X-Plane with custom algorithms to the point that not a single bit of the old engine model is left in the sim.

Everything in the engine is made from scratch to provide the maximum realism. This includes the combustion model to which all the other models - such as the Power Output, the Cylinders Head Temperature or the Oil Pressure - depend.

The engine now breathes air, mix it with fuel and produce a realistic combustion.

Some of the features include:

- **Correct animations and sounds:** the cylinders compression is simulated to the deepest level, enhancing the propeller movements at very low RPMs and at startup and shutdown
- **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 primed and prepared for startup following the correct procedure
- **Realistic engine issues:**
  - 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 custom one.

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

- Check the starter status
- Replace a 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.

---

## Induction System

The Reality Expansion Pack replaces the Manifold Absolute Pressure (MAP) algorithm of X-Plane with a custom one.

The Turbo Arrow III/IV engine is supercharged. That is, it can provide the same amount of power at low altitude as well as at high flight levels.

To do so, the engine is equipped with a **supercharger**.

## Turbo-supercharger

It consists in a small turbine powered by the engine’s exhaust gas. The gas spins the turbine that sucks in fresh air from the other side and compress it, pushing it inside the engine.

This allow the engine to maintain its power at high altitude. The Continental TSIO-360-FB can provide 200HP up to 14.000 feet.

## Fixed Wastegate

The included turbocharger features by default a fixed waste-gate. That is, the manifold pressure must be always regulated manually. In case the Manifold Pressure exceeds 41 inches of Manifold Pressure, the “Boost” lamp goes off in the cockpit. That means the maximum turbo boost has been exceeded and damage could occur to the engine.

A pressure release valve is meant to protect the engine from excessive overboost, but its action may be slow, especially when the engine oil is cold and thick.

## Automatic Wastegate

Properly controlling the fixed wastegate is not easy and may lead to engine inefficiencies or worse, damages. That is why some third-parties manufacturers developed an automatic wastegate controller.



The automatic controller moves the wastegate to set the manifold pressure selected by the pilot using the throttle. When the throttle is fully closed, the target manifold pressure is ~8 inHg. When the throttle is fully open, the target manifold pressure is 41 inHg.

Slamming the throttle to the firewall will still lead to overboost, because the wastegate controller is not that fast. Some precaution is still needed and the best way to prevent an overboost is to slowly advance the throttle when adding power.

The automatic wastegate improves the backpressure dynamics, especially at altitude, and provides ~5% of power increase for the same throttle setting.

It is possible to switch from the fixed to the automatic wastegate using the [maintenance report](#).

### **System Limitations**

1. Maximum MAP: 41 InHg

Because the engine is turbocharged, some of its characteristics are different from a normally aspirated engine.

The compressor has the capability of producing manifold pressures in excess of the 5 minute takeoff maximum of 36.5 inches Hg. In order not to exceed 36.5 inches of manifold pressure, a waste gate is used so that some of the exhaust will bypass the turbine and be vented into the tailpipe.

Anything that affects the flow of induction air into the compressor or the flow of exhaust gases into the turbine will increase or decrease the speed of the turbo-charger. This resultant change in flow will have no effect on the engine if the waste gate is still open because the waste gate position is changed to hold compressor discharge pressure constant. A waste gate controller automatically maintains maximum allowable compressor discharge pressure any time the turbine and compressor are capable of producing that pressure.

At high altitude, part throttle, or low RPM, the exhaust flow is not capable of turning the turbine and compressor fast enough to maintain maximum compressor discharge pressure, and the waste gate will close to force all of the exhaust flow through the turbine.

When the waste gate is fully closed, any change in turbocharger speed will mean a change in engine operation. Thus, any increase or decrease in turbine speed will cause an increase or decrease in manifold pressure and fuel flow. If turbine speed increases, the manifold pressure increases; if the turbine speed decreases, the manifold pressure decreases. Since the compression ratio approaches 3 to 1 at high altitude, any change in exhaust flow to the turbine or ram induction air pressure will be magnified proportionally by the compression ratio and the change in flow through the exhaust system.

### **Manifold Pressure variation with Engine RPM**

When the waste gate is open, the supercharged engine will react the same as a normally aspirated engine when the engine RPM is varied. That is, when the RPM is increased, the manifold pressure will decrease slightly. When the engine RPM is decreased, the manifold pressure will increase slightly.

However, when the waste gate is closed, manifold pressure variation with engine RPM is just the opposite of the normally aspirated engine. An increase in engine RPM will result in an increase in manifold pressure, and a decrease in engine RPM will result in a decrease in manifold pressure.

### **Manifold Pressure variation with Altitude**

At full throttle, the turbocharger has the capability of maintaining the maximum continuous manifold pressure of 35 inches Hg to well above 17,000 feet depending on engine and atmospheric conditions. However, engine operating limitations establish the maximum manifold pressure that may be used. Manifold pressure should be reduced above 17,000 feet, as noted on the operating placard in the airplane (subtract 1 inch Hg from 35 inches for each 1000 feet above 17,000 feet).

At part throttle, the turbocharger is capable of maintaining cruise climb power of 2500 RPM and 30 inches Hg from sea level to 20,000 feet in standard temperatures, and from sea level to 8000 feet under hot day conditions without changing the throttle position, once the power setting is established after takeoff. Under hot day conditions, this climb power setting is maintained above

8000 feet by advancing the throttle as necessary to maintain 30 inches of manifold pressure in the same manner as a normally aspirated engine during climb.

### **Manifold Pressure variation with Airspeed**

When the waste gate is closed, manifold pressure will vary with variations in airspeed. This is because the compressor side of the turbo charger operates at pressure ratios of up to 3 to 1 and any change in pressure at the compressor inlet is magnified at the compressor outlet with a resulting effect on the exhaust flow and turbine side of the turbo charger.

### **Fuelflow variations with changes in Manifold Pressure**

The engine-driven fuel pump output is regulated by engine speed and compressor discharge pressure. Engine fuel flow is regulated by fuel pump output and the metering effects of the throttle and mixture control. When the waste gate is open, fuel flow will vary directly with manifold pressure, engine speed, mixture, or throttle control position. In this case, manifold pressure is controlled by throttle position and the waste gate controller, while fuel flow varies with throttle movement and manifold pressure.

When the waste gate is closed and manifold pressure changes are due to turbocharger output, as discussed previously, fuel flow will follow manifold pressure even though the throttle position is unchanged. This means that fuel flow adjustments required of the pilot are minimized to (1) small initial adjustments on takeoff or climb-out for the proper rich climb setting, (2) lean-out in cruise, and (3) return to full rich position for approach and landing.

### **Manifold Pressure variation with increasing or decreasing Fuel Flow**

When the waste gate is open, movement of the mixture control has little or no effect on the manifold pressure of the turbocharged engine.

When the waste gate is closed, any change in fuel flow to the engine will have a corresponding change in manifold pressure. That is, increasing the fuel flow will increase the manifold pressure and decreasing the fuel flow will decrease the manifold pressure. This is because an increased fuel flow to the engine increases the mass flow of the exhaust. This turns the turbocharger faster, increasing the induction air flow and raising the manifold pressure.

### **Fuel Pump**

The fuel system is provided with a primer and an electrical fuel pump that can be used to prime the engine.

The fuel pump should not be used in flight unless required by the checklists.

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

- Check the fuel pump **status**
- **Repair** the pump in case of failure

---

### **CAUTION**



Engaging the fuel pump during flight will cause an increase of the fuel flow. That is, the EGT will raise or drop depending on your current mixture settings.

Be sure to reset the mixture setting when the fuel pump switch is being turned on or off.

---

### Vapor Locks

A vapor lock is a fuel vapor bubble in the fuel lines that prevents cool fuel to reach the combustion chambers.

If the engine was shut down in the last 10-15 minutes and should be restarted, a vapor lock is in place if the engine starts up for a moment and then dies.

To clear the vapor lock, close the mixture and switch on the electrical fuel pump for at least 30 seconds to up to one minute. Then repeat the startup procedure.

The fuel pump will recirculate the fuel in the continuous flow fuel system, dumping the fuel vapor inside the fuel tanks.

### Fuel Injection System

The Reality Expansion Pack fully recreates the TCM Continuous Flow Fuel Injection System that powers the real world Turbo Arrow III/IV.

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 but it does compensate for MAP.

### Tuned Fuel Injectors

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 website](#).

### Spark Plugs

Each cylinder is provided with two spark plugs, one connected to the left magneto and the other connected to the right magneto.

Carbon deposits form on the spark plugs pointers if the engine is run at low RPMs with rich mixture. That is, the spark plugs foul.

To avoid fouling, always keep at least 1000RPM and aggressively lean the mixture when on ground.

A big drop in RPM during the magnetos check is a sign of a fouled spark plug.

To clean the spark plugs, set a high power setting and aggressively lean the mixture. Run the engine with this setting for about 20 seconds then recheck the magnetos.

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

- Check the spark plugs status
- Manually clean the spark plugs
- Change the default spark plugs with the "fine wire" type.

Fine wire spark plugs are less prone to fouling but not immune to it.

### Exhaust System

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.

---

### NOTE

The oil pressure may get closer to its maximum value when a cold engine is first started. This is normal and do not cause any harm to the engine as long as the oil pressure gets lower during engine warmup.

Warmup the engine to ensure the correct oil temperature and pressure before applying full power for takeoff.

---

### CAUTION



Using a higher grade oil in cold climates could lead to high oil pressure, thus damaging the oil system components.

---



### **Propeller Governor**

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.

During the engine run up, three prop governor cycles will ensure a better oil recirculation inside the propeller governor oil circuit.

### **The Red Box**

When the IO-360 was firstly 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.



### Engine Startup Tips

- Before starting the engine, always apply full mixture and full throttle and then prime the engine using the primer button. Keep the primer button pressed for as long as required by the priming table provided in the checklists. After this priming 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 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

## System Limitations

### 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 Turbo Arrow III/IV 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

## 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 12: 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.

---

**Dateref:** simcoders/rep/stallwarning/on

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

**Dateref:** simcoders/rep/stallwarning/level

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

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

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

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

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

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

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

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

- Type: float
  - Writable: No
-





- Contents: Stdby attitude indicator pitch
- 

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

- Type: float
  - Writable: No
  - Contents: Stdby 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\_fuelpump/switch\_on\_0

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

**Dateref:** simcoders/rep/engine/electrical\_fuelpump/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)
- 

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

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

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

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

**Dateref:** 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 asking for support please read [the FAQs we published on our site](#). They contain information about installation troubles and general usage.

If you encounter any kind of technical problem with our software, please write to [support@simcoders.com](mailto:support@simcoders.com) providing as much information as possible and including your X-Plane's Log.txt file.



## **VERSION CHANGELOG**

### **V4.8.9**

No change for this aircraft





## LICENCE

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