8. Engines

8.1 Introduction

The Engines module is used to display or introduce the characteristics of a given engine, i.e.:

- its geometrical characteristics
- its weight characteristics
- the characteristics of the various systems that are part of it (reduction gear, turbocharger, …)
- its performances
- the 3-view drawings

The data can be downloaded from the PCA2000 website or inserted by the user via the PCA2000 interface.

Thereafter, in the PCA2000 analysis and design modules, mentioning merely the name of the engine will imply the knowledge of all its technical characteristics.

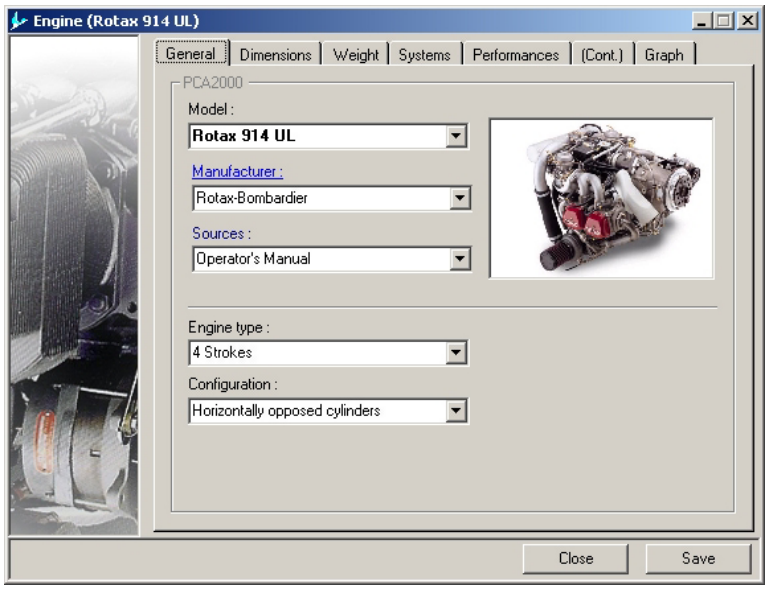

Figure 8.1 : Generalities

8.2 Table of content

8.3 Engines

8.3.1 Description

To access the Engines module, **click** on [**Analysis**] then [**Engines**] of the menu bar of the main window. You can also reach it directly by clicking on  in the vertical toolbar.

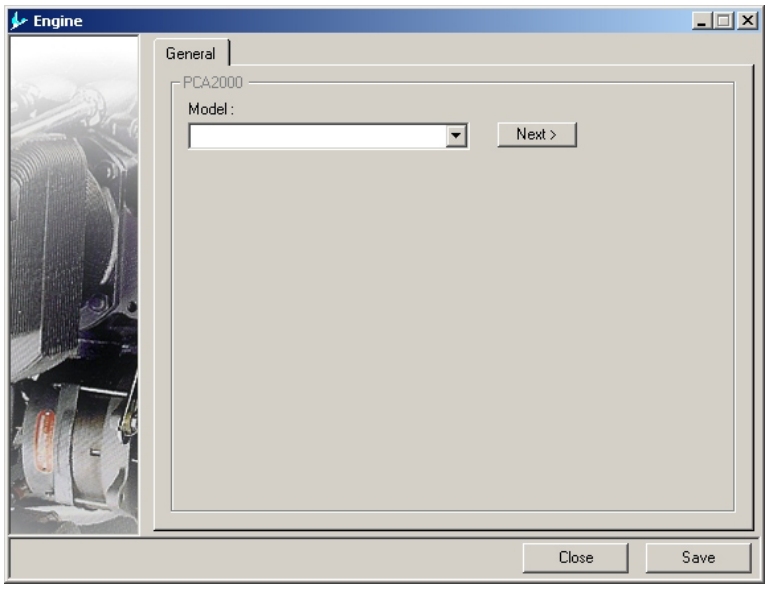

Figure 8.2 : Engines

You can press on the **F1** key at any time to reach the contextual help.

To navigate within the controls of a window, use the **tab key**.

8.3.2 To visualize the characteristics of a given engine

Once you open the **Engine** module, all the references related to data files of engines stored in the **Engines** directory of **PCA2000-Data** are automatically downloaded in the application.

To visualize the characteristics of a given engine, **click** on the engine reference that appears in the drop-down list under **Model**. All the tabs in the Engine window are now accessible.

8.3.2.1 Generalities

The first tab gathers general data related to the selected engine.

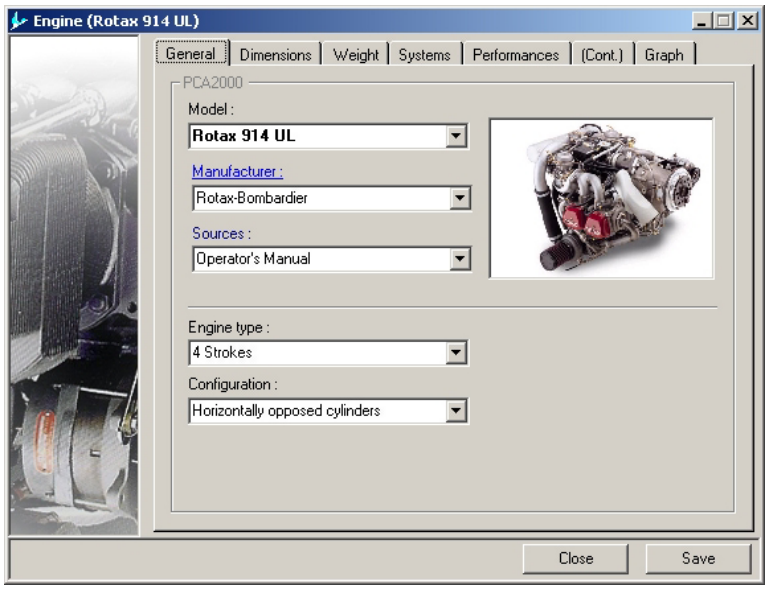

Figure 8.3 : Generalities

8.3.2.2 Specifications

The second tab displays the geometric characteristics of the selected engine as well as its weights.

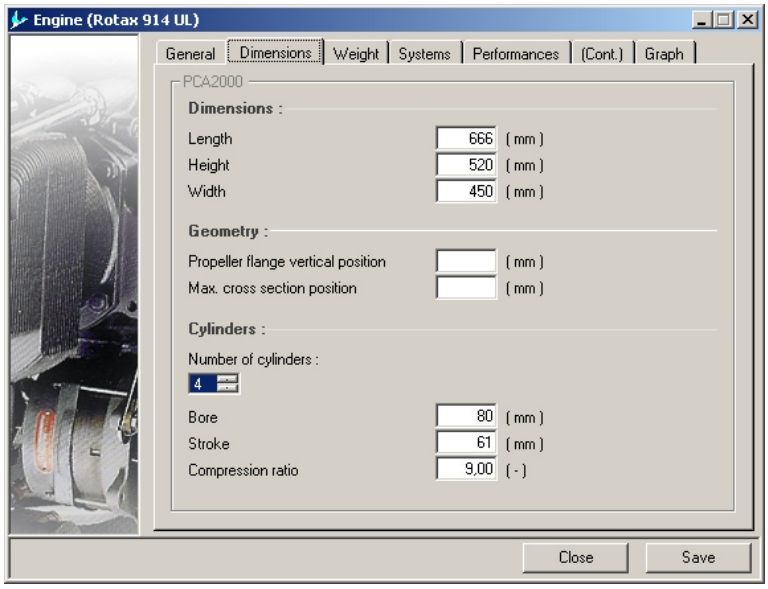

Figure 8.4 : Specifications

8.3.2.3 Weight

The third tab displays the weight characteristics of the selected engine as well as its centre of gravity position and its moment of inertia.

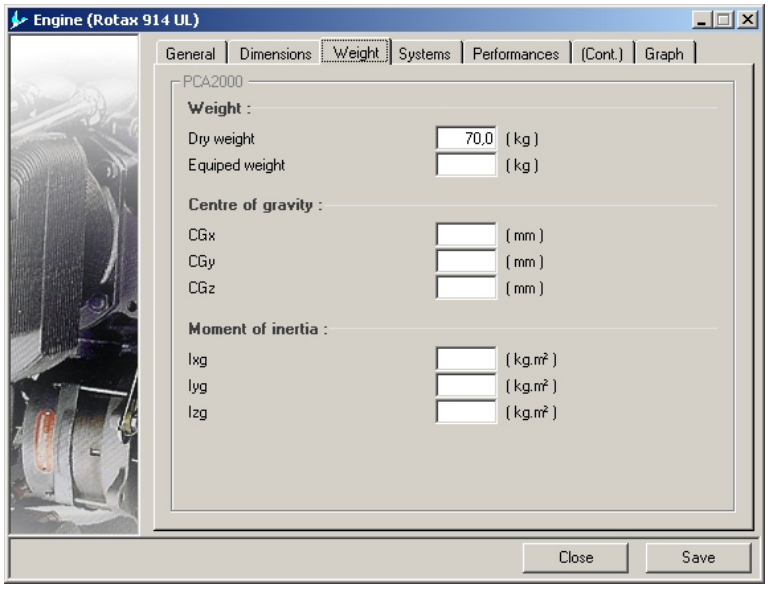

Figure 8.5 : Weight

8.3.2.4 Systems

The fourth tab displays the data related to the various systems that are part of the selected engine. **Click** on one of the option buttons to display the information about the corresponding system.

Once the mouse pointer leaves the drawer, the drawer closes itself.

To reopen it, move again the mouse pointer on it.

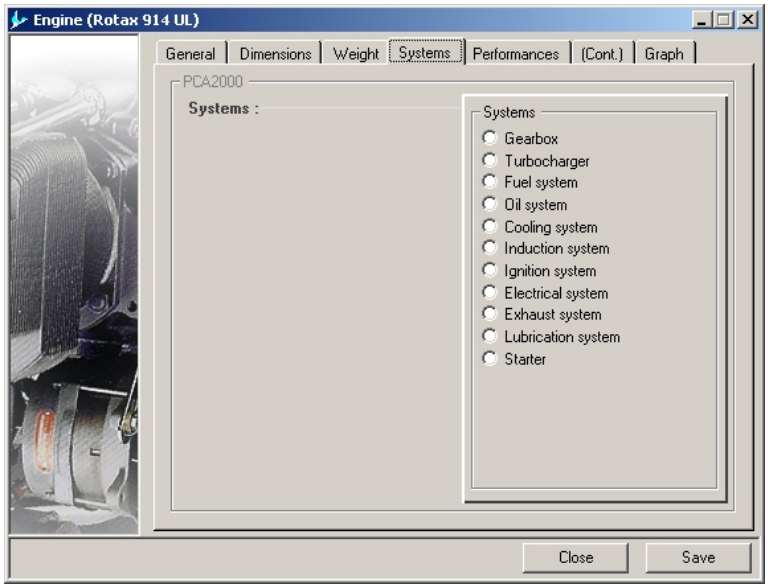

Figure 8.6 : Systems

8.3.2.5 Gearbox

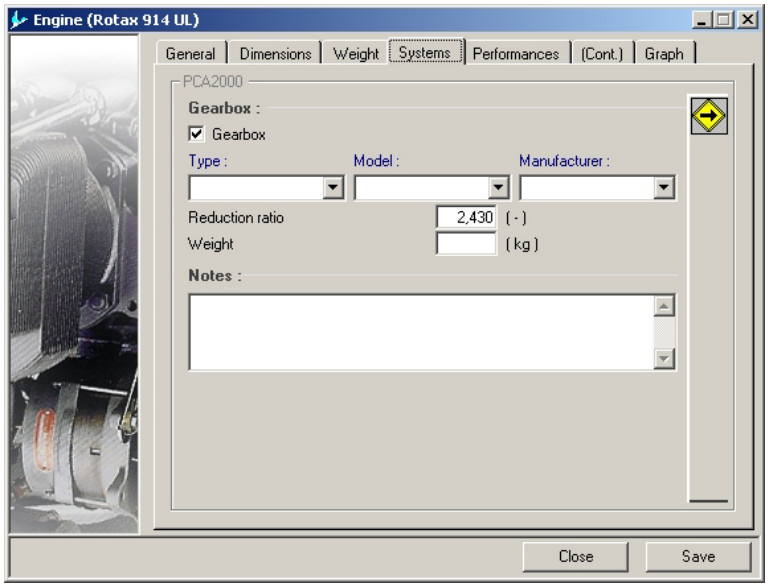

Figure 8.7 : Data related to the gearbox

If the engine is equipped with a gearbox:

1. **Check** the check box **Gearbox**,
2. **Insert** its various characteristics from which at least, the **gearbox ratio**.

8.3.2.6 Turbocharger

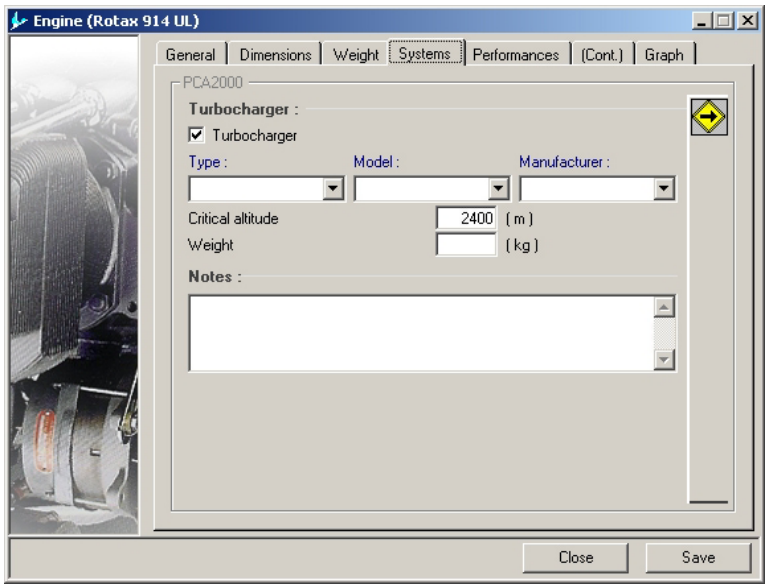

Figure 8.8 : Data related to the turbocharger

If the engine is equipped with a turbocharger:

1. **Check** the check box **Turbocharger**,
2. **Insert** its various characteristics from which at least the **critical altitude**.

8.3.2.7 Fuel system

Give at least the fuel used .

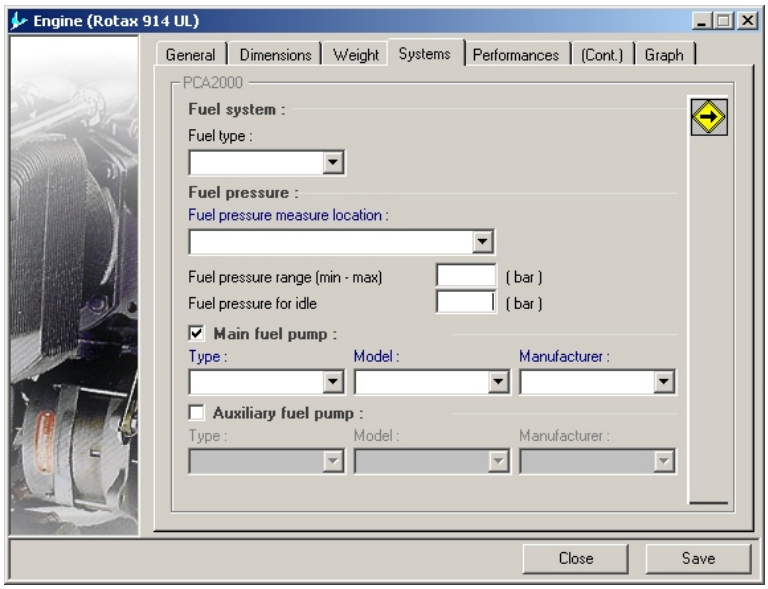

Figure 8.9 : Data related to the fuel system

8.3.2.8 Oil system.

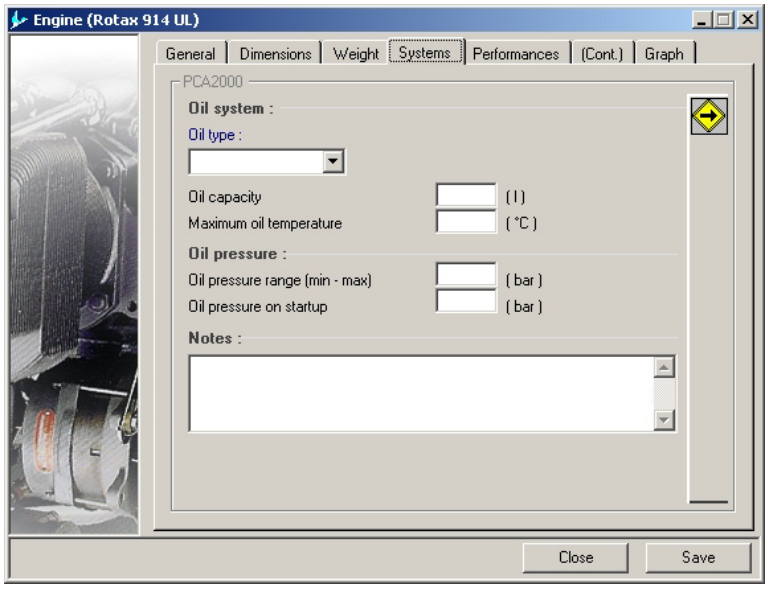

Figure 8.10 : Data related to the oil system

8.3.2.9 Cooling system.

Give at least the cooling system used.

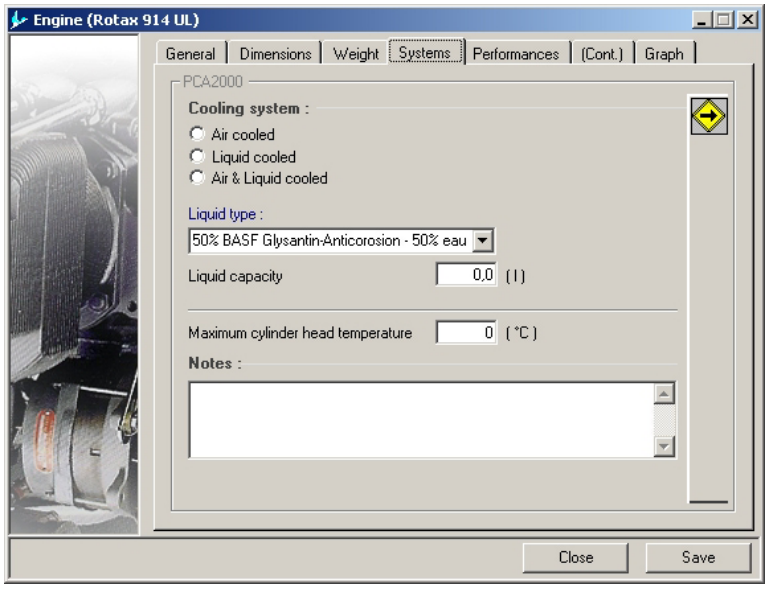

Figure 8.11 : Data related to the cooling system

8.3.2.10 Manifold system.

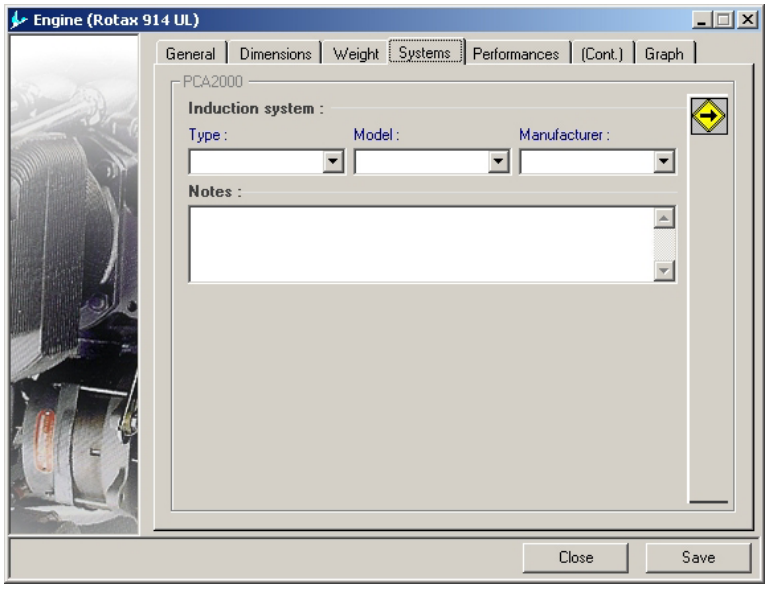

Figure 8.12 : Data related to the manifold system

8.3.2.11 Ignition system.

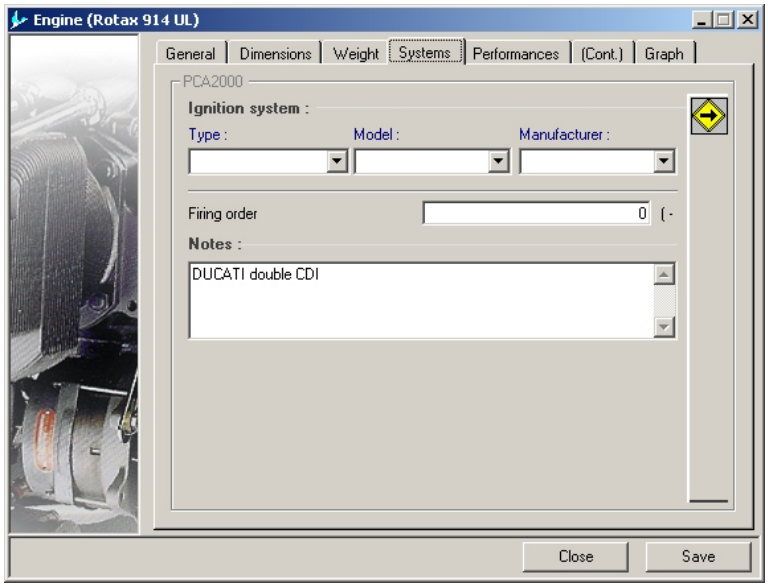

Figure 8.13 : Data related to the ignition system

8.3.2.12 Exhaust system

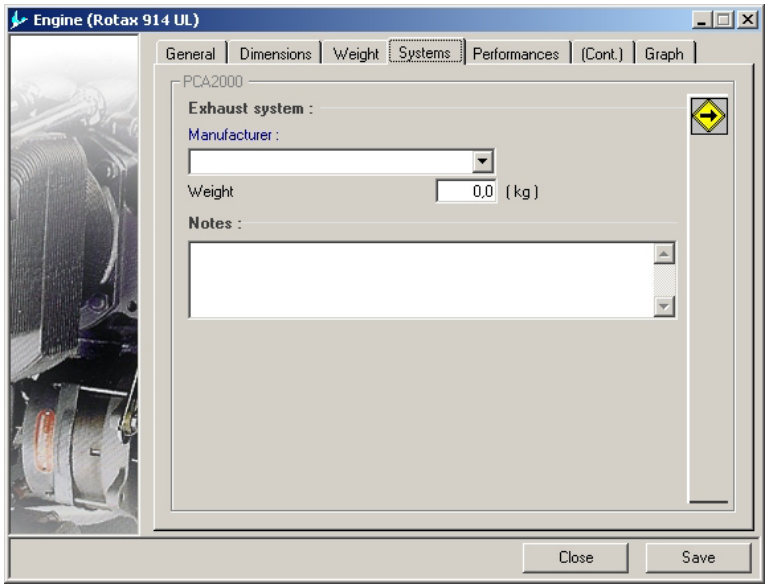

Figure 8.14 : Data related to the exhaust system

8.3.2.13 Lubrication system.

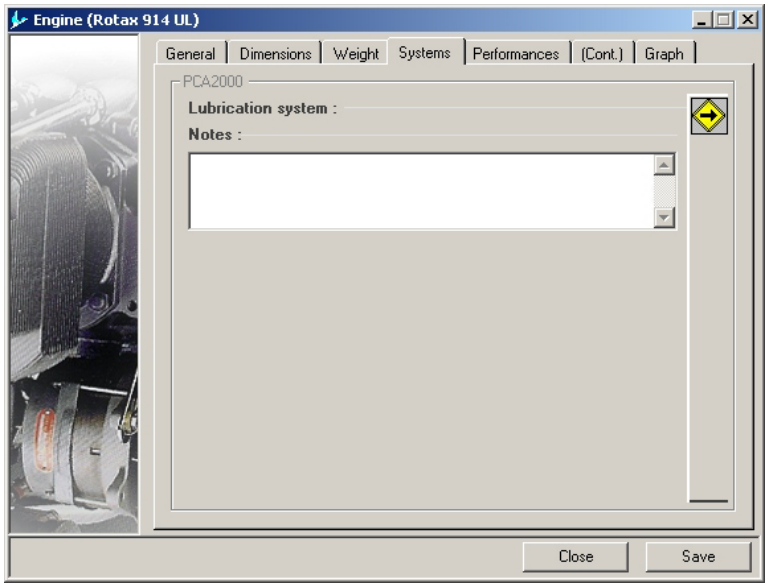

Figure 8.15 : Data related to the lubrication system

8.3.2.14 Starter

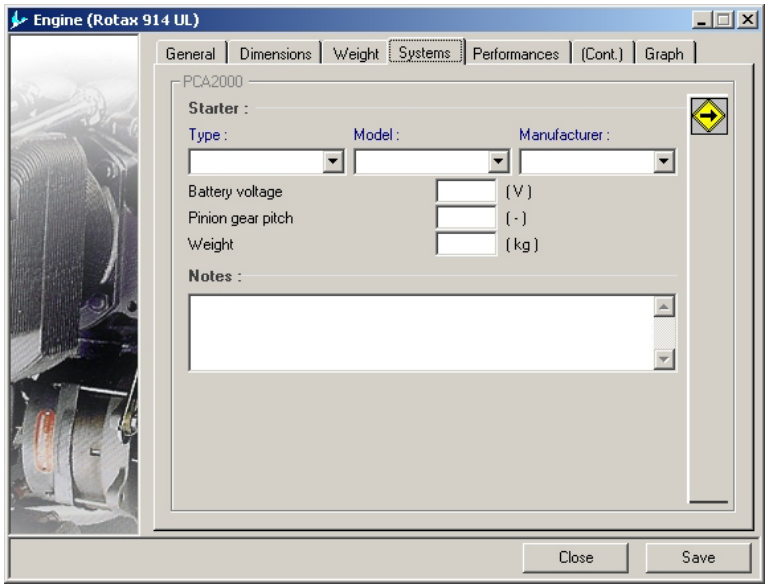

Figure 8.16 : Data related to the starter

8.3.2.15 Performances

The fifth tab gathers the data related to the performances of the selected engine.

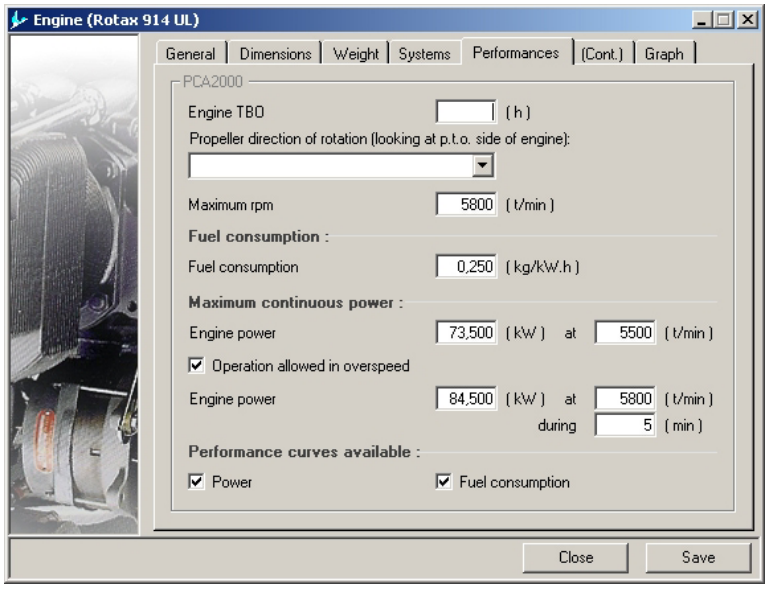

Figure 8.17 : Performances

If the engine can run in overspeed during a given period of time,

1. **Check** the check box **Operation allowed in overspeed.** ,
2. **Specify** the engine power, the corresponding engine rating as well as the maximum period of time allowed

If the power curves are available, **check** the check box **Power**.

If the specific fuel consumption curves are available, **check** the check box **Fuel consumption**.

8.3.2.16 Performances curves

The sixth tab contains all the information related to the performance curves of the selected engine:

- Maximum continuous power.
- Maximum power at take-off.
- Specific fuel consumption.

The different curves are presented as points included in the table.

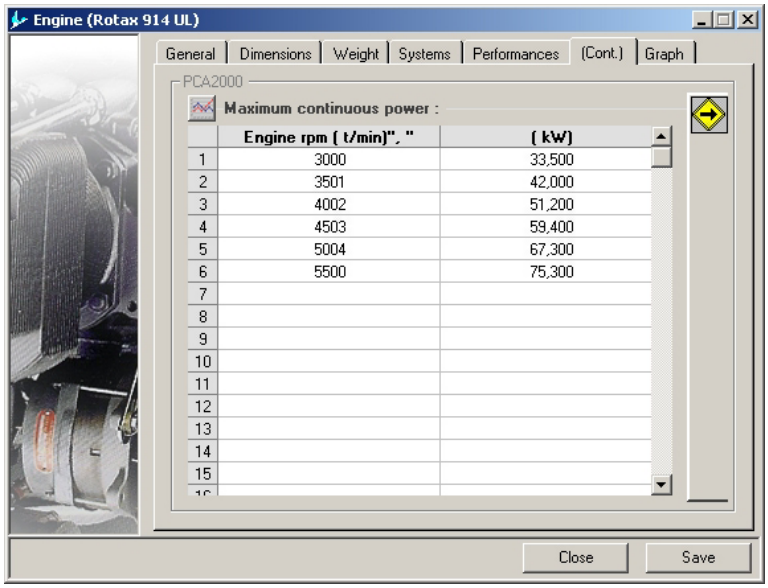

Figure 8.18 : Performances

To visualize the table information in a graphic, **click** directly on the [**Graphic**] tab or click on the button located in the upper left part in the table.

Click with the left button of the mouse on the column title or on the line number to select the entire column or the entire line.

Click with the right button of the mouse once it is on the table to activate the functions [**Cut**], [**Copy**], [**Paste**].

Use those 2 functionalities to fill in the table with the values copied from other PCA2000 tables or spreadsheets such as Excel for example. While proceeding in that way, you speed up considerably the introduction of data and you avoid transcription errors.

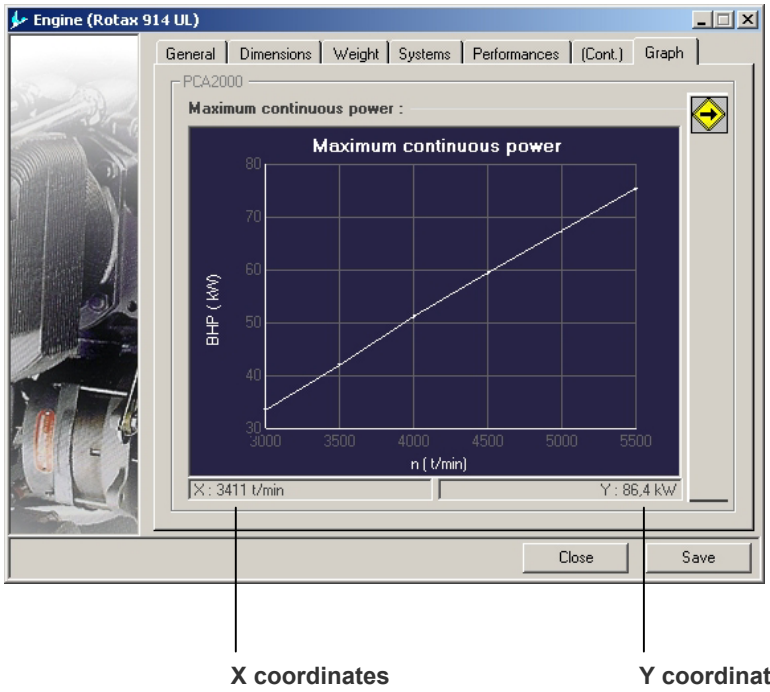

Figure 8.19 : Performances curves

To display other information:

1. **Open** the drawer by moving the pointer of the mouse on it
2. **Chose** the information that you wish to visualize. The display is done automatically.

The drawer closes itself automatically once you move the mouse pointer away from it. Once you move the mouse pointer on the graphic, the coordinates of the mouse pointer are displayed in the 2 areas located under the graphic.

Use the **arrows** ← → ↑ ↓ of the keyboard to move precisely the mouse pointer.

It is also possible to display the 3 views drawings of the engine:

- Front view.
- Side view.
- Top view.

In order to do that:

1. **Move** the mouse pointer on the drawer to open it
2. **Select** then the view that you wish to see displayed.

The files associated with the data file have to be named in the following way:

- Front view : NameOfTheDataFile-FR.jpg
- Side view : NameOfTheDataFile-SD.jpg
- Top view : NameOfTheDataFile-TP.jpg

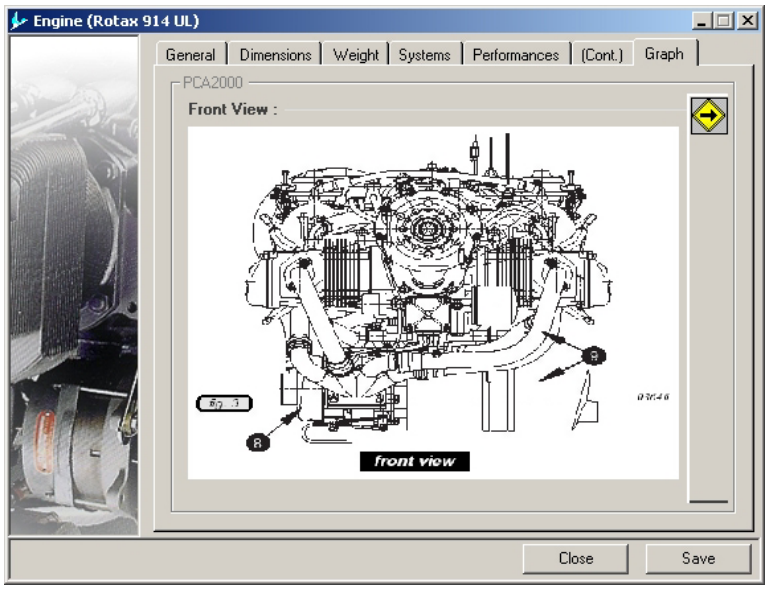

Figure 8.20 : 3-view drawings

8.3.3 Introduce the characteristics of a new engine

To introduce in the database the characteristics of a new engine,

1. **Click** on [**File**] then [**New**] of the menu bar of the main window.

The Engines module is initialized.

2. **Introduce** the name of the new engine
3. **Click** on Next >.

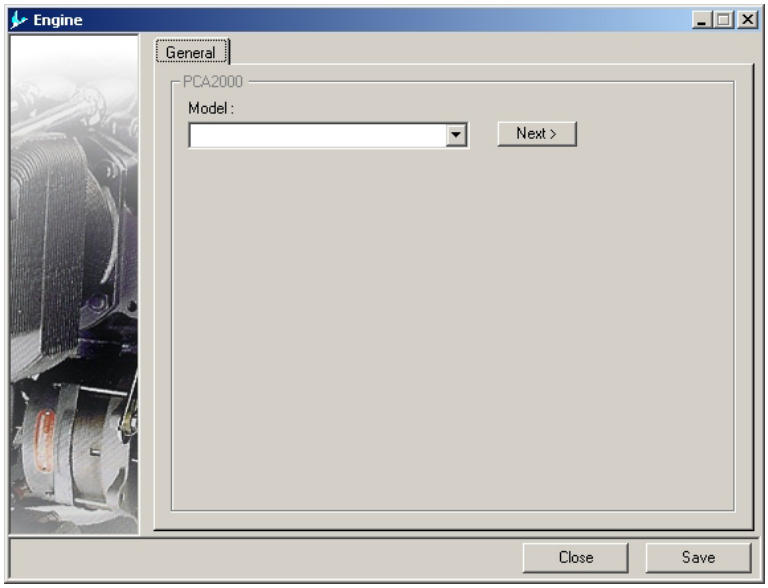

Figure 8.21 : Definition of the model

8.3.3.1 Definition of the general information

Introduce the general information in relation with the new engine

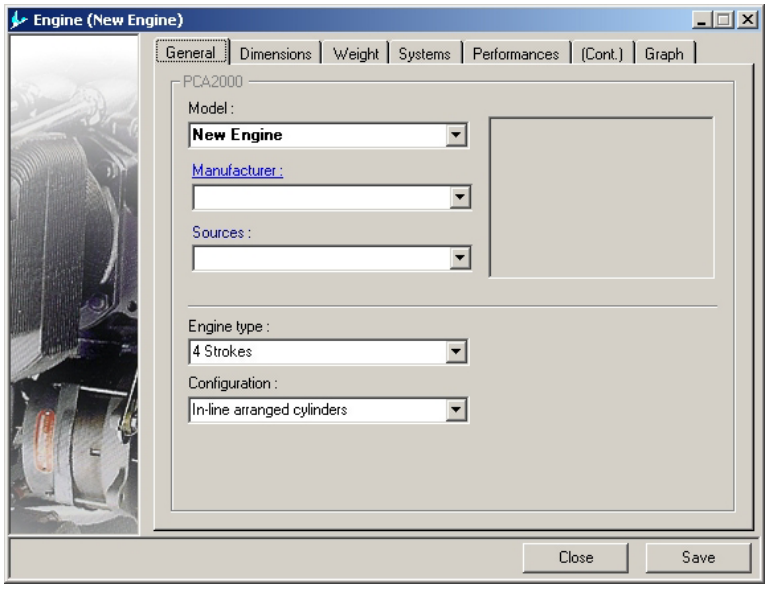

Figure 8.22 : Generalities

8.3.3.2 Definition of the geometrical information

Introduce the information in relation with the engine geometry.

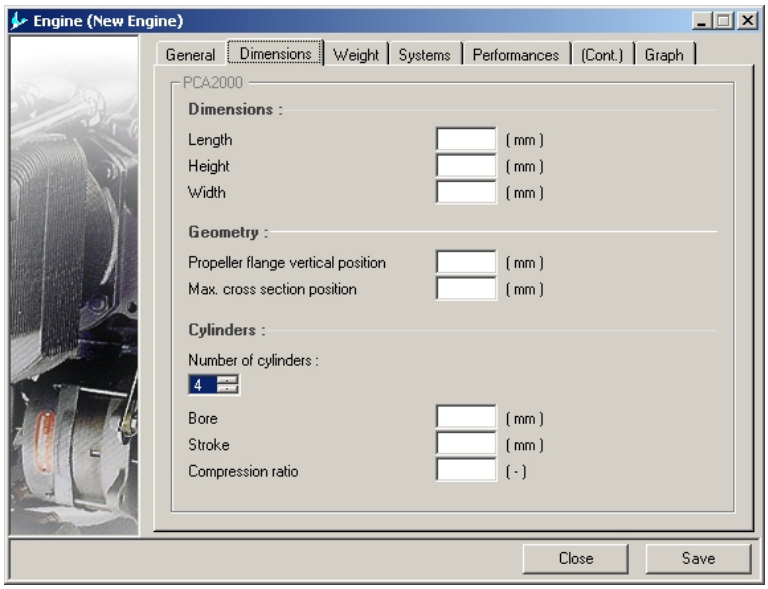

Figure 8.23 : Specifications

8.3.3.3 Definition of the geometrical and weight information

Introduce the information in relation with the engine weights.

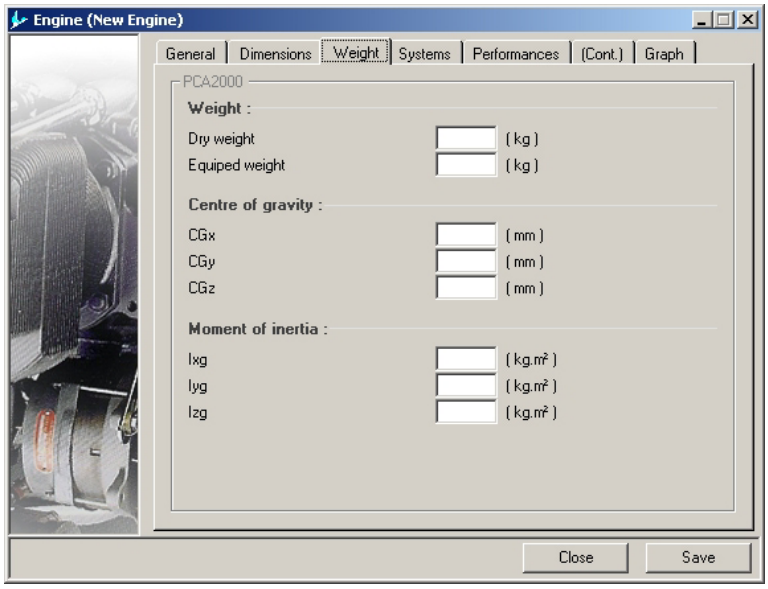

Figure 8.24 : Weight

8.3.3.4 Definition of the information in relation with the various systems

Introduce the information in relation with the various systems that equip the engine.

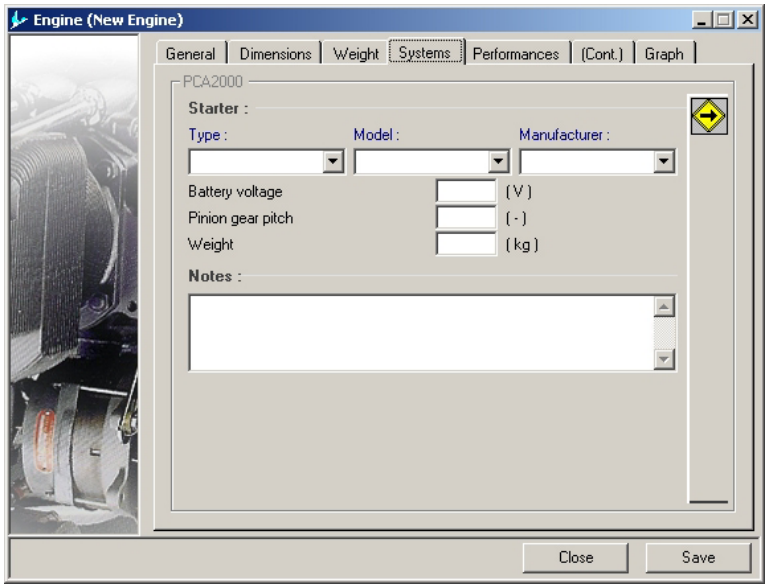

Figure 8.25 : Systems

8.3.3.5 Definition of the performances

Introduce the information in relation with the general performances.

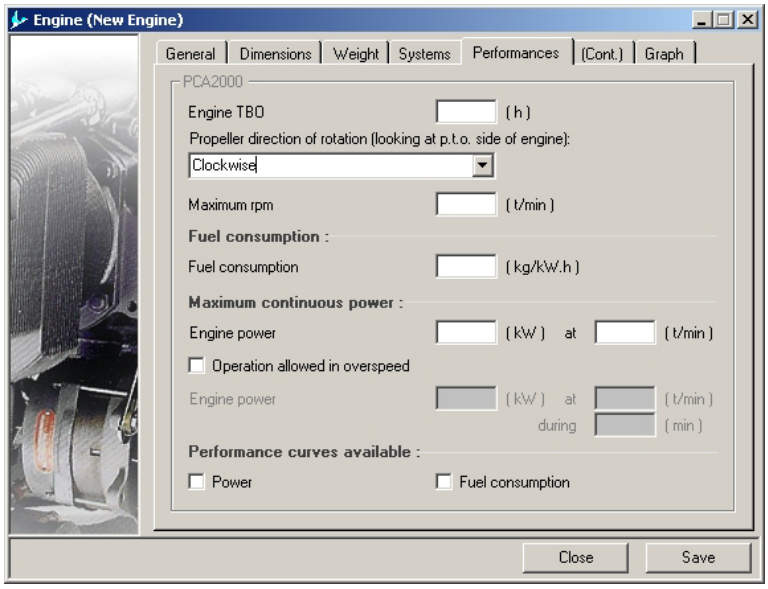

Figure 8.26 : Performances

8.3.3.6 Performances curves

Introduce the information in relation with the power and specific fuel consumption curves.

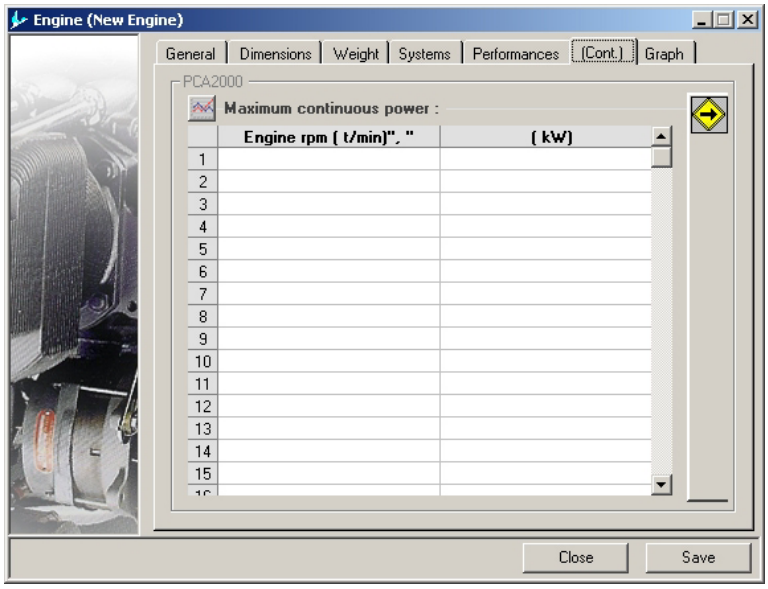

Figure 8.27 : Performances

Click with the left button of the mouse on the column title or on the line number to select the entire column or the entire line.

Click with the right button of the mouse once it is on the table to activate the functions [**Cut**], [**Copy**], [**Paste**].

Use those 2 functionalities to fill in the table with the values copied from other PCA2000 tables or spreadsheets such as Excel for example. While proceeding in that way, you speed up considerably the introduction of data and you avoid transcription errors.

8.3.4 To save the data file related to the new engine

In order to save in a file the information related to a new engine, **click** on [**File**] then [**Save as**] in the menu bar in the main window. You can also do it by clicking on in the toolbar.

The dialogue box [**Save as**] is displayed on the screen.

The name of the file will be NameOfTheEngine.eng

The file will be saved automatically in a specific folder according to the type of the engine :

- **2 Strokes**: PCA2000-Data\Engines\2 Strokes\NameOfTheEngine
- **2 Strokes Diesel**: PCA2000-Data\Engines\2 Strokes Diesel\ NameOfTheEngine
- **4 Strokes**: PCA2000-Data\Engines\4 Strokes\ NameOfTheEngine
- **4 Strokes Diesel**: PCA2000-Data\Engines\4 Strokes Diesel\ NameOfTheEngine
- **Rotary**: PCA2000-Data\Engines\Rotary\ NameOfTheEngine
- **Turboprop**: PCA2000-Data\Engines\Turbopropeller\ NameOfTheEngine.

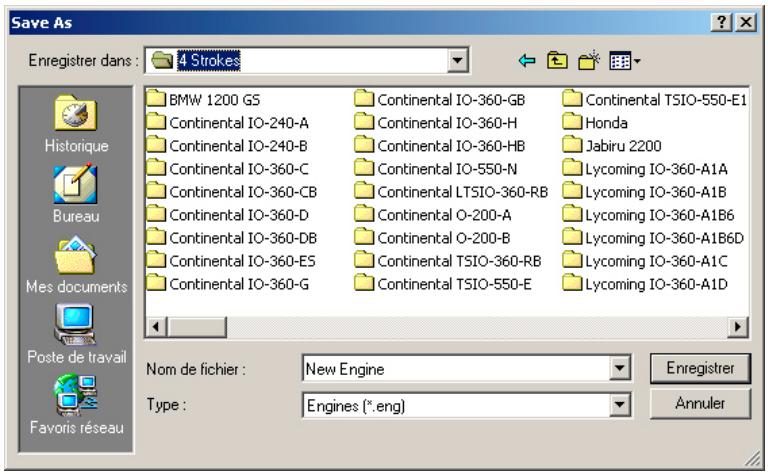

Figure 8.28 : Save the data file