Virtual Cockpit Panel

with random and pilot induced failure modules
Version 2

for the great
Curtiss Commando C46 V2 aircraft

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INTRODUCTION
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This is for FS9. However, this might also work for FSX as FSX uses the same variables as FS9, but I don't have FSX so I don't know; you would have to try on your own.

If you want more realism like
- keeping engine parameters within limits
- experiencing random engine, systems, and instruments failures with a probability selectable by you
- coping with these failures and any resulting emergency situation
- having a need to consider emergency landing sites along your route

then this is for you!

This is Version 2 of my previous upload and includes a lot of additional features and corrections to the systems, the failures and the VC.

Note: The failure models as well as the airframe icing are largely based on the great work by **Charles "Dutch" Owens** ceo1944@yahoo.com for his DC3C gauges with **failure modules** (***dc3cv1.zip*** at flightsim.com) and his **ICE gauge**; those of his gauges, which I have not modified, are now included, so a separate download of dc3cv1.zip is no longer necessary).
Also included are additional failure modules by **Robert Graf** for **Carburator Icing** and **Oil Consumption** (part of the DC6 aircraft of Greg Pepper, Max, and Tom Gibson (http://library.avsim.net/esearch.php?CatID=fs2004ac&DLID=174897).

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INSTALLATION
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1. **If you don't have Version 1 installed**, you need to download and install the following files first:

   - the great **Curtiss Commando C46 V2 aircraft** (GA C46 and GA C46 SA) by Libardo Guzman García, Greg Pepper, and Tom Gibson available at avsim.com (***ga_c46_v2.zip***, http://library.avsim.net/search.php?CatID=fs2004&SearchTerm=curtiss+commando&Sort=Added&ScanMode=0&Go=Change+View)
   - Gunter Teson1's ***RealEngine_v14.zip*** available at flightsim.com. This is needed for a realistic calculation of Mixture Ratio and Cylinder Head Temperature. RealEngine aircraft specific installation for C46 is already included in my download.

2. **Then for everybody:** Unzip „C46BFLVC2.zip“ to a temporary folder

3. **Make a backup copy of your "aircraft.cfg"** in your "FS2004/aircraft/GA C46" folder

4. **Make a backup copy of your "aircraft.cfg"** in your "FS2004/aircraft/GA C46 SA" folder

5. From my folder „C46BFLVC2“ move the folders
   - „aircraft“
   - „gauges“ (only needed for RealEngine and must be installed after installation of RealEngine!)
   - „sound“

   into your "FS2004 root directory.
   Click yes when asked whether you want to integrate the folders into the existing folders. If you have made a backup copy of your aircraft.cfg in step 1 and if you don't have Version 1 installed then there should be no files to be overwritten; if you have Version 1 already installed overwrite when prompted.

6. **Optional:** to avoid instrument lighting from the original VC in places where there are now no instruments you may want to deactivate the files vc_panel01_L.bmp and vc_panel02_L.bmp in the texture folders of your liveries by renaming (e.g. to vc_panel01_L.b) or by removing from the texture folder. There will still be red or white panel lighting.

7. **Optional:** Not required but strongly **recommended**: download and install the Tupolev TU-154 aircraft (http://www.avsim.com/pages/0109/tu154/tu154.htm). Apart from being one of the most fantasic aircraft simulations it contains and integrates into FS9 a fully functional KLN90B GPS which is not available separately.
   It is really worthwhile, because you can generate/modify flight plans or directs during your flight and you also get information on navaids and airports. You can use the FS9 database or load other databases into the GPS. Instructions on the use of this KLN90B are contained in the Tu154M Manual (Tu-154M.pdf).
   To replace the simple GPS in my C-46 panel by the Tu-154 GPS open my C-46 panel.cfg and under the section [Vcockpit02] change the following lines:

   ```
   //gauge87=kln90b!Kln90B,  114,137,290
   gauge87=cad_kln90bro!gpsro,  114,137,290
   ```

   to read:

   ```
   gauge87=kln90b!Kln90B,  114,137,290
   //gauge87=cad_kln90bro!gpsro,  114,137,290
   ```

8. That's it!

Note: My aircraft.cfg is already set up for Manuele Villa's C-46 Buffalo Repaint; if you don't have the textures you can donwload them here:
http://library.avsim.net/esearch.php?CatID=fs2004acrp&DLID=101976 .

Note: Should you find out that you don't like my VC, all you need to do is to replace my "aircraft.cfg" with the backup copy of your original "aircraft.cfg" file which you have made in the first step of installation.

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The Virtual Cockpit
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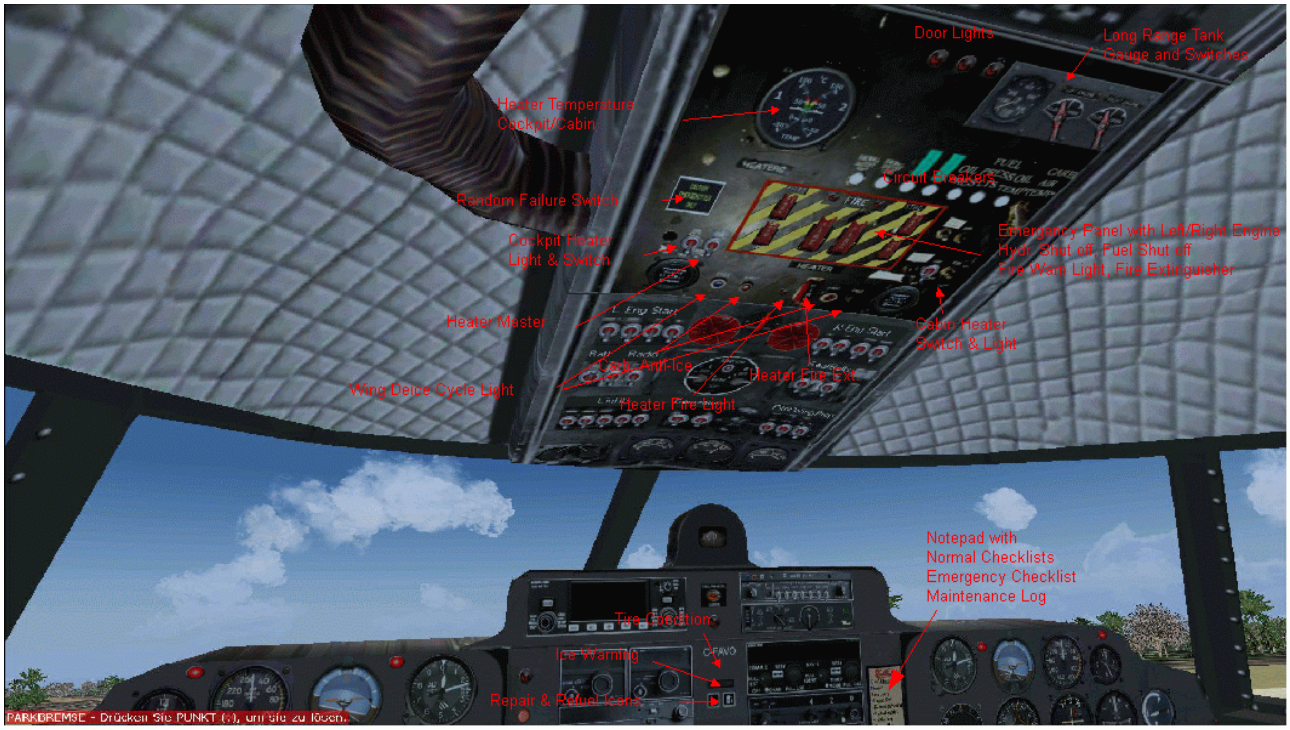
The VC lay out is largely based on
- a Buffalo Airways C-46 cockpit (www.icepilots.com , then look under fleet and then

under C-46).
- and a C-46A Manual (http://de.scribd.com/doc/11327612/C46-Manual)

with some artistic license/compromises:
- Instead of the DC3C Emergency Panel in Version 1 I incorporated fuel and hydraulic shut-off switches and fire extinguishing switches for each engine in Version 2 on the upper overhead panel (where I have seen emergency/fire controls on other C46 pictures)
- I incorporated hydraulic shut-off switches for the hydraulic and the brake systems on the lower copilot's panel below the hydraulic pressure gauges
- the lower overhead panel is based on the information from the C-46 Manual
- the upper overhead panel is based on the Buffalo cockpit (new in Version 2)
- Switches/handles for parking brake, tailwheel lock, carburator heat, and prop feather are on the pedestal in the real aircraft, I have moved them to the lower central panel due to their importance for operation
- I also incorporated the long range tank gauge by Mark Beaumont/Dave Bitzer on the upper overhead panel.
  Note: If you want to use the long range tank, you have to remove the // in front of the line „//Center3= ...“ in the fuel section of the aircraft.cfg

Most switches, gauges, and annunciator lights have tooltips. The picture above shows Version 1. The changes of Version 2 are particularly in the upper overhead panel and on the central panel and are shown and explained in the text below.



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Important before you fly!
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1. **Read the section „Systems“ below to understand the failure modules**; for further information you may want to read
   - the Operations_Manual.htm for the DC3C failures and related gauges
   - the Damage Module Readme.txt for the Carburator Icing and Oil Consumption failures

   in the „Must Read“ folder (I kept the name of the folder but it's no longer a must)
   NOTE: there are differences in the limits of this C46.
2. **Select the likelihood of random failures** by clicking into the area where it says „Caution Emergency Use Only“ on the upper overhead panel to one of the following options; Never, Rare, Likely, Frequent, Certain; default setting is Rare.
3. **Add oil and/or Alcohol for longer flights** by clicking the oil and/or alcohol quantity gauges before engine start and with parking brake set.
4. **Click on the mixture control panel** on the pilot's panel to adjust the mixture either
   - manually (not realisic for C-46)
   - or by external mixture lever to „full rich“, „auto rich“ and „auto lean“
   - or by mouse click to „full rich“, „auto rich“, and „auto lean“.

   Note that mixture adjustment is required; if the mixture is either too rich or too lean the engine will start to stutter.
5. **Warm up the engines** at RPM below 1600 until CHT reaches 100 Celsius
6. **Do the pre-flight checks**, otherwise you may get into trouble, in particular
   - at 2000 RPM check magnetos
   - at 2000 RPM check feather switches: click on the switch, the RPM should start to fall, click again to bring RPM back.
   - at 2000 RPM check prop governors: using the prop control levers decrease RPM and watch for equal RPM reduction on both props

- check both hydraulic pumps working and hydraulic pressure around 1350 PSI; a significantly lower reading is a sign of hydraulic oil leakage
- check engine oil pressure: a significantly lower reading on one engine indicates an oil leak
- check vacuum system
- check generators
- check battery (generators off and external power disconnected)
- check flight controls for free movement.

An abbreviated checklist with reference information adjusted to the failure modules is available in the kneeboard reference (C-46A_BFL_ref.html). Or use the interactive Checklists/Maintenance Log on the central panel.

7. **After takeoff reduce power** to METO 2500 RPM and 44 MAP, then to Climb Power 2300 RPM and 37 MAP; cruise at 2000 RPM and 30-32 MAP
8. **Use Carburator Heat** from time to time
9. **Monitor your CHT** and make proper use of the cowl flaps
10. **Monitor engine oil pressure and temperature**, sudden changes could be a sign of an engine failing
11. **Monitor the hydraulic system** for leakage or pump failures
12. **Monitor your fuel quantity** for any leakage
13. **Monitor your alcohol quantity** for any leakage (I am talking about the anti-icing fluid!)
14. If you have to use the **heaters** turn them off from time to time to prevent them from overheating and catching fire.

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The Systems
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0. Random Failures (modified in Version 2):

Random failures include engine failures, system failures, equipment failures, and instrument failures. There is a list of all random failures in the Annex. Each failure and each engine damage has a code (ACMEFault and AMCEDamage). If you want to cheat, the tooltips for „No Smoking“ and „Seatbelts“ will show the latest damage code respectively the latest fault code also during flight.

If you don't want random failures, or if you want them more often than seldom, change the setting where it says „Caution Emergency Use Only“ on the upper overhead panel to one of the following options; Rare, Never, Likely, Frequent, Certain; default setting is Rare.

The difference between the settings is the time interval between the checks for random failures; each time the system checks for a random failure there is a 1 out of 65 chance for a failure to occur. Therefore, even with the setting „Failures are likely“ you may fly quite a long time without any failure; but then, you may not ....
However, pilot induced failures will occur independent of the setting, so treat your engines well!
Since failures may occur already on the ground, make sure to do your preflight checks!

On the ground with engines out and parking brake set you can check the maintenance log on the central panel for failures occured during flight.

1. Pilot induced Engine failures:

Each Engine has a damage count (slightly different per engine). The damage count increases each time

- the CHT exceeds 250 C for more than 20 sec
- the MAP exceeds 50 InHg for more that 30 sec
- the RPM exceeds 2500 for more than 60 sec
- the RPM divided by 100 is greater than MAP plus 5 with IAS over 105 IAS for more that 20 sec (to avoid backpressure from the propeller to the engine)
- the RPM exceeds 1600 with CHT below 100 C

Decrease in oil pressure and increase in oil temperature are signs of engine wear.

2. Electrical System

Gound power is shown as available when a/c is parked on hard surface and when a/c has not moved. Hold your feet on the brakes when you release the parking brake and make sure the ground power light has gone off before you start moving the aircraft, otherwise your total electrical system will fail!
Battery, Generator, and Inverter failures may occur.

3. Fuel System:

Fuel Pumps
There is an engine mounted fuel pump on each engine. In addition there is one booster pump for each engine. The booster pumps have to be switched on to start the engine; once the engine is running, the booster pump can be switched off. However, since the engine mounted pumps may fail **(new in Version 2)**, it is advisable to switch on the booster pumps for take-off and landing. The booster pumps can only fail on ground in this simulation.
Fuel Tanks
The basic aircraft has six fuel tanks: a front, center, and rear wing tank on each side. At start-up with full tanks the aircraft weight will be near the airline certification limit of of 44000 lbs for max take-off weight.
In addition, there are provisions for a fuselage mounted long range tank holding 800 gals (not 1600 gals as in Version 1, 800 is the correct value). To activate this tank you have to open the aircraft.cfg and delete the two slashes (//) in front of the line „Center3 = ..“ in the [fuel] section. In this case your start-up weight will be near the USAF Emercency Overload weight of 50000 lbs; so expect a long takeoff run in this case.
Fuel leakage (new in Version 2)
may occur in any of the tanks or in the line to the left or the right engine. In the first case leakage will stop when the leaking tank is empty. In the latter case the leakage will continue (independent of tank selection) as long as the engine on the leaking side is running; leakage will stop if you shut it down.
Tanks/Cross Feed Selectors (modified in Version 2)
At start-up the fuel tank levers are in the position for the forward wing tanks.
The port engine can be fed from the starboard tanks and vice versa by use of the cross feed lever:
- cross feed lever poiting left feeds left engine from the tank selected on the right tank selector
- cross feed lever poiting right feeds right engine from the tank selected on the left tank selector.

4. Oil System:

Oil Consumption:
For each engine oil consumption at 2000 rpm is 3.0-4.0 gals per hour. On higher rpms the engine consumes even more oil. If the oil is overheated and goes above 90°C, it starts to 'smoke' away. This reaches the maximum at 120°C, where 20-22 gals are lost every hour.

The engine will fail on 4-8 gals left.

Oil Leakage:

Oil leakage may occur either on the left or the right engine. A sudden drop in oil pressure may be a sign of oil leakage. Once the oil quantity is depleted the engine will fail. So monitor your oil quantity gauge and if you don't want to run the risk of breaking your engine, you should land or shut the engine down before the oil quantity drops into the red zone and your engine fails! The leak will stop if you shut down the engine and close the corresponding fuel shut off switch on the emergency panel.

Each engine's oil tank holds up to 40 gals. At start up, the tanks contain 24 gals each. Oil can be refilled for each tank in increments of 2 gals by clicking on the face of the gauge, left side for engine 1 and right side for engine 2. For this the engine has to be stopped, the aircraft on the ground and parking brake set. Make sure you have enough oil for longer flights before you start your flight!

5. Hydraulic System (modified in Version 2):

The hydraulic system supplies brakes, flaps, landing gear, and cowl flaps with power and consists of:

- two engine driven pumps producing each the system pressure of 1350 PSI (residual pressure is 600 PSI)
- an electrical auxillary pump (instead of the hand pump in the real aircraft)
- one dual hydraulic pump pressure gauge
- one system pressure gauge

If one pump fails (or one engine out) all hydraulic systems will still work

In case of both engines flame out, or one engine flame out and failure of the pump on the other engine, hydraulic pressure will come up again once the flame out engine has been restarted. Instead, you can also use the electrical auxilliary hydraulic pump.

Hydraulic leakage (modified in Version 2)

may occur in the main line, in the brake line, in the line for the other hydraulic equipment (flaps, gear, cowl flaps), in the left wing line, or in the right wing line; any leakage will cause an initial drop in hydraulic pressure and then a continuous drop as the hydraulic fluid is depleted.

- Leaks in the main system (flaps, gear, cowl flaps) or in the brake line can be stopped by activating the corresponding shutoff switch on the lower copilot's panel; this, however will also deactivate the corresponding system for the time the line has been shut off. So shortly before you want to activate the gear, flaps, cowl flaps, and/or the brakes, you need to switch the shutoff switch to on again.
- Leaks in the left or right wing line can be stopped by activating the left or right engine hydraulic shutoff switch on the upper overhead emergency panel; in this case you will still have full hydraulic power as long as the other engine hydraulic pump is working.
- If the leakage has not been stopped or could not be stopped (in the case of the main line leakage), the hydraulic system will fail below 700 psi at which point the hydraulic pressure will drop to zero and no operation of brakes, cowl flaps, flaps or gear will be possible. Of course, the gear can still be extended manually by emergency extension (ctrl+g).

6. Anti-Icing (Props, Pitot mast, and Carburators) (new in Version 2):

The anti-icing alcohol tank contains initially 9 gals = 1152 FlOz. The tank will hold up to 22 gals. You can increase the amount of alcohol in increments of 2 gals by clicking on the face of the gauge which is located on the far right of the copilot's panel. For this the engine has to be stopped, the aircraft on the ground and parking brake set.

During icing conditions ice will accumulate on the props reducing prop efficiency. To avoid or remove icing, alcohol is spread over the propellers.

Likewise, with electric power available and switches set to on alcohol is used to prevent

icing on the pitot mast (in addition to the pitot heater) and in the carburators (in addition to the heated air). (NOTE: in this simulation alcohol will flow to the carburators respectively to the pitot mast if the respective heat switch is activated and if electrical power is available). There are two yellow lights on the overhead panel showing the status of carburator anti-icing.
The props will use about 3 gals/hr (max. real value), the pitot mast and each carburator will use about 0.5 gals/hr (guessed!)
However, in case of a leak, you will loose your alcohol supply much quicker! So make sure you have enough alcohol in the tank when you are likely to encounter icing conditions in flight.

7. Carburator Heat (from Robert Graf's Readme):
"Conditions for carb icing:
- Airspeed over 85 kts
- Below 22" MAP: Ambient temperature betwenn 0°C and 25°C
- Over 22" MAP: Ambient temperature between 0°C and 15°C
- Dewpoint between 0°C and ambient temperature
The carb takes 5-7mins to completely freeze. In this state no fuel reaches the engine and it dies. Before this happens a MAP drop can be observed.
This is like the last warning. The lower the MAP the quicker the engine will go quiet after the drop starts.
So use the carb heaters QUICK, if that happens. Pushing the throttles is no good and wont help at all!
The carb heaters will melt all the ice in about 30 seconds, 10 times faster then a temperature change to above 25°C.
On carb heating ice may fall into the carb choking the engine a bit. That doesn't do any harm and no throttle action is required.
The engine will regain normal MAP by itself, when all the ice is cleared.
If the egine dies from fuel starvation on an iced carb, just turn the heater on and wait about 30 seconds before restarting the engine.
Dewpoint is calculated from ambient pressure, ambient temperature and saturation vapor pressure (from an approximation formula).
The calculation is not perfect (due to some limitations in XML values), but its quite close."

8. De-Icing (modified in Version 2)
There is now a gauge on the center panel between the radios above the Repair and Refuel Icons which will light up in icing conditions (blue=light icing, yellow=medium icing, red=heavy icing).
Wings (from Charles („Dutch“) Owen's Readme):
"During icing conditions ice will accumulate on the wings increasing the aircraft weight. Also, in rain at temperatures below 0 C and above -11 C you will accumulate freezing rain on the aircraft. So make sure you use the wing deicing controls to get rid of the ice. If you don't, stall speed will increase and eventually you may just fall out of the sky. Under icing conditions you will hear the ice breaking off the wings when operating the wing deicing boots ".
The de-icing boots require pressure from the vacuum system. The operating cycle of 40 seconds can be monitored by two blue lights on the overhead panel.
Windshield (new in Version 2):
The windshield will cover with ice at temperatures below 0 Celsius. To de-ice the windshield turn on the cockpit heater on the overhead panel (see 14. below). The ice will start melting once the heater temperature rises above 5 Celsius. Unfortunately I am not able to achieve the icing on the VC windows; therefore, I had to use the 2D window with

the limitation that the iced 2D window will stay in place independent of your looking around in the VC. If you don't like it, delete or deactivate the gauge00 in the panel.cfg under [Window00].

9. Brakes (new in Version 2): NOTE: may not work with external toe brakes!
Hydraulic pressure is needed for the brakes to work.
The effectivity of the brakes is increasingly reduced depending on the prevailing conditions:
- dry conditions (not raining or snowing):
  100% wheels rolling;
  70% wheels blocked (skidding)
- wet conditions (when raining):
  70% wheels rolling;
  40% wheels blocked (skidding)
- snowy conditions (when snowing):
  40% wheels rolling;
  20% wheels blocked (skidding)
- icy conditions (when raining and temperature below 32 F or 0 C):
  20% wheels rolling;
  10% wheels blocked (skidding)

As you can see the effectivity is further reduced if you hold your feet for too long on the brakes so that the wheels are blocked and start skidding (you will hear a sound). Of course, during dry or wet conditions (and only then) each time the wheels are blocked the condition of the tires will deteriorate. This will eventually result in a burst tire with a corresponding yaw effect. Therefore brake intermittently and avoid blocked wheels. Wheels will not block below 20 kts ground speed. You can check the wear on your tires in percent by holding the mouse arrow over the invisible gauge located on the center panel below the call sign.
Should you not like this effect, deactivate the gauge "BrakingAction" in the panel.cfg. However, should you want to use it on other aircraft, download „BrakingAction.zip“ from flightsim.com or avsim.com! This will give you also a gauge for aircraft with antiskid systems.

10. Mixture Control:
By mouse click the mixture control panel on the pilot's panel lets you either adjust the mixture either manually or automatically by external mixture lever or by mouse click to „full rich“, „auto rich“ and „auto lean“.
For the C46 automatic adjustment should be used. However, if you prefer manual adjustement, make sure that the mixture is neither too rich nor too lean otherwise the engine will start to stutter.

11. Cowl Flaps (new in Version 2):
The cowl flaps are now dependent on hydraulic pressure. Also there is now an increase in drag when the cowl flaps are extended (see also 5. Hydraulic System!)

12. Prop Governor Failures (new in Version 2):
In case of governor failure the propeller pitch will go to its maximum and RPM can no longer be controlled by the prop lever. This results at medium to high power settings in an RPM in excess of 2500 RPM. Uninterrupted engine operation for more than 60 seconds at such RPM will damage the engine. If a governor failure occurs on the ground do not take off; if the failure occurs in flight, you have two choices:
- either shut down the engine and feather the prop

- or make intermittent use of the feathering switch to let the RPM drop below 2500 RPM; however, in this simulation the high RPM will lead to high oil temperature with high consequential oil consumption.

13. Fire Extinguishing (modified in Version 2)

There are now two CO2 Bottles on each engine. The corresponding switches as well as fuel and hydraulic shut-off switches for each engine are on the upper overhead emergency panel. If an engine catches fire, make sure you have closed the fuel and hydraulic shut-off switches for that engine before you activate the CO2 Bottles, otherwise the fire won't stop. Use one bottle first and wait for a moment; if fire persists, use second bottle; if fire still continues, the vacuum system will fail first, then the hydraulic system, and then the aircraft will become uncontrollable - so look for a landing site and land immediately!

14. Heating (new in Version 2)

The aircraft has three gasoline fired, combustion type heaters, one for the cockpit and two (one in simulation) for the cabin. To start the heaters electrical power either from the cart or from a running generator has to be available and the left fuel selector has to be switched to a tank containing fuel; then turn on the Heater Master switch and the cockpit heater switch (both on upper overhead left side) and/or cabin heater switch (right side). Operation of each heater is indicated by an amber light. Heater temperatures are shown on the upper temperature gauge. There are no temperature controls on the heaters, turn on and off as needed. Heater temperature should not exceed 60 Celsius. If heater temperature reaches 70 Celsius the heater will catch fire. There is a fire warning light next to the fire switch. The Fire switch shuts off both heaters and activates a CO2 bottle. Be careful to activate the switch only in case of fire, otherwise your CO2 bottle will be depleted and both heaters will not work any more.

15. Icons (new in Version 2)

There are now two icons on the central panel between the radios.

Refuelling:

Press the Refuel icon repeatedly to add 25% of fuel each time to the forward and center tanks. For this the aircraft must be on ground, engines off, parking brake set. In addition, the aircraft must be on a paved surface (asphalt, concrete, macadam, oil treated, tarmac, or bituminous).

Repairing Failures:

Press the Repair icon to repair any failures. For this the aircraft must be on ground, engines off, parking brake set. However, you may still have to refill engine oil and alcohol. Of course, you can also reload the aircraft to repair any failures.

16. Checklists/Maintenance Log (new in Version 2)

There are abbreviated normal and emergency checklists available on a note pad on the right side of the center panel. Click on the left side of the pad to call up Normal Checklists or one of the Emergency Checklist or the Maintenance Log; the latter is only available on the ground with engines off and parking brake set. Click on the arrows on the top right side to go to the next or the previous page. Click on the N or the E between the arrows to go directly to the Normal or the Emergency Checklists. The Mainenance Log will show the failures occured during flight.

17. Door Lights (new in Version 2)

The main passenger door opens when the left engine and the smoking sign are off and closes when the smoking sign is switched on or the left engine is started.

On the top of the upper overhead panel there are now three lights which can be clicked to open/close the cockpit doors, the cargo door, and the right rear door.
The warning light on the top left side of the center panel now lights up if any of the doors is open.

18. Circuit Breakers (modified in Version 2):
On the upper overhead panel above the emergency panel there are now working CBs only for the generators, the power cart, the fuel pumps, and the avionics.

19. Panel Lights (modified in Version 2)
The two rotary light switches on the lower left of the lower overhead panel are now working separately, the left on for white light, the right one for red light.

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Credits
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To make it very clear: What I have done is to take the work of others (see credits below) and to modify their bitmaps and/or the xml-code of gauges and to re-arrange the VC Panel lay out. Meanwhile I also added new functions to the gauges and created new gauges.

Thanks to the gentlemen below for letting me use their work:

The aircraft:
VISUAL MODEL: Master work: Libardo Guzman, Program support: Luis Felipe Abad, Details and instructions: Tom Gibson and Greg Pepper Version 2 modifications: Tom Gibson
TEXTURES.
AEROCONODOR: Main work by Greg Pepper . Crew and other small work by Libardo Guzman and Camilo Luengas, who made some reworks for this livery. Blurred prop by BananaBob.
BASE MODEL: Main work by Greg Pepper. Repaint by LIBARDO GUZMAN.
FLYING TIGERS: Main work by Greg Pepper. Repaint by LIBARDO GUZMAN
AERONORTE: Main work by Greg Pepper. Repaint by LIBARDO GUZMAN
EVERTS AIR FUEL: Repaint by Brian Gladden
USAAF repaint and texture improvements by Cliff Presley. Blurred prop by BananaBob.
ANIMATION. Libardo Guzman, Tom Gibson and Greg Pepper.
PANEL AND V.C. PANEL: Libardo Guzman and Willy McCoy. Version 2 mods by Tom Gibson, modern cfg file by Pete Ham
Some GAUGES by Doug Dawson for the aircraft

Buffalo Repaint by Manuele Villa (only picture included)

Gauges, partly modified by me:
- Charles "Dutch" Owens ceo1944@yahoo.com for his DC3C gauges with failure modules (***dc3cv1.zip*** at flightsim.com) (see his „operations_manual“ for further credits); many of his gauges are also in my folder „C46BFL“, however, several with modifications to gauge and/or bitmap
- Robert Graf for his DC6 failure modules, in particular for Carburator Icing and Oil Consumption robert.graf@pontiac51.com , with slight modifications in my folder „C46BFL“
- Gunter Teson1 for his RealEngine failure modules, in particular for Mixture Control and

Cylinder Head Temperature
- Mark Beaumont/Dave Bitzer MABeaumont@aol.com , bitzer7@comcast.net for the long range tank gauges in folder „BB_DC3_LR“
- Ken Mitchell justmitch@charter.net for his gauges, in particular for Flap Position in the folder „Z_DC6KMTG“, and with modifications to gauge and/or bitmap for RPM, MAP, Fuel Pressure, Fuel Quantity in my folder „C46BFL“
- Milton Shupe, Scott Thomas, Urs Burkhardt acdesign@flightsimonline.com for the Spartan fuel switch gauge, which is in my folder „C46BFL“ in modified form
- Pierre Fasseaux pierre.fasseaux@skynet.be for the Hobbs Hour Meters in folder „FP_HOBBS“
- Rob Barendregt rc.barendregt@planet.nl for his FS2004 Engine Selection Correction gauge (folder „rcb-gauges“)
- Daniel MAQOUR daniel.maqour@wanadoo.fr for his Bendix-King KI-525 HSI („KI525NEW.CAB“
- Barry Blaisdell for letting me use and modify his ADF Indicator support@premaircraft.com
- The creators of the Neiva T25 aircraft for their Collins radio gauges

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Legal
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March 2015

ANNEX

C46 Fault Codes

Random-failure codes (reported in ACMEFault)

Engine failures...
101 - General Engine Failure 1
102 - General Engine Failure 2

Fires...
103 - Fire in Engine 1
104 - Fire in Engine 2

Systems failures...
107 - Hydraulic Leak
108 - General Vacuum failure
109 - General Electrical Failure
110 - General Static/Pitot failure

Fluid leaks...
111 - Fuel Leak
112 - Oil Leak
113 - Hydraulic Leak
114 - Alcohol leak

In-flight failures...
115 - Mag 1L in flight
116 - Mag 1R in flight
117 - Mag 2L in flight
118 - Mag 2R in flight
119 - Hyd Pump 1
120 - Hyd Pump 2
121 - Generator 1
122 - Generator 2
123 - Battery circuit
124 - Prop de-ice system
125 - Wing de-ice system
126 - Inverter
127 - Eng. 1 Fuel Pump
128 - Eng. 2 Fuel Pump
129 - Prop Governor 1
130 - Prop Governor 2

Instruments...
201 - Altimeter gauge
202 - ASI gauge
203 - VSI gauge
204 - Attitude gauge
205 - VOR1 gauge
206 - VOR2 gauge

207 - RMI gauge
208 - Autopilot
209 - COM1

211 - NAV1

213 - ADF
214 - Transponder
215 - Ammeter
216 - T&B gauge
217 - Gyro gauge
218 - Carb Air temp gauge
219 - Cyl temp gauge
220 - DME
221 - Fuel Press gauge
222 - Oil Press gauge
223 - Oil temp gauge
224 - OAT gauge
225 - RPM gauge
226 - MP gauge

Pre-flight failures...
301 - Vacuum System
302 - Mag 1L
303 - Mag 1R
304 - Mag 2L
305 - Gyro
306 - Mag 2R
307 - Alcohol leak
308 - Battery
309 - Takeoff engine fire
310 - Takeoff engine fail
311 - Hyd Leak
312 - Prop Governor 1
313 - Prop Governor 2
314 - Prop Feather 1
315 - Electr. Fuel Pump 1
316 - Electr. Fuel Pump 2
317 - Prop Feather 2
318 - Elevator freeze
319 - Oil leak
320 - Aileron Freeze
321 - Fuel leak
322 - Pitot Blockage
323 - Generator 1
324 - Generator 2
325 - Inverter
326 - Eng. 1 Fuel Pump
327 - Eng. 1 Fuel Pump

pilot-induced error codes (reported in ACMEFault)

1101 - Prime-induced fire Engine 1
1102 - Prime-induced fire Engine 2
2001 - Oil pressure engine failure 1
2101 - Oil temp engine failure 1
2002 - Oil pressure engine failure 2
2102 - Oil temp engine failure 2
2601 - Induced engine failure 1
2602 - Induced engine failure 2
2701 - Induced engine fire 1
2702 - Induced engine fire 2

Engine damage codes (reported in ACMEDamage)

2201 - Cyl temp high engine damage 1
2301 - MP engine damage 1
2401 - Cyl temp low engine damage 1
2501 - Backloading engine damage 1
2801 - RPM high engine damage 1
2202 - Cyl temp high engine damage 2
2302 - MP engine damage 2
2402 - Cyl temp low engine damage 2
2502 - Backloading engine damage 2
2801 - RPM high engine damage 2
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Controller Locations

Engines are monitored in ignition.xml
Ground power is in Groundlight.xml
Hydraulic system is monitored in ignition.xml
Electrical system is in voltmeter.xml
Random failures are in Seatbelts.xml
FA Door handling is in Smoking.xml
Prop, Pitot, and Carburator Anti-icing is in Anti_icing_system.xml
Wing Deicing is in DeIceWing.xml
Firefighting is in emergency.xml
Fuel leakage is in Seatbelts.xml
Oil Leakage is in Seatbelts.xml
Hydraulic Leakage is in Seatbelts.xml
Prop Governor is in Seatbelts.xml
Engine Fuel Pumps are in Seatbelts.xml
Reduced braking action in rain and snow is in BrakingAction.xml