

DHC-2 Beaver
powered by
Reality Expansion Pack

v4.8.4

March 4, 2024

Contents

AIRCRAFT GENERAL DESCRIPTION **4**

INSTALLATION & CONFIGURATION **5**
System requirements . . . 5
Install the software . . . 5
Automatic Update of the Software . . . 6
Manual Update of the software . . . 6
Remove the software . . . 6
Recommended sound settings . . . 7
Recommended control settings . . . 7

HARDWARE & SOFTWARE COMPATIBILITY **8**
Headshake . . . 8
Saitek Panels . . . 8
XPRealistic . . . 8
Differential and progressive brakes for X-Plane 11 . . . 8

USER INTERFACE **9**
Lateral Menu . . . 9
Maintenance Report . . . 10
Kneeboard . . . 11
Mass & Balance . . . 13
Walkaround . . . 14
Move the viewpoint while doing the walkaround in 2D . . . 14
Walkaround in VR . . . 14
Towing . . . 14
Move the viewpoint while towing in 2D . . . 15
Towing in VR . . . 15
Engine Autostart . . . 15
Settings Window . . . 16
Lateral menu vertical offset . . . 17
Use Advanced Steering . . . 17
Use Advanced Braking . . . 17
Use VR Walkaround and Towing . . . 17
Wait for real weather at startup . . . 18
In flight tips vertical offset . . . 18

ECONOMY SYSTEM **19**
Enable the Economy System . . . 19
How it works . . . 19
Buy/Sell Fuel . . . 22
Earn Money: Rewards . . . 22

VR Support **25**
How to open the plugin windows in VR . . . 25

SOUNDS SYSTEM **26**

PERSISTENT AIRCRAFT AND COMPONENTS WEARING **27**
How to load a worn out aircraft . . . 27
How to check the components status . . . 27
Hobbs Time and Tach Time . . . 27

SYSTEMS DESCRIPTION **29**
Powerplant . . . 29
Engine Overview . . . 29
Starter . . . 30
Induction System . . . 30
Fuel System . . . 31
Mixture Lever . . . 36
Spark Plugs . . . 36
Oil System . . . 38
Propeller Governor . . . 40
Engine Monitor . . . 40
Engine Startup Tips . . . 40
Vacuum System . . . 40
Electrical Systems & Avionics . . . 41
Battery . . . 41
Alternator . . . 41
Lights . . . 41
Electrical Gyros . . . 41
Radio Stack . . . 41
Landing Gear . . . 42
Tires . . . 42
Brakes . . . 42

HUMAN FACTOR **44**
Hypoxia . . . 44
TUC & EPT . . . 44

HOME COCKPITS/CUSTOM DATAREFS **46**

RESOURCES & HOW-TOs **53**

SUPPORT & CONTACTS **53**

VERSION CHANGELOG **54**

LICENCE **70**
SOFTWARE PRODUCT LICENSE . . . 70
LIMITED WARRANTY . . . 71
LibCURL EULA . . . 72
COPYRIGHT AND PERMISSION NOTICE . . . 72

AIRCRAFT GENERAL DESCRIPTION

The De Havilland Canada DHC-2 Beaver is a single-engined high-wing propeller-driven STOL aircraft built by De Havilland Canada. It is primarily operated as a bush plane for a wide variety of utility roles, such as cargo and passenger hauling.

Until Second World War, De Havilland Canada was committed to mainly build war planes. By the end of the war, the company decided to orient itself towards civilian operators. Based on feedback from pilots, the company decided that the envisioned aircraft should have excellent STOL performance, all-metal construction, and accommodate many features sought by the operators of bush planes.

In addition to its use in civilian operations, the Beaver has been widely adopted by armed forces as a utility aircraft. By 1967, over 1,600 Beavers had been constructed prior to the closure of the original assembly line. Various aircraft have been remanufactured and upgraded. Additionally, various proposals have been made to return the Beaver to production.

The Beaver's versatility and performance led to it being the preferred aircraft of bush pilots servicing remote locations in the Canadian north, and it is considered by aviation historians to be a Canadian icon. In 1987, the Canadian Engineering Centennial Board named the DHC-2 one of the top ten Canadian engineering achievements of the 20th century. The Royal Canadian Mint honoured the aircraft on a special edition Canadian quarter in November 1999, and on a 50-cent commemorative gold coin in 2008. Large numbers continue to be operational into the 21st century, while the tooling and type certificate for the Beaver have been acquired by Viking Air who continue to produce replacement components and refurbish examples of the type.

Source: Wikipedia

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.

If you use REP under Linux, there are some addictional requirements:

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

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

In order to install this software, the **DHC-2 Beaver for X-Plane 11 by Thranda** 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 DHC-2 Beaver 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 DHC-2 Beaver folder and call it “DHC-2 Beaver REP”.
4. Extract the contents of this REP package into a temporary folder
5. Move **the contents** of “**into-aircraft-plugins-folder**” into the “**DHC-2 Beaver REP/plugins**” folder
6. Move **the contents** of “**into-aircraft-main-folder**” into the “**DHC-2 Beaver REP**” folder
7. Run X-Plane and load the DHC-2 Beaver.
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 DHC-2 Beaver 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.

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

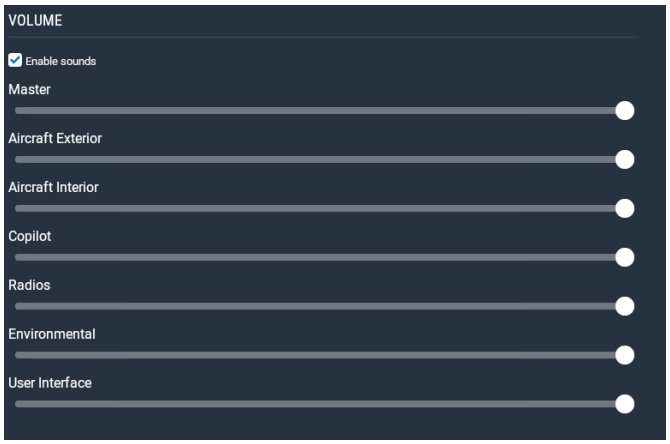


Figure 1: Recommended sound settings

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 DHC-2 Beaver.

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

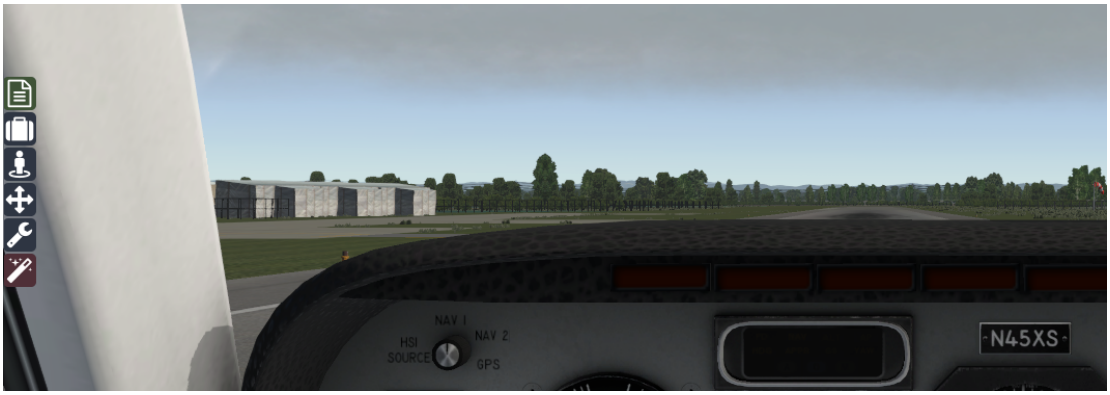


Figure 4: The menu is shown when the mouse pointer gets closer to it

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.

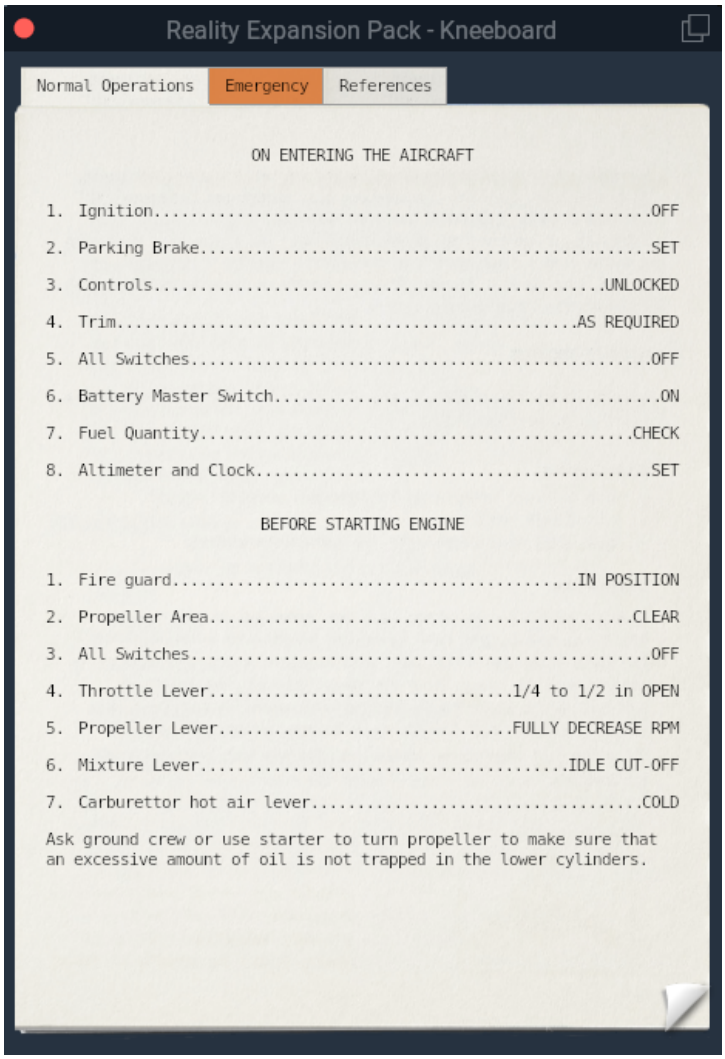


Figure 6: The Kneeboard window

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 DHC-2 Beaver 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
simcoders/rep/walkaround/toggle	Toggle the walkaround mode
simcoders/rep/walkaround/next	Next walkaround station
simcoders/rep/walkaround/previous	Previous walkaround station
simcoders/rep/walkaround/action	Execute current action
simcoders/rep/walkaround/static_elements/toggle	Static elements toggle

Move the viewpoint while doing the walkaround in 2D

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

Walkaround in VR

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

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

Towing

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

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

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

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

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

Move the viewpoint while towing in 2D

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

Towing in VR

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

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

Engine Autostart

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

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

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

Settings Window

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

Enable the plane damages

When ticked, this option enable the plane damages.

Show generic messages

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

Show failure messages

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

Show tip messages

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

Show side menu on mouse hover only

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

Save and restore the plane status between sessions

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

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

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

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

Save and restore the windows position between sessions

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

Enable hypoxia effect

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

Roll axis drives ground steering

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

Use US Customary

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

Wind sound level

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

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 features a custom Economy System that may rewards you for your flight time and lets you pay to fix the airplane damages and do the everyday maintenance.

The Economy System features two modes of operation:

- **Standalone**: your bank account and maintenance records are locally saved to your PC. They are shared among your REPs. The system rewards you for your flight time and landing skills.
- **FSEconomy**: REP connects to the FSEconomy bank account and drains the required amount of money for maintenance directly from there. There are no rewards for your flight time as they are already provided by FSEconomy.
- **X-CPL-Pilot**: REP connects to the X-CPL-Pilot bank account from which it drains the required amount of money for maintenance. There are no rewards for your flight time because they are paid by X-CPL-Pilot already.

Enable the Economy System

Open the Maintenance Report window then scroll to the latest page available. Click on the "Enable" button corresponding to the economy system you want to enable.

When enabling the FSEconomy System, it is required to enter an **Aircraft Key**.

The Aircraft Key is a 15 chars key provided by FSEconomy that uniquely identifies the aircraft you are flying in the FSEconomy environment.

To find the Aircraft Key:

1. Login to the FSEconomy website: http://server.fseconomy.net/
2. Click the main menu's "**Aircraft**" button
3. Scroll the aircrafts' list down to the plane you want to connect to REP
4. In the "Action" column, click the drop-down menu's "**Edit**" button
5. Generate/Copy the Aircraft Key in the webpage's lower-left corner

When the Economy System is enabled, the aircraft state is saved to a separated file. When you disable the Economy System, that very same file is loaded again.

Thus, there are two different aircraft states that are loaded in relation to the usage of the Economy System. One state is loaded and updated when the Economy System is disabled. The other one is loaded and updated when the Economy System is enabled.

You can switch between the two states by disabling or enabling the Economy System.

The Bank Account is shared among all your REP airplanes. That is, it possible to earn money flying an airplane and use it to fix another airplane that needed maintenance.

How it works

Once enabled, the Economic System page in the Maintenance Report shows your current Bank Account Balance and a log of the last transactions (amount spent for maintenance and fuel or income from a flight).



Figure 7: This is the screen that allows you to enable the Economy System

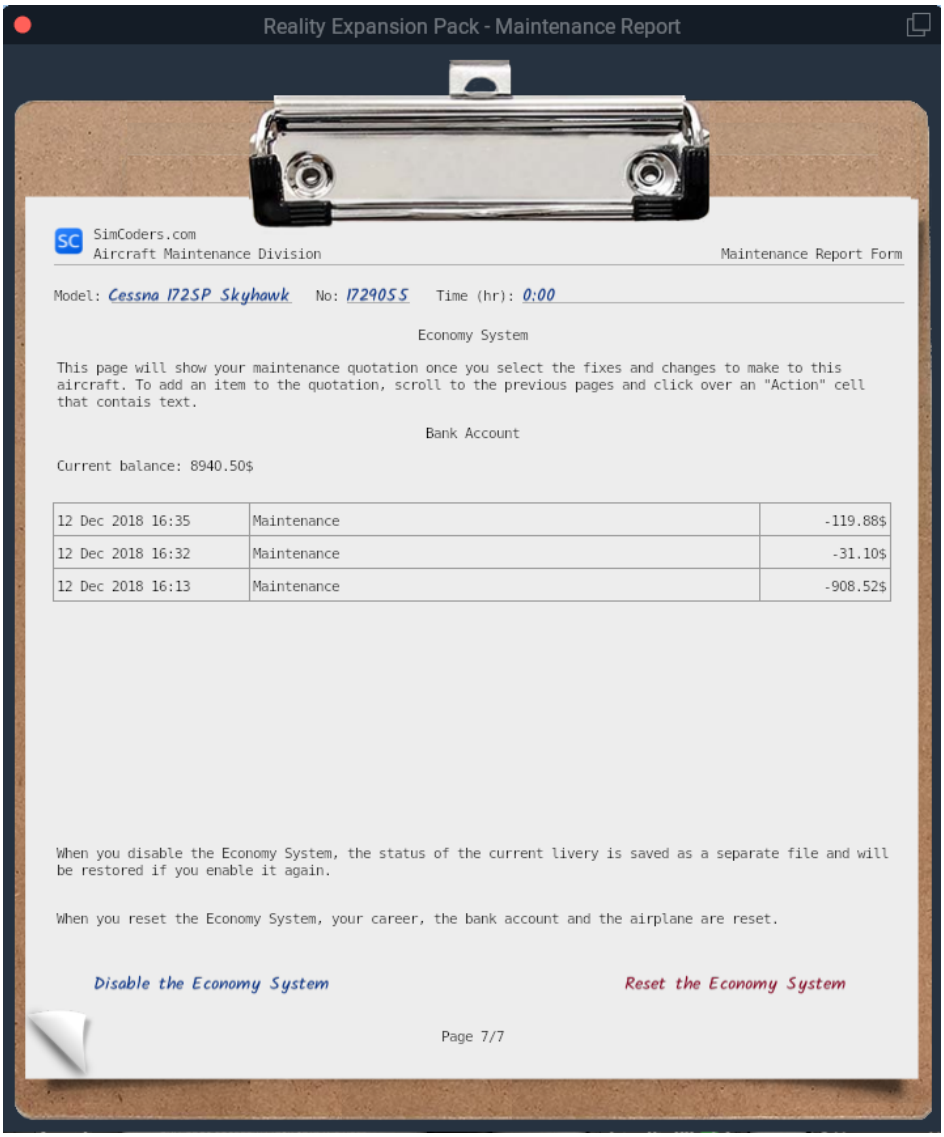


Figure 8: This is the default screen of the Economic System

Each fix or maintenance you want to do to your airplane must be first added to a quotation.

Each page of the Maintenance Report shows a table that reports the available maintenance actions.

For each action, the table reports the price and required work time.

To add a maintenance action to the Quotation, click over its “Action” cell in the Maintenance Report. Once an action has been added to the Quotation, the “Action” cell reports “In Quote”. To remove the maintenance action from the Quotation, click the “Action” cell again.

If the “Action” column is empty, it means that no actions are available at that time.

Once all the needed maintenance actions have been added to the Quotation, click over “View Quotation” or scroll to the last page of the Maintenance Report to see the Quotation.

The quotation reports two possible total prices:

- **Normal Price**: This price will be applied for a fix that will take the amount of time reported in the time column. The fixes will be done one at a time in real time. The mechanic will continue his work even when the sim is closed.
- **Quick Fix Price**: This price will be higher but will do all the actions at once in zero time.

You can accept either price or decline the Quotation, in which case no action is done and the quotation is scrapped.

Buy/Sell Fuel

This feature is available in Standalone Mode only.

In the Weight and Balance window, it is possible to add/remove fuel from the fuel tanks.

Adding fuel will drain money from your bank account. Removing fuel from the tanks will result in selling it to the local airport. The selling price will be slightly lower than the local buying price.

Fuel price is based on the current country/region and varies from airport to airport and from time to time. It is possible to specify a custom fuel price in the “fuel_prices.cfg” file found in the “Output/preferences/REP” folder of X-Plane. The file already contains an example of a custom price for two airports. **Once REP calculates a fuel price, it stores is for a random interval between 4 and 8 days, then it recalculates the fuel price again. That is, when you set a new fuel price in the fuel_prices.cfg file, REP will not use it immediately. Instead, it will start using it the next time it will need to recalculate the fuel price for that airport.**

It is possible to check the fuel price in a specific airport by going to the plugins menu and click over “SimCoders - REP” -> “Check fuel price at an airport”.

Earn Money: Rewards

This feature is available in Standalone Mode only.

The more you fly, the more money you earn. At the end of a flight, a new Log entry is added to your Bank Account Log with the amount of money you earned.

In case you make a smooth landing, a “Soft Landing” bonus is added to your reward. The softer the landing, the higher the reward.



Figure 9: Click over one of the Action cells to put that specific action in the quotation. Note: The maintenance report shown here is an example of how the table looks. It may not include the systems modeled in the airplane described in this manual.



Figure 10: A Quotation Example

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 taylored 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 -> SimCorders.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 weared 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 damanged 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 DHC-2 Beaver is powered by a Pratt & Whitney R-985 Wasp Junior geared-supercharged, direct-drive, air-cooled, radial, carburated engine with 985 cubic inches displacement.

The engine outputs a maximum power of 450HP at 2300RPM.

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
  - Carburetor dynamics and ice accretion
  - Realistic Geared-Turbocharger behavior
  - Realistic fuel metering system (normal carburetor or Stromberg-Bendix pressure carburetor with automatic mixture control)
  - Realistic Wobble-Pump and Primer behaviors
  - 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 DHC-2 Beaver 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**.

Geared-turbocharger

It consists of a supercharger driven by the engine shaft. The higher the engine RPM, the higher the pressure of the compressed air delivered to the engine.

System Limitations

1. Maximum MAP: 36.5 InHg

Fuel System

Fuel is contained in three tanks under the cabin floor which are used separately. They are serviced through three filler necks in a filler compartment protected by a hinged door on the forward left-hand side of the fuselage, adjacent to the cockpit door.

For long range operations non-jettisonable wing-tip tanks may be installed to replace conventional wing-tips. Fuel from these tanks is gravity fed to the front tank.

A long-range tanks may also be installed on special order.

Fuel Capacities

Front tank: 35 USG Centre tank: 35 USG Rear tank: 25 USG Wing tip tanks: 2 x 21.5 USG Total with tip tanks: 138 USG

Fuel Selector

Fuel is supplied from any of the three fuel tanks by selecting FRONT TANK, CENTRE TANK or REAR TANK on the fuel selector, located to the left of the instruments panel.

Fuel Transfer Selector (Wing tip tanks)

The fuel transfer selector, for use when wing tip tanks are installed, is located to the left of the pilot, above the cockpit door window. It has four positions marked LH, RH, BOTH and OFF.

Fuel Wobble Pump Lever

A fuel wobble pump lever, below the engine instrument panel on the pedestal, is used to build up fuel pressure to 5 psi, for starting the engine.

Fuel and Oil emergency shut-off lever

The emergency shut-off lever, on the right side of the pedestal, below the engine instrument panel, is normally in the down position. When pulled sharply up and moved to the closed position, it cuts the supply of both fuel and oil to the engine. After use it can be returned to its down normal position for normal operation.

Fuel contents gauge

A triple indicator fuel content gauge, located on the right side of the engine instruments panel, is graduated in imperial gallons.

Fuel pressure gauge

A combined fuel pressure, oil pressure and oil temperature gauge is located on the left side of the instruments panel.

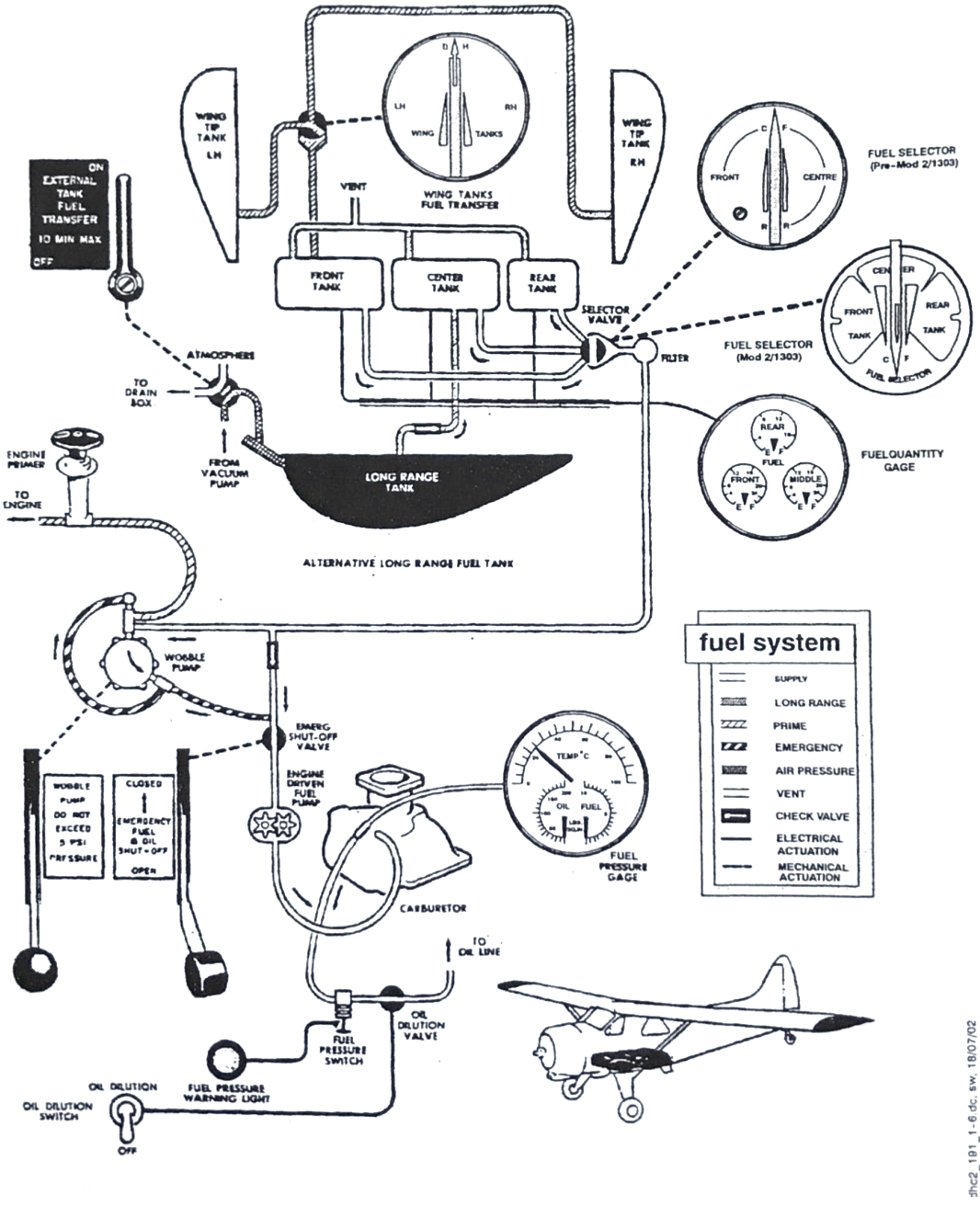


Figure 12: Fuel System Schematics

Fuel pressure warning light

A fuel pressure warning light is placed on the instrument panel. It lights up when the fuel pressure drops below 3psi.

Carburetor

The Reality Expansion Pack simulates the carburetor dynamics and the carburetor ice accretion.

Carburetor Icing, or carb icing, is an icing condition which can affect any carburetor under certain atmospheric conditions.

Carburetor icing occurs when there is humid air - such during hot summer days or rainy winter days - and the temperature drop in the Venturi causes the water vapor to freeze.

The Venturi effect can drop the ambient air temperature by 30-40 degrees F (16.7-22.2 degrees C), therefore carburetor icing often occurs when the outside air temperature is in the 60-70 degree F (15.6-21.1 degree C) range.

Unfortunately, **the warm air temperature often causes pilots of aircraft to overlook the possibility of carb icing**. The ice will form on the surfaces of the carburetor throat, further restricting it. This may increase the Venturi effect initially, but eventually restricts airflow, perhaps even causing a complete blockage of air to the carburetor.

To prevent carb icing, a carburetor heating system drives hot, unfiltered air from the engine directly into the engine air intake. Pull the carburetor heat lever (black) to activate the carburetor heat.

On many aircrafts, the carburetor heat knob can only be fully pulled or fully pushed. When a carburetor temperature gauge is available, however, the knob can be partially pulled just enough to exclude any ice danger.

Detect carburetor Icing

Symptoms of carburetor icing include:

- **Quick MAP decrease**: the air intake area is reduced by ice accretion thus reducing the amount of air sucked in by the engine.
- **Engine stutters**: when the ice accretion is large enough, ice is ingested by the engine preventing proper fuel combustion.

Whenever ice accretion is suspected, the carburetor heat knob must be fully pulled.

WARNING

When carburetor ice is taking place, pulling the heat knob may temporarily increase the perceived engine stutters and loss of power. That is, the engine ingests melted ice and stutters more than before.

Do not disable the carburetor heat. After a few seconds the ice will clear and the engine will run normally.

Mixture Lever

In the maintenance window, engine upgrades section, it is possible to switch carburetor type. The two types allowed are:

- Conventional
- AMC

Conventional Carburetor

This is a pressure carburetor that allows for manual mixture regulation. The mixture lever can be freely set in any position between IDLE CUT-OFF and FULL RICH.

AMC

AMC stands for Automatic Mixture Control. A real **Bendix-Stromberg carburetor** is modelled in REP by properly simulating the different fuel nozzles mounted inside this kind of pressure carburetor.

The mixture lever has four detents:

- IDLE CUT-OFF
- FULL RICH
- AUTO RICH
- AUTO LEAN

The lever can assume any position between IDLE CUT-OFF and FULL RICH. When used in this range, the lever will manually control the caburetor mixture regulation.

When on AUTO RICH, the carburetor will automatically set the mixture for rich-of-peak operations. This setting is to be used during takeoff, landing and go-around.

When on AUTO LEAN, the caburetor will automatically set the mixture for lean-of-peak operations. Additionally, when high power is required, the carburetor will enrich the mixture to prevent detonation and engine damages. This setting is to be used during cruise.

Note: When the AMC system is activated, the “modern” throttle layout is forced.

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

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

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.

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

- Always use the Wobble Pump to pressurize the fuel to at least 4PSI
- If the engine is cold, use up to 7-8 hand-primer strokes to properly prime the engine
- Slightly open the throttle to allow a proper startup
- Always switch on the boost coil before start. If the boost coil is not on, the engine will very unlikely start properly
- Do not keep the boost coil on after start
- Let the engine warmup properly. In case of a very cold start, do not touch the throttle after engine start. Let the engine rev up slowly while getting warmer.
- 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 bicycle 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

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 DHC-2 Beaver 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 adeguate oxygen until a specific degree of impairment, generally taken to be the point when the individual can no longer take steps to help him/herself.

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

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

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



Figure 13: Hypoxia effect

HOME COCKPITS/CUSTOM DATAREFS

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

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

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

Dataref: simcoders/rep/stallwarning/on

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

Dataref: simcoders/rep/stallwarning/level

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

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

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

Dataref: simcoders/rep/cockpit2/gauges/indicators/attitude_indicator_0_pitch

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

Dataref: simcoders/rep/cockpit2/gauges/indicators/attitude_indicator_0_roll

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

Dataref: simcoders/rep/cockpit2/gauges/indicators/attitude_indicator_1_pitch

- Type: float
- Writable: No

- Contents: 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)

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 providing as much information as possible and including your X-Plane's Log.txt file.

VERSION CHANGELOG

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

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

V4.8.0

1. Support for time and ground speed multiplier

V4.7.14

1. No change for this airplane

V4.7.13

1. No change for this airplane

V4.7.12

V4.7.11

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

V4.7.10

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

V4.7.9

1. Fix: in some engine configuration and bus loads, the alternator could not charge the battery completely
2. Fix: minor power “linearity” issues at low RPM

V4.7.8

1. Fix: In X-Plane 12 the plugin forces could bump the plane at engines stop
2. Fix: memory leak in datarefs handling
3. Fix: manifold pressur ebehavior vs RPM
4. Fix: Fuel Press warning light did not work properly in XP12

V4.7.7

V4.7.6

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

V4.7.5

1. Improvement: better supercharger efficiency to meet more realistic values
2. Improvement: more realistic minumum RPM
3. Improvement: more realistic propeller inertia

V4.7.4

No changes for this airplane

V4.7.3

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

V4.7.2

1. Fix: crash after replay

V4.7.1

1. Fix: crash after pause

V4.7.0

1. **New**: improved XP12 Flight Dynamics
2. Improvement: the Manifold Pressure behavior is now more realistic on RPM change
3. Fix: it was not possible to refill the oil in flight with an economy system turned on
4. Improvement: better alternator voltage simulation at low RPM
5. Improvement: support for Apple M* processors
6. Improvement: better compatibility of the Mass and Balance system with X-Plane 12
7. Improvement: it is now possible to vertically move the in-flight tips windows (no VR support for this feature at the moment)

8. Fix: missing library link if XP12

V4.6.8

1. Fix: restored the ignition switch click sound

V4.6.7

1. Fix: improved support for v1.2 version of the base plane

V4.6.6

1. Improved REP sound compatibility with internal X-Plane sound sliders
2. Fix: support for v1.2 version of the base plane

V4.6.5-h2

1. Fixed broken plugin reset

V4.6.5-h1

1. Fixed broken dataref

V4.6.5

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

V4.6.4

1. No changes for this plane

V4.6.3

1. No changes for this plane

V4.6.2

1. Improvement: MAP behavior at low RPM

V4.6.1

1. Fix: the starter did not disengage correctly

V4.6.0

1. Change: “Smooth Brakes” and “Automatic Differential Brakes” options merged into the “Advanced Braking” option
2. New: REP now includes TXT format checklists too
3. Fix: the primer sound was not completely played
4. Improvement: increased elevator trim authority
5. Improvement: better LOP cut-out behavior in piston engines
6. Improvement: more realistic piston engine power response when running ROP
7. Improvement: more realistic manifold pressure behavior at high RPM
8. Improvement: running oversquare when LOP does not damage the piston engines
9. Improvement: REP waits for the real weather to load (if enabled) before updating the engine temperatures at startup
10. Improvement: improved hypoxia recover at low altitude
11. Fix: the manifold pressure was too low at idle
12. Fix: The REP update loop was not always executed correctly in certain configurations
13. Fix: The avionics is less prone to damage if the alternator is turned on/off with the avionics master on

V4.5.12

1. Improved towing behavior
2. Added engine cooling down sounds (exhaust ticks)
3. Fix: the primer sound was not played correctly
4. Improvement: closing the booster coil cover turns off the booster coil switch
5. Improvement: the wobble pump moves slowly to the bottom position when released
6. Improvement: it is now possible to refill the oil in flight (using the maintenance window)
7. No changes for this plane

V4.5.10-h1

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

V4.5.10

1. A cancel window is shown before beginning the engine autostart procedure
2. Fix: the instrument wear could not save its state properly on some systems
3. Improved the fuel flow behavior at altitude

V4.5.9

1. Improved the FSEconomy implementation reliability
2. Improved manifold pressure algorithm

V4.5.8

1. Improved the hardware rudder pedals compatibility (it is now possible to disable the automatic differential braking)
2. Improved checklists
3. Updated base model to v1.1.1
4. Fix: the fuel weight conversion was not done correctly

V4.5.7-h2

1. Improved the manifold pressure behavior at low RPM
2. The wobble pump and primer manipulator are now a draggable axis
3. Added the booster coil on/off/toggle commands
4. Improved the magnetos check engine behavior
5. Added some custom datarefs description in this manual
6. Fix: The flap lever sound was not played correctly
7. Fix: At the higher levels, the engine power output was slightly higher than expected for a given MAP/RPM setting
8. Fix: the engine was burning slightly too much oil for a given MAP/RPM setting

V4.5.7-h1

1. Fix: the flaps lever did not work anymore
2. Fix: the fuel selector didn't properly select the middle tank
3. Fix: landing on the water set the propeller as bent
4. Fix: the installation procedure described in the user manual was wrong

V4.5.7

1. New: Support for the Thranda Beaver

V4.5.6

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

V4.5.5

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

V4.5.3

V4.5.2

V4.5.1

1. Fix: the oil pump failure message was missing

V4.5.0

1. New: improved VR support in walkaround and towing modes
2. The magnetos are forced to “both” when starting the flight with engines running
3. The tiedowns and chocks are removed when starting the flight with engines running
4. Fix: CTD when trying to connect to FSE
5. Fix: Typos in Maintenance Window
6. Fix: excessive oil comsuption when a cylinder is partially worn out

V4.4.6

V4.4.5

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

V4.4.4

1. Fix: XP10 crash on reload
2. Fix: CTD on plugin disable

V4.4.3

1. New: dataref to control the wind volume: simcoders/rep/settings/wind_volume
2. Fix: memory leak

V4.4.2

1. New: the standalone fuel market support USA airport codes 3 chars long
2. Fix: large windows did not fit the screen properly

V4.4.1

V4.4.0

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

V4.3.5

1. FSEconomy: fix for HTTPS protocolo update

V4.3.4

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

V4.3.3

V4.3.2

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

V4.3.1

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

V4.3.0

1. Fix: the EGT indicator could report negative values
2. Message to warn that the Experimental Flight Model is not supported
3. Engine Monitor shows CHT and Oil Temperature
4. Fix: The preheater did not work properly
5. Fix: the Economy System status could be loaded only partially in some situations
6. Fix: the in-flight tips were not visible in VR. Thanks to sparker for helping debugging the issue.
7. Fix: walkaround CTD
8. Fix: message boxes did not support VR
9. Improved the engine negative torque model

V4.2.3

1. Fix: solved some windows positioning issues
2. Fix: in XP10 REP did not recognize opening a window as a paused sim state
3. Improved startup behavior

V4.2.2

1. Fix: Tach time was not shown correctly in the Tachometer
2. Fix: improved CHT algorithm with X-Plane 11.35
3. Fix: the kneeboard and maintenance windows did not save their position properly, therefore they were not shown correctly after being popped out
4. Fix: and X-Plane 11.35 bug prevented REP from reading the proper airspeed

V4.2.1

1. No changes for this aircraft

V4.2.0

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

V4.1.8

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

V4.1.7

1. CTD fix

V4.1.6

1. Minor Networking fix

V4.1.5

1. Increased the debug log for the Economic System

V4.1.4

1. No changes for this aircraft

V4.1.3

1. No changes for this aircraft

V4.1.2

1. No changes for this aircraft

V4.1.1

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

V4.1.0

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

V4.0.3

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

V4.0.2

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

V4.0.1

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

V4.0.0

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

V3.5.11

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

V3.5.10

1. Minor fixes

V3.5.9

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

V3.5.8

1. Minor fixes

V3.5.7

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

V3.5.6

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

V3.5.5

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

V3.5.4

1. Minor Fixes

V3.5.3

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

V3.5.2

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

V3.5.1

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

V3.5.0

1. **New**: It is now possible to load a worn out airplane. Checkout the Persistent Aircraft and Components Wearing chapter.
2. **New**: The cockpit instrumentation wears out with time and can be fixed using the Maintenance Report
3. **New**: Hobbs Time and Tach Time are now counted separately for the airframe and the engines
4. **New**: It is now possible to move the viewpoint while in walkaround or towing mode. VR not supported yet. See the Towing and Walkaround sections for more information.
5. The static elements, such chocks and tie-downs, are now managed during replay

6. The propeller governor dynamics at low RPMs are much improved
7. Improved starter algorithm
8. Fix: under certain conditions, the fuel pump sounds where not stopped with the pump itself
9. Fix: a bug prevented the cylinders to fail properly and to report their compressions in the Maintenance Report
10. Fix: the hypoxia message was shown when the hypoxia was disabled
11. Fix: the oil filter get less clogged when it's past TBO
12. Fix: the autostart broke if the weight and balance configuration was changed while it was running
13. Fix: The Maintenance Report and the Kneeboard were not dimmed correctly at night

V3.4.6

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

V3.4.5

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

V3.4.4

1. Minor fixes

V3.4.3

1. **New**: Improved engine torque algorithm
2. **New**: Improved sparkplugs fouling algorithm
3. **New**: Removed the mouse gestures to open the kneeboard
4. **New**: The checklists/mass and balance/towing mode/autostart are now accessible from the plugins menu as well as the lateral menu

5. **New**: a new command has been added to switch on the HI fuel pump
6. Improved multimonitor compatibility

7. Fix: oil pressure was sometimes too low
8. Minor fixes

V3.4.2

Internal test build – not released to the public

V3.4.1

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

V3.4.0

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

V3.3.1:

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

V3.3.0

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

V3.2.1

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

V3.2.0

1. **New**: 3D sounds
2. **New**: Advanced gyro wander

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

V3.1.1

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

V3.1.0

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

V3.0.0

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

V2.6.4

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

V2.6.3

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

V2.6.2

1. Fix: Minor fixes

V2.6.1

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

V2.6.0

1. **New**: Custom propeller governor

V2.5.1

1. Fix: Corrected the toe brakes algorithm

V2.5.0

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

V2.4.0

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

V2.3.0

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

V2.2.1

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

V2.2.0

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

V2.1.0

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

V2.0.3

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

V2.0.2

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

V2.0.1

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

V2.0.0

1. **New**: Custom interactive walkaround and pre-flight procedures.
2. **New**: Custom airplane towing system
3. **New**: More advanced engine physics (especially for engine startup)
4. **New**: More complex damages system for the avionics, the engine and the landing gear such as:
    - Oversquare operation of the engine is not always allowed

- The tire are damaged if the brakes are active on touchdown

5. **New**: More in-flight tips
6. **New**: Custom menu that provides an easy access to REP's features
7. **New**: Stall buffeting effect (improved if HeadShake 1.5+ is installed)
8. Minor changes to the sounds system
9. Minor changes to the graphics system
10. Bug fixes

V1.0.2

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

V1.0.1

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

V1.0.0

1. Initial Release

LICENCE

End-User License Agreement for SimCoders.com Reality Expansion Pack

---

This End-User License Agreement (EULA) is a legal agreement between you (either an individual or a single entity) and the mentioned author (SimCoders.com) of this Software for the software product identified above, which includes computer software and may include associated media, printed materials, and “online” or electronic documentation (“SOFTWARE PRODUCT”).

By installing, copying, or otherwise using the SOFTWARE PRODUCT, you agree to be bounded by the terms of this EULA. If you do not agree to the terms of this EULA, do not install or use the SOFTWARE PRODUCT.

SOFTWARE PRODUCT LICENSE

The Reality Expansion Pack is being distributed as payware licenced software for personal, commercial use, non-profit organization, educational purpose. It may not be included with CD-ROM/DVD-ROM distributions. You are NOT allowed to make a charge for distributing this Software (either for profit or merely to recover your media and distribution costs) whether as a stand-alone product, or as part of a compilation or anthology, nor to use it for supporting your business or customers without the written permission of the author. It may not be distributed freely on any website or through any other distribution mechanism.

1. GRANT OF LICENSE.

This EULA grants you the following rights: Installation and Use. You may install and use an unlimited number of copies of the SOFTWARE PRODUCT.

Reproduction and Distribution. You may not reproduce and distribute an unlimited number of copies of the SOFTWARE PRODUCT.

2. DESCRIPTION OF OTHER RIGHTS AND LIMITATIONS.

Limitations on Reverse Engineering, Decompilation, Disassembly and change (add,delete or modify) the resources in the compiled the assembly. You may not reverse engineer, decompile, or disassemble the SOFTWARE PRODUCT, except and only to the extent that such activity is expressly permitted by applicable law notwithstanding this limitation.

Update and Maintenance

The Reality Expansion Pack minor upgrates are FREE of charge.

Separation of Components.

The SOFTWARE PRODUCT is licensed as a single product. Its component parts may not be separated for use on more than one computer.

Software Transfer.

You may permanently transfer all of your rights under this EULA, provided the recipient agrees to the terms of this EULA.

Termination.

Without prejudice to any other rights, the Author of this Software may terminate this EULA if you fail to comply with the terms and conditions of this EULA. In such event, you must destroy all copies of the SOFTWARE PRODUCT and all of its component parts.

3. COPYRIGHT.

All title and copyrights in and to the SOFTWARE PRODUCT (including but not limited to any images, photographs, clipart, libraries, and examples incorporated into the SOFTWARE PRODUCT), the accompanying printed materials, and any copies of the SOFTWARE PRODUCT are owned by the Author of this Software. The SOFTWARE PRODUCT is protected by copyright laws and international treaty provisions. Therefore, you must treat the SOFTWARE PRODUCT like any other copyrighted material. The licensed users or licensed company can use all functions, example, templates, clipart, libraries and symbols in the SOFTWARE PRODUCT to create new diagrams and distribute the diagrams.

LIMITED WARRANTY

NO WARRANTIES.

The Author of this Software expressly disclaims any warranty for the SOFTWARE PRODUCT. The SOFTWARE PRODUCT and any related documentation is provided “as is” without warranty of any kind, either express or implied, including, without limitation, the implied warranties or merchantability, fitness for a particular purpose, or noninfringement. The entire risk arising out of use or performance of the SOFTWARE PRODUCT remains with you.

NO LIABILITY FOR DAMAGES.

In no event shall the author of this Software be liable for any special, consequential, incidental or indirect damages whatsoever (including, without limitation, damages for loss of business profits, business interruption, loss of business information, or any other pecuniary or physical loss) arising out of the use of or inability to use this product, even if the Author of this Software is aware of the possibility of such damages and known defects.

LibCURL EULA

The following statements are applicable **only** to the LibCURL library used to provide some features of this product.

COPYRIGHT AND PERMISSION NOTICE

Copyright (c) 1996 - 2018, Daniel Stenberg, daniel@haxx.se, and many contributors, see the THANKS file.

All rights reserved.

Permission to use, copy, modify, and distribute this software for any purpose with or without fee is hereby granted, provided that the above copyright notice and this permission notice appear in all copies.

THE SOFTWARE IS PROVIDED “AS IS”, WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT OF THIRD PARTY RIGHTS. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Except as contained in this notice, the name of a copyright holder shall not be used in advertising or otherwise to promote the sale, use or other dealings in this Software without prior written authorization of the copyright holder.