Carenado's Cessna C152 II for FS2004

by Claudio "Cloudy" Di Veroli, published in PC FLIGHT,
The Official magazine of the "PC Pilots Ireland", June 2009, pp. 25-29

CARENADO IS BACK TO FS2004!

In last August 2008 Carenado had made the following public announcement: "Due to some incompatibility issues … the company decided to develop again its complete fleet from zero to be full FSX and DX10 compatible…. The company is not developing FS2004 compatible aircraft any more." In November 2008, however, the British FlightSimX website was showing surprising news:

"Power To The People - Carenado comes back to FS2004! After Carenado's recent announcement that they will only be producing add-ons for Flight Simulator X, I'm sure many people will be, like myself, delighted at the news that they have decided to release their last 2 models for Flight Simulator 2004. [Carenado's announcement reads:] 'After many emails from customers demanding us to make the C152II compatible with FS2004, we finally decided to go ahead and make that product compatible with FS2004. The product will be ready in the next weeks and will be as a separate package, meaning no upgrades or patches. We are working in order to have it ASAP; this decision also involves our C172 which will be ready early 2009.' This really is fantastic news and, hopefully, only the beginning for FS developers. To be honest, I'm not terribly surprised by their decision. There's still a huge demand for quality add-ons for Flight Simulator 2004, and I believe there will be for a very long time to come. ... It takes a certain amount of courage to admit you're wrong, and my hat goes off to Carenado for making this decision, although the cynic in me can see that Carenado probably saw a lot of money not coming their way if they decided to stick to FSX only." (http://www.flightsimx.co.uk/fs9/power-to-the-people-carenado-comes-back-to-fs2004/)

WHY A CESSNA C152 FOR FLIGHT SIMULATOR?

Having been a PC-pilot for almost 20 years, mostly flying small aircraft, and having long ago purchased and flown extensively Carenado's excellent Cessnas C182 and U206 (released 2005), I was not particularly interested in the C172 (which Carenado would eventually release for FS2004 in January 2009). My reasons:

- I already had the C182 which is after all a powered up variable-propeller upgrade of the C172.
- FS2004's default C172 is a very well designed model, and very good freeware repaints are available
- As early as Oct.2003, FS2004's C172 good-but-not-stellar flying dynamics were brilliantly upgraded as "C172SP RealAir Simulation", a freeware produced for the TAFE fling academy in Melbourne, Australia. This was considered "really realistic" flying by demanding real-aircraft instructors.

The question is: with excellent C172 and C182 models available for FS2004, is the C152 such a different machine to justify the hassle of purchasing the software, installing and learning to fly it in FS2004?

Surely it is. Let us view the matter from a FS-history and also technical perspective. The 1990's versions of Flight Simulator made the C182 the "staple aircraft" among flightsimmers, until the C172 took its place thanks to FS2004. Problem is, even the smaller C172 is not so small: it accommodates 4 persons, is 8.2m long with a 10.9m span and has a typical MTOW (Max. take-off weight) of 2,300lb. For the "real life" general aviation, the quintessential "small Cessnas" have always been the C150 (the first massively-produced trycicle-gear aircraft, of which 23,836 units were built between 1957 and 1977) and its successor the C152 (of which 7,584 units were built between 1977 and 1985). Here we are talking about aircraft significantly smaller than the C172, almost exactly 1 metre shorter both in length and span and, even more significantly, about 2/3rds the engine power and MTOW.

So it is not surprising that, when Carenado released the C152 as an FSX-only product last year, there was a true "uproar of angry FS2004 aficionados", to which Carenado promptly and positively responded. From Carenado's website it is apparent that only a few and really minor details had to be left aside to adapt their C152 model to FS2004. We thus expected from this model the quality of Carenado's C182RG II, enhanced by 3½ years of further experience in development.

Carenado's website reads thus:

C152 II FS2004.

- Four different paints with maximum details and realistic textures
- Includes: Interactive virtual cockpit
- Full moving parts: Ailerons, elevators, rudders, flaps, rolling wheels
- Animated sections such as: doors, pilot's window, glove compartment, sun visor and fresh air control
- FS2004 lights: Navigation lights, beacons, landing lights
- Full dynamic effects (shines over the body and panel, nightlights)
- Dynamic shine and reflections
- Transparent windows
- 3D modelled pilot and cockpit area
- Real Propeller
- Many details as: pitot pressure chamber, antennas, chocks, pitot tube cover
- Realistic textures and original paint design
- Custom panel and gauges
- Realistic light effects on gauges
- Nightlight effects on panel
- Yoke
- Full checklist and reference text about the Flight Dynamics
- Realistic performance based on documents and experimented pilot observations...and our own experience on real flight and MFS
- Similar behaviour compared to the real airplane
- Real weight and balance
- PDF document with information - 1 persons on board
- By CARENADO". (http://www.carenado.com/ecommerce/buscador.php3?id_producto=58)

The product was released last November. Even if not mentioned in Carenado's website, there is a review available from AVSIM, in PDF format, well written by Marlon Carter, though non-technical and succinct (a text-only copy prints in about 1½ pages). Flying performance is dealt with in less than 10 lines; cockpit and panels are not reviewed at all. The review below is meant to be a complete coverage instead.

INSTALLATION

Carenado and other online websites sell the product as a download. This is a 36Mbytes compressed zip file containing an .exe installation program (a true installer executable, not a compressed file). Upon purchase, the buyer is asked an email and is given a matching password. The install program asks for both and checks that they match before proceeding. It then searches for the FS2004 folder and asks the user for approval of the install location. Trying to install the product in a non-FS2004 folder fails with the message "Has to be installed into an FS2004 installation". This may annoy the advanced users who, with many aircraft installed all over the place in FS2004, are keen to verify that this new addition is not spoiling any other already-existing add-on. Fortunately the author has checked the obvious workaround: you should just create an empty folder (best if in the same disk partition), call it in any meaningful way, say \MockFS, then copy into it the root files of \FS2004 and, most importantly, create there the empty subfolders \Aircraft and \Effects (this product does not install anything anywhere else).

Once you have installed the C152II in \MockFS, inspected folders and files created and you are happy, you can just move them over to your real FS2004 installation (this happens in a split second and does not even fragment the hard disk, because the files change folder within the same partition, thus they are not actually moved, only their pointers in the file system are modified). All the gauges used by the C152II are stored in a large C152.CAB file installed in \Aircraft\Carenado C152II\panel. The installation uses 35 Mbytes of disk space: the size of the installer file.

EXTERNAL MODEL

The realism to which Carenado arrived in their previous Cessnas for FS2004 was astonishing, and the quality has been preserved in the C152II (see picture below

A few details are even better, such as the fire extinguisher fully modelled in 3D, the rudder details, the right-elevator trim surface and the chocks and pitot cover (also in 3D) that appear as soon as you shut down the engine and set the parking brakes. But the "main courses" are the front wheel suspension and the main wheel brakes, each part reproduced in incredible detail (see picture below).

The metallic paint colours are a pleasure with their reflections. The textures faithfully reproduce an aircraft with some campaign behind, the metal parts not strictly in line, some realistic dirt showing immediately after the engine. A minor quibble: the body details are identical in the four repaints: it would have been quite simple to produce textures with differences so that some repaints showed a brand new aircraft. Another minor detail was overlooked: the nice upper air intakes, carefully modelled and clickable in both 2D panel and Virtual Cockpit, in SPOT view are seen always closed.

DOORS

In real life, the very first thing you do in order to go and fly and aircraft, is to open the door. As expected, Shift-E opens the pilot door. Also, in this model, Shift-E 2 opens the co-pilot door. [Well, not always: once you have done it a few times, sometimes the "second door" stops moving and its key presses operate the pilot door instead: I have seen this issue before, so it appears to be a FS2004 bug.]

PANEL DESIGN AND SHARPNESS

Unlike other Carenado Cessnas where they put the gauges in countless windows (probably way more than necessary), here the real-life panel is simple enough, allowing Carenado to produce a **2D panel** that is both photographic and almost complete in only one window (see picture below), with a static yoke that you can hide by clicking on its axle, the customary separate GPS and a floating window with the co-pilot gauges: RPM and Ampere, to which I will return below. Also, for some reason, the 2D panel does not include the Magnetic Compass. These are really minor blemishes in an otherwise beautiful piece of work.

The **Virtual Cockpit (VC)** does not look much different (see picture below) from the 2D panel, except for the benefit of the 3D environment—complete with propeller seen through the window—and the expected loss of sharpness in the gauges.

Importantly, in both 2D and VC the individual gauges provided by Carenado have background bitmaps with very high resolutions, guaranteeing sharpness even in the largest of nowadays computer monitors. However, the panel background bitmaps have only 1280x960 pixels, which viewed in the larger resolutions many flightsimmers are using nowadays results in some loss of sharpness. Carenado should have provided a 1600x1200 pixels background: FS2004 adjusts the size as necessary and the only loss would be, in a very slow computer, a split-second when the panel is shown for the first time at the beginning of a flight.

VIRTUAL COCKPIT DETAILS

The decoration is realistic if somehow simple. That said, there are quite a few nice mouse-clickable moving parts:

- movable overhead air intakes (included in the 2D panel as well).
- gloves compartment and sun visors
- if you click on any gauge, a mini-window opens showing the gauge slightly enlarged
- small door windows (clicking on the windows handle)

With most controls being rendered in 3D, incredibly the magnetos switch is a low-quality rotating 2D bitmap: the effect is poor especially when you operate the switch in the VC.

COCKPIT VIEW ISSUES

In the VC the panel is zoomed too close, and the user has to zoom back to see even the main gauges. Luckily this can be fixed by the user.
TIP 1: Edit the aircraft.cfg file: find the line "eyepoint=-2.45,-0.75,1" and replace thus: "eyepoint=-4,-0.75,1".

Surprisingly, in the VC you see the outside scenery's horizon but in the 2D you don't, the view is directed to the sky! In the AVSIM forum a user commented: "I have around 700 hours in 150's and 152's, and the visibility over the real cowling is actually very good - nothing like what the Carenado bird depicts in the 2-D pit, which feels like someone took the seats out.". Of course this is also easy to fix by the user.
TIP 2: Edit panel.cfg. After the line "Window14=RMI" insert the following lines:

```
[VIEWS]
VIEW_FORWARD_WINDOWS=0
VIEW_FORWARD_ZOOM=1.000
VIEW_FORWARD_DIR=7.000, 0.000, 0.000     // 7.0000 is the eye height
```

PANEL ISSUES

A pilot, real or simulated, spends most of the time looking at the instrument panel: this is the most important visual feature of a FS aircraft. Carenado has provided excellent panels in the past, but this one has a long list of issues.

RPM in separate window. The 2D panel wastes valuable "screen real estate" in showing on the left hand side a large static section of the pilot's door. By shifting the whole panel a few centimetres to the left, the missing RPM and Amp gauges would fit without issues to the right of the Radio Stack, without the need of the annoying separate window provided.

No nameplate in 2D. In the Virtual Cockpit, as expected, the ATC-ID changes according to the variation, following the data entered in aircraft.cfg in the "atc_id= ... "line. In the 2D panel instead there is a black hole there: the gauge is missing. [ATCID gauges are available as freeware on the web and can be fitted by any user confident with elementary panel design.]

Primer wrongly labelled. The Primer button reads "PUSH" but actually "pulls".

VOR1 issues. The mouse tooltip reads "Condition Lever"! Also, unlike most other FS2004 gauges, this one does NOT double as an ILS gauge Though admittedly many real-life C152's do not have an ILS, this is certainly bringing realism too far. [The advanced FS user can easily fix this by editing panel.cfg and changing the "C152!vor1" gauge in both 2D and VC.]

Defective Attitude gauge. While testing some basic aerobatics this gauges was found—and checked by slewing—that this important gauge moves only between +10º to -5º and is quite defective even within that limited range, e.g. showing +5% with the aircraft perfectly horizontal.
TIP 3: In panel.cfg edit the line "gauge02=C152!Attitude, 453,454,129,133" using instead the default "Cessna!Attitude" or better, if you have Carenado's C182RG installed, the "CessnaRG!attitude_indicator" gauge.

No Audio controls. They appear to be in their correct place in both the 2D and VC, above and slightly to the right of the Radio stack, but they are just pictures in the background bitmap: there are no FS gauges there so, not surprisingly, nothing happens if you click on them. The only way to toggle the audio Morse beeps is by the usual keyboard commands. [The advanced user will find it relatively easy to add an Audio control gauge to the panel]

Radio on/off switches issue. Two on/off switches are shown within the radios, one in the COM/NAV receiver, another in the ADF one. However, only the upper one is operational, switching both the COM/NAV and the ADF.

Radio numbers not clickable in VC. The radios are very realistic and one would expect that both numbers **and** knobs were clickable: so they are in the 2D panel, but not in the VC where only the numbers are clickable.

Swapped Oil and Fuel Gauges. The rectangular Oil and Fuel double gauge are placed the wrong way around with respect to the real aircraft. A minor issue anyway, and easy to fix because the two FS gauges are identical in size.
TIP 4: Open panel.cfg in Notepad and edit the following lines

```
gauge03=C152!fuel,       716,809,165,41
gauge08=C152!oil_gauges,  450,808,165,41
```

swapping the numerical parameters on the right hand sides.

Rudder Trim issue. The real aircraft has a ground-operated rudder adjustment: this is not pilot-operated and therefore is not really a trim at all. Clearly a rudder trim should not be included in the aircraft model. Carenado however did include it, but failed to include a gauge showing the trim's position. The unfortunate result is that if the pilot inadvertently uses it, the aircraft will show a tendency to bank, and the trim can only be re-centred by trial and error.
TIP 5: Disabling the rudder trim is easy: edit in aircraft.cfg the following lines, substituting zeros for the "ones":

```
aileron_trim_effectiveness  = 1.0       // this is not modelled anyway
rudder_trim_effectiveness   = 1.0
```

Fuel Tanks issue. The real C152's mostly had one tank only, fitted with a fuel cutoff valve. Carenado's C152 II has instead two tanks L/R with 13gl of fuel each, but no valve. In FS2004, if you change to the C152 after flying another aircraft, you may end up drawing fuel from one tank only, and are left with no means to correct the weight imbalance. The usual Fuel Selector gauge should have been included in the panels. This is easy to fix.
TIP 6: To add the default Cessna fuel selector to the 2D panel, simply open panel.cfg in Notepad, then search for the lines

```
//--------------------------------------------------
[Window01]
```

and immediately ABOVE them add the line

```
gauge40=Cessna!Fuel_Selector,  749,366,39
```

to position the new gauge above the Attitude Indicator, or else the line

```
gauge40=Cessna!Fuel_Selector,  1114,719,39
```

to position it below the Radio stack.

Minipanel not provided. The Minipanel of FS2004 is very useful when you need a large external view (e.g. landing in a thunderstorm or simply enjoying a beautiful scenery): it hides your 2D panel showing just a row of essential gauges. The minipanel is very easy to program in the panel.cfg file, where one selects the most important gauges from the main panel and puts them in a meaningful order for that particular aircraft. Carenado, incredibly, has failed to provide a minipanel for this product: therefore, when you ask for one by pressing W, you are shown the default FS2004 minipanel which includes, among other things, an Airspeed gauge going up to 500KTS without any colour arcs.
TIP 7: The advanced flightsimmer with utilities like Panel Studio can easily add a Minipanel Windows to panel.cfg and place there the gauges he/she fancies.

Defective Parking Brake gauge. When set, the knob should show in the back position. Yet, whether you set the park brake on or off, the knob moves back and forth again! This glaring error is Carenado's XML code, which reacts to the mouse click but not to the FS status variable.
TIP 8: For the VC there is no user solution because the gauge is not separate but instead embedded in the panel. Things are better for the 2D where the advanced flightsimmer can resolve the issue in a few minutes, producing a new gauge based on Carenado's bitmaps. You need to find out a working Parking Brake gauge in .XML format (compressed into a .CAB file): they come included in some FS add-on aircraft. You also need a CAB compressing utility. You should first copy into an empty folder the files parkingon.bmp and parkingoff.bmp from C152.CAB, then copy your Parking Brake gauge XML file there as well, rename it say Park_brake_C152.xml, open it in Notepad, substitute in the XML text the file names for the on and off images with "parkingoff.bmp" and "parking.on.bmp" "> (yes, parking off for ON and parking on for OFF, as Carenado named them the wrong way around!), replace the line

<Area Left="..." Top="..." Width="..." Height="...">

with <Area Left="5" Top="15" Width="70" Height="70>,

save and close the file, pack the contents of the folder into a Park_brake_addons.CAB file and move it into the \Gauges folder. Finally in panel.cfg edit the line "gauge24=..." replacing the "C152!Parking Brake" with "Park_brake_addons!Park_brake_C152".

LIGHTS SWITCHES

The panels provide titles for 7 light switches, but only five are provided, from right to left:

- LDG: Landing light. (This aircraft does not have a separate Taxi light).

- BCN**:** Beacon light. This does not work at all, due to issues in the effects file installed. Luckily it can be easily fixed.
TIP 9: In aircraft.cfg edit the line

"light.2 = 1, -17.43, 0.00, 4.35, fx_beaconalabeo152" .

Just delete the "alabeo152" and you get the standard effect "fx_beacon" that works fine.

- NAV: provides 3 light bulbs, green, red and white (over the rudder), all nicely modelled as 3D light bulbs thanks to the special effects files installed.

- PITOT HT: no switch here, which is realistic: original C152's were built in significant proportions both with and without it.

- DOME: in the 2D this has no effect. In the VC this switch moves together with the next one below.

- PANEL/RADIO LT (rotary knob): panel light switch.

CHECKLISTS AND DOCUMENTATION

Both a "Carenado C152 Checklist.PDF" and a "Carenado C152 Reference.PDF" are provided. The Checklist is certainly among the best ones seen around, but it is derived from the real aircraft manual, not especially written for this model (this was already criticised in the AVSIM review of the model for FSX, http://www.avsim.com/pages/1108/Carenado/152.htm). The Checklist has plenty of actions that are meaningless in the simulated model or even in Flight Simulator: we read about Seat Belts, Fuel Shutoff Valve (which should be provided but is not) Throttle Friction Lock and many others. Far from delivering a feeling of the real thing, it just causes confusion to the user who searches in vain for non-existing items. Amidst those hundreds of lines with instructions and data, one looks in vain for information on the model's history, and the following important performance parameters are nowhere to be found: Runway takeoff roll, Typical Cruise Altitude and Speed, Fuel consumption rates and Stall speeds. Luckily information about the real aircraft can be found on the web. Here is then some useful information on the real aircraft, found in http://en.wikipedia.org/wiki/Cessna_152 . Some of the values used by Carenado for the simulated model (as opposed to the Checklist which shows real-life specs) are found in aircraft.cfg, in the "performance=..." line. They are shown below between brackets { }. The values we tested in FS2004 are shown between square brackets [ ].

- Material: most of the fuselage is made of an aluminium alloy.
- Engine: Lycoming O-235, with 110 hp or 82 kW at 2,550 RPM.
- Maximum horizontal speed: 110 KTS {106} [98]
- Cruise speed: 107 KTS {90} [83]
- Stall speed with flaps down: 43 KTS
- Range: 414 NM {320} [500]
- Service ceiling: 14,700 ft {14,700} [<10,000]
- Takeoff roll: 725 ft [1,000 ft]
- Rate of climb: 715 ft/min [650]

The above shows how, compared with the real-life aircraft, Carenado's model is clearly underpowered. More on this below.

TAXI, TAKEOFF AND CLIMB

Taxiing is excellent in this model, either with front wheel or with differential toe braking. Takeoff suffers from a tendency of the suspension to oscillate the cabin up and down, significantly more than in a real life situation. The checklist prescribed rotating at 50 KTS to complete a takeoff roll of 725 ft, but with the customary 10º of flaps, 55 KTS were needed and almost 1,000 ft of runway. During climb the model showed more instability than other Cessnas in FS2004 (whether default or Carenado's), certainly not reflecting the real-life 1º wing dihedral: during flight it needed constant aileron correction or else it would progressively bank left or right. This was quite annoying in a model without an Autopilot's Wing Leveller.
TIP 10: Edit aircraft.cfg. Leave unchanged both the line "wing_dihedral line = 1.2" (to which the simulation is insensitive) and the line "roll_stability = 1.1" (changing it would make rolls difficult). Increasing the "yaw_stability = 1.0" to 3.0 resolves the problem.

CRUISE AND PERFORMANCE

Cruising at 5,000 ft, the 26 GL in the fuel tanks provide for a range of about 500 NM, slightly above the specs. Unfortunately there was no way to reach the specified speed performance which, at almost full throttle yielding 2,400 RPM, was a paltry 83 KTS. Full power only increased it up to 90KTS. [We tried lowering significantly the aircraft load, e.g. the fuel in the tanks or omitting the co-pilot, which does not show visually but is there in the FS configuration: either way did not produce the full correction necessary and imbalanced the flying behaviour]. At 7,000 ft full power was needed to obtain 83 KTS, and the absolute ceiling was 10,000 ft. If slewed up to 13,500 ft, fully within the ceiling specs, even with full power and optimal mixture the aircraft slowly lost speed until it stalled at 42 KTS.

Luckily all the above issues—plus realistic takeoff performance—can be simultaneously and accurately resolved by means of a simple modification which does not affect any other flying parameter such as Mixture values or RPM.
TIP 11: Edit aircraft.cfg and change the propeller's "thrust_scalar": instead of the original 0.93, type 1.2. The results now match the specs very accurately: with 10º flaps the bird rotates at 50 KTS with a takeoff roll of 750 ft. Maximum horizontal speed at 2,000 ft is 110 KTS. Cruise speed at 7,000 ft, with throttle for 2,400 RPM, is 90 KTS. The Service ceiling is 14,000 ft. These data were measured in steady horizontal flight with optimal mixture setting, no wind and fuel load between 75% and 50%.

STABILITY, STALL, LANDING AND BRAKING

Though the real C152 was produced in an "Aerobat" version, Carenado's product provides the standard version only: the user should not expect good behaviour in aerobatics, and having a gravity carburettor the engine will quit as soon as the aircraft is upside down. Some users in AVSIM have reported instability in bad weather. Especially after the yaw stability adjustment mentioned in TIP 10, I did not find any more than it would be expected of the real aircraft. It was perfectly possible to land with significant turbulence, gusts and a diagonal wind as high as 24 kts. Stall speed is OK if a bit low, 43 KTS with flaps up, 39 KTS with flaps down.

The landing process is most natural. As for external view of the aircraft, we are already accustomed to the delicate reproduction of nose wheel moving parts in the latest FS2004 models. Here also the main gear struts show their natural flexibility when landing: yet another touch of realism. Unfortunately, as soon as you apply brakes Immediately after touchdown, if you use more than 1/3 of toe brakes, in some runways the cabin oscillates violently back and forth (without any wheel leaving the ground). This behaviour could only happen in real life with very bumpy places or with defective brakes, and is not reproduced by Replay. The solution is to use the toe brakes with care until one gets below 30 KTS of speed.

CONCLUSION

A brilliant product with poor testing. Luckily, virtually all the issues can be resolved by "user tweaking" as shown: every single TIP described above has been tested by the author. The uniqueness of the model and its many attractions certainly make it a recommended addition to the fleets of all lovers of the remarkable simulation of propeller aircraft in FS2004. You will feel, like myself, a great emotion flying this beautiful small aircraft, for decades a mainstay of so many Aero Clubs worldwide.