

Qt



# Voando Alto com Qt

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**SimCORE**



# Atuação profissional / acadêmica

Formado em Ciência da Computação pela  
EEP, Escola de Engenharia de Piracicaba, período 2004 a 2008  
Megatech Sistemas 2001 a 2009.  
Maxibyte Sistemas desde 2010.

Sócio da SkyJet, Treinamento, desenvolvimento e locação de equipamento aeronáutico  
desde 2017.

*Cientes: Edapa Escola de Aviação e Azul Linhas Aéreas.*

Proprietário da SimCORE simuladores de vôo, desde 2007.

*Cientes: Edapa Escola de aviação, Delta 5 simuladores, MacBare Simuladores e outros.*

***Divulgador do Qt.***



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# OBJETIVOS DA PALESTRA

- Como o Qt se tornou a **ferramenta central** para o desenvolvimento de um simulador de voo.
- A aposta e o  **tiro certo** ao se tomar a decisão de usar o Qt em todos os softwares envolvidos.
- Mostrar onde o Qt está sendo executado, e em quais partes.

# O que é um simulador de voo certificado ?

- Estar de acordo e cumprir todos os requisitos da norma AC 61-136 ANAC/FAA ou FAR 60 ANAC/FAA dependendo da categoria e os níveis de realismo.
- Substituir parte das horas de voo em uma aeronave real por simulador, para treinamento em navegação por instrumentos.



**CONHECENDO UM SIMULADOR E SUAS FUNCIONALIDADES.**

# SimCORE Cessna C208 Grand Caravan - AATD



# SimCORE Helibrás AS350-B2



# Delta5 Beechcraft B58 Baron - AATD



# Delta5 Beechcraft B200 King Air - AATD



# Como era o ambiente de desenvolvimento antes do Qt ano < 2012

- Múltiplas IDE's para diferentes propósitos.
- Forte dependência com API's de terceiros ex: FreeType, OpenGL, GLUT.
- Forte dependência com recursos do sistema operacional, ex: WinSocket, USB-HID, Thread.
- Nenhuma interface com o usuário, ambiente de configuração, etc.  
Tudo era feito por arquivos .ini.
- Poucos softwares.

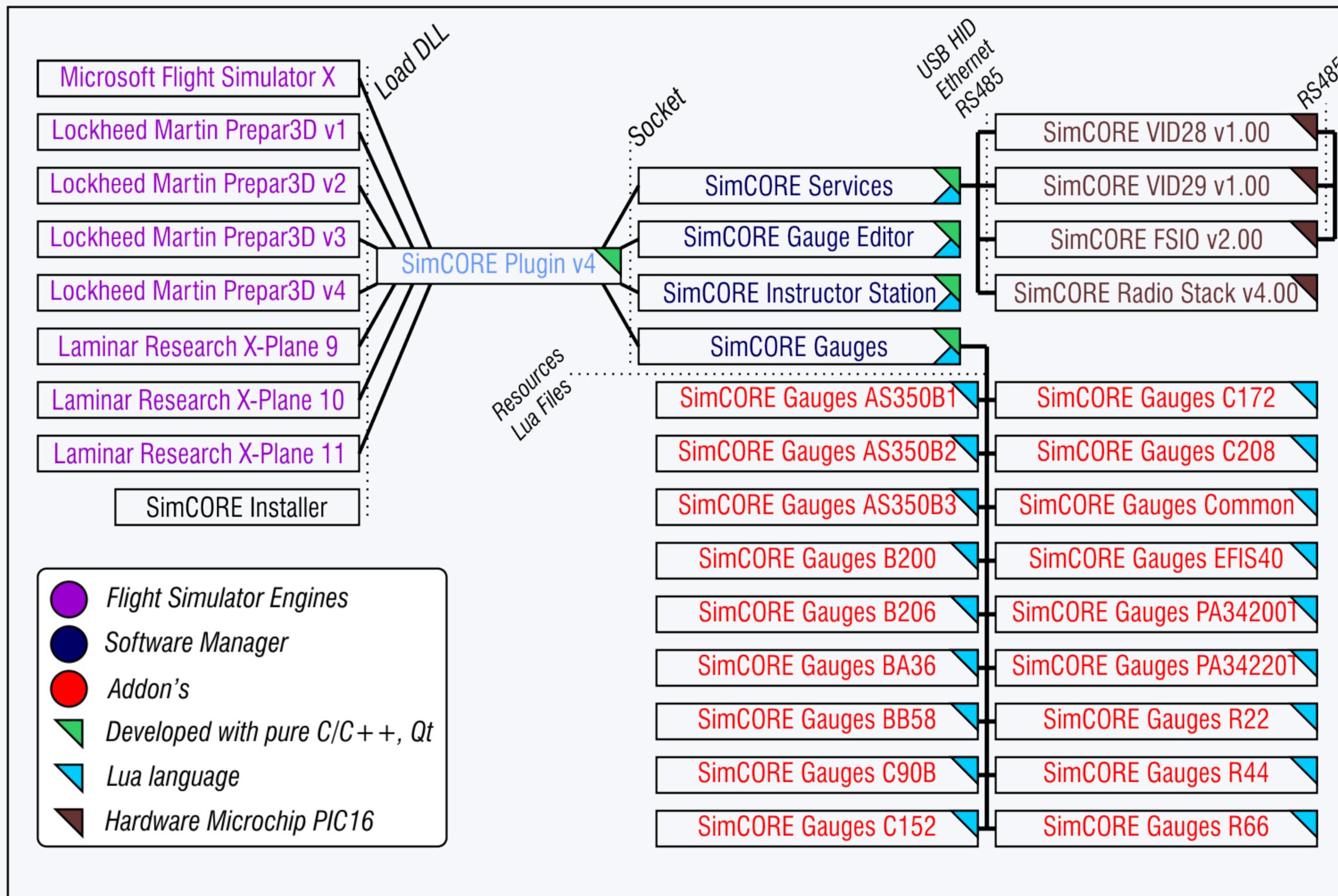
# Transição

- Como conheceu o Qt e apostou nesta ferramenta.
- Primeiros testes com Qt 4.8.5

# Como é com o Qt

- Uma única IDE para todos os produtos e plugins, Qt Creator.
- Homogeneização das classes comuns para todos os projetos.
- Facilidades e praticidade para se trabalhar com o OpenGL via QOpenGLWidget, QOpenGLFunctions, ...
- Facilidades com o uso de QTcpServer, QTcpSocket, QThread, etc.
- Com o uso da API Qt, teve uma redução na proporção de 70% do código em C++ anterior.
- Interface com o usuário para configuração dos painéis, hardware, etc.
- Muitos aplicativos desenvolvidos com alta produtividade.

# Mapa completo de plugins, aplicativos, v4.3.



# Novos recursos

## Lua 5.3.5

- A linguagem LUA passa a fazer parte do projeto, simplificando e deixando mais customizável, instrumentos, e placas de controle.
- Classes em C++/Qt ficam expostas para se programar em LUA.

## Ferramentas criadas

- SimCORE Gauge Engine API
- Editor de instrumentos feito em Qt e programável em LUA.
- SimCORE Hardware API
- Editor de configuração de hardware FSIO/VID feitos em Qt e programável em LUA.

# SimCORE Gauge Editor v4.3

SC SimCORE Gauge Editor v4.3.0.0 - [C:/Users/user/Desktop/Gauge\_R22\_Airspeed.lua]



```
LUA Script Language v5.3.5
font = fonts:getFont("Digital-7 Mono", "-.0123456789", 28, 1, 0)

text01:setFont(font)
text01:setPosX(-128)
text01:setPosY(110)
text01:setPosZ(viewport:getOrderZ())
text01:setText("888.88")
text01:setColor(32, 32, 32, 255)
text01:setFontSpace(22, 12)

text02:setFont(font)
text02:setPosX(-128)
text02:setPosY(110)
text02:setPosZ(viewport:getOrderZ())
text02:setColor(255, 255, 0, 255)
text02:setFontSpace(22, 12)

end

function draw()
    value = smooth:exec( ( main:getValue() * weight:getValue() ) * 8 )

    square01:draw()

    square02:setAngleZ(-proportional:calc(value));
    square02:draw()

    text01:draw()

    text = string.format("%7.2f", value)
    text02:setText(text)
    text02:draw()
end
```

Row: 28, Col: 24

Messages:

OK! Valid Script.

Executed at: 06/11/2018 00:13:05.098

terça-feira 06 novembro, 2018 - 00:28:39 v4.3.0.0 FPS: 60 Disconnected -- NONE --

# PRODUTOS

# SimCORE Service v4.3

Item	Tag	Address	Rx/Tx	Fail	I/O	Active	State
SimCORE							
Services							
Devices							
Network TCP at 5801		0.0.0.0:5801					
FSIO v2.00 #0	A36 / BB58	192.168.0.56:1073	40		133349	0, 00:01:17	Normal
Vid29 v1.00 #0	Fuel Left/Right	RS485 Addr: 11	0		122	0, 00:01:16	Normal
Vid28 v1.00 #1	Pressure Cabin	RS485 Addr: 12	0		126	0, 00:01:16	Normal
Network UDP at 5802		0.0.0.0:5802					
Serial RS232/RS485							
USB HID							
Applications							
Client(s)							
Plugin TCP Client	Trying connect . . .	127.0.0.1:6801					Wait
Server(s)							
Network TCP at 7801		0.0.0.0:8801					
Network UDP at 7802		0.0.0.0:9802					

terça-feira 06 novembro, 2018 - 00:35:35 v4.3.0.0 -- ENGINE SIMULATION UNDEFINED --

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 application window. The main area shows a configuration table for 16 channels, with tabs for Analog, Input, Encoder, and Output. The table has columns for Read, Write, and Variable Name. The Read and Write columns contain the value 0,000. The Variable Name column is empty. The table is numbered 1 to 16. At the bottom, there are three tabs: 1. Config, 2. Edit, and 3. Info.

SimCORE Service v4.3.0.0  
File Tools Help

FSIO v2.00  
UID: e89a8e29449f | Firmware: 2018-10-13 | Serial: 01-02-00003

Analog Input Encoder Output

	Read	Write	Variable Name	
1	0,000	0,000		↑↑
2	0,000	0,000		↑↑
3	0,000	0,000		↑↑
4	0,000	0,000		↑↑
5	0,000	0,000		↑↑
6	0,000	0,000		↑↑
7	0,000	0,000		↑↑
8	0,000	0,000		↑↑
9	0,000	0,000		↑↑
10	0,000	0,000		↑↑
11	0,000	0,000		↑↑
12	0,000	0,000		↑↑
13	0,000	0,000		↑↑
14	0,000	0,000		↑↑
15	0,000	0,000		↑↑
16	0,000	0,000		↑↑

1. Config 2. Edit 3. Info

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 application window. The main window shows the configuration for an FSIO v2.00 device with the following details: UID: e89a8e29449f, Firmware: 2018-10-13, and Serial: 01-02-00003. The interface is divided into several sections:

- Tree:** A sidebar on the left showing a hierarchical tree view of the device configuration.
- Analogs:** A vertical list of 16 channels, numbered 1 to 16, with a blue highlight on channel 2.
- Input/Encoder/Output:** A central area with tabs for 'Input', 'Encoder', and 'Output'. The 'Input' tab is active, showing a grid of 13 input channels (Inp-01 to Inp-13) and a 'CONFIG' section. Each channel has a red indicator light, a yellow input field, and a control knob.
- Bottom Bar:** A navigation bar with three buttons: '1. Config', '2. Edit', and '3. Info'.

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 application interface. It features a menu bar with 'File', 'Tools', and 'Help'. The main workspace is filled with overlapping windows for configuring FSIO v2.00 hardware modules. The top-most window shows the configuration for 'Inp-01' through 'Inp-13'. Each input channel (e.g., Inp-01) is configured with a 4-bit input (0-3) and a 4-bit output (1,2-5,6-7,8). The configuration is organized into a grid of input channels. A sidebar on the left shows a tree view of the hardware components. The bottom of the window has a navigation bar with '1. Config', '2. Edit', and '3. Info' tabs.

SimCORE Service v4.3.0.0

File Tools Help

SC FSIO v2.00

Tree

UID: e89a8e29449f | Firmware: 2018-10-13 | Serial: 01-02-00003

Analog

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

terça-fe

1. Con

1. Config

1. Config 2. Edit 3. Info

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 interface, which is a multi-window application. The main window, titled "FSIO v2.00", shows a configuration screen for an 8-bit output device. The interface is organized into several sections:

- Menu Bar:** File, Tools, Help.
- Tree View:** Located on the left, showing a hierarchical structure of the device configuration.
- Device Information:** At the top of the main window, displaying "UUID: e89a8e29449f | Firmware: 2018-10-13 | Serial: 01-02-00003".
- Configuration Grid:** The central area is divided into eight output sections, labeled "Out-01" through "Out-08". Each section contains eight rows, representing bits 1 through 8. Each bit has a red indicator light and a control element (likely a switch or button).
- Functions Section:** Located at the bottom right, containing two buttons: "Turn ON ALL" and "Turn OFF ALL".
- Status Bar:** At the bottom, showing three tabs: "1. Config", "2. Edit", and "3. Info".

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 interface, which is a multi-windowed application. The main window, titled "SimCORE Service v4.3.0.0", contains a menu bar (File, Tools, Help) and a tree view on the left. Overlaid on this are several windows for configuring and running code on different devices.

The background window shows a configuration panel for "FSIO v2.00" (UUID: e89a8e29449f, Firmware: 2018-10-13, Serial: 01-02-00003). It features a "Tree" view on the left and a central panel with tabs for "Analog", "Input", "Encoder", and "Output". The "Analog" tab is active, showing a list of 16 channels (Inp-01 to Inp-11) with red indicator lights and numerical values (mostly 0).

In the foreground, a window titled "Vid28 v1.00" (UUID: ef7c59d71180, Firmware: 2018-06-26, Serial: 01-03-00012) is open. It has a similar layout but is currently displaying a "LUA Script Language v5.3.5" editor. The editor contains the following Lua code:

```
parameters = {  
  aircraft = "B200",  
  tag = "Pressure Cabin",  
  enabled = true,  
  delay = 500  
}  
  
local prop_inn = MathProportional()  
local var_inn = VarNode("uni.generic.avionics.pressure_cabin.altitude.feet")  
  
local prop_out = MathProportional()  
local var_out = VarNode("uni.generic.avionics.pressure_cabin.diff_press.psi")  
  
function vid28_init()  
  prop_inn:append( 0, 0)  
  prop_inn:append( 5000, 173)  
  prop_inn:append( 10000, 336)  
  prop_inn:append( 15000, 469)  
end
```

Below the editor is a "Messages" section showing a green confirmation message: "OK! Valid Script." and the execution time: "Executed at: 06/11/2018 00:35:08.506". To the right of the editor are control panels for "Inner" and "Outer" variables, each with "Value read" and "Value write" fields. The "Value read" fields show "0,000" and the "Value write" fields show "0". At the bottom right of this window is a "Turn OFF ALL" button.

# SimCORE Service v4.3

The screenshot displays the SimCORE Service v4.3.0.0 interface with several overlapping windows. The main window shows a configuration tree on the left and a central panel for editing a component. The component being edited is 'Vid28 v1.00' (UUID: ef7c59d71180), which is part of an 'FSIO v2.00' (UUID: e89a8e29449f) system. The configuration panel for 'Vid28 v1.00' includes input and output channels (Inp-01 to Inp-11, Out-01 to Out-07) with associated status indicators and numerical values. A 'LUA Script Language v5.3.5' editor is open, showing the following code:

```
parameters = {  
  aircraft = "B200",  
  tag = "Pressure Cabin",  
  enabled = true,  
  delay = 500  
}  
  
local prop_inn = MathProportional()  
local var_inn = VarNode()  
  
local prop_out = MathProportional()  
local var_out = VarNode()  
  
function vid28_init()  
  prop_inn:append( 500)  
  prop_inn:append( 1000)  
  prop_inn:append( 1500)  
end  
  
function vid28_exec()  
  if ( idx:getValue() == 0 ) then
```

The editor also shows a 'Messages' section with the text: 'OK! Valid Script. Executed at: 06/11/2018'. Below the editor, there are tabs for '1. Config', '2. Edit', and '3. Info'. Another window in the foreground shows the configuration for 'Vid29 v1.00' (UUID: a6110a82e15e), which also has a 'LUA Script Language v5.3.5' editor. The code for 'Vid29 v1.00' is:

```
parameters = {  
  aircraft = "B200",  
  tag = "Fuel Left",  
  enabled = true,  
  delay = 500  
}  
  
local prop = MathProportional()  
local idx = VarNode("uni.fuel.view1.select")  
local weight = VarNode("uni.fuel.weight_per_gallon.lbs")  
local aux = VarNode("uni.fuel.tank.left_aux.quantity.gallons")  
local main = VarNode("uni.fuel.tank.left_main.quantity.gallons")  
  
function vid29_init()  
  prop:append( 0, 0)  
  prop:append( 200, 114)  
  prop:append( 400, 224)  
  prop:append( 600, 329)  
  prop:append( 800, 436)  
  prop:append( 1000, 536)  
  prop:append( 1200, 646)  
  prop:append( 1400, 751)  
end  
  
function vid29_exec()  
  if ( idx:getValue() == 0 ) then
```

The 'Vid29 v1.00' window also has a 'Messages' section and tabs for '1. Config', '2. Edit', and '3. Info'. A 'Common' panel on the right side of the 'Vid29 v1.00' window shows a 'Value read' field with the value '0,000' and a 'Value write' field with the value '0'. The 'Manual' checkbox is unchecked. The status bar at the bottom right of the 'Vid29 v1.00' window indicates 'Row: 1, Col: 1'.

# SimCORE Instructor Station

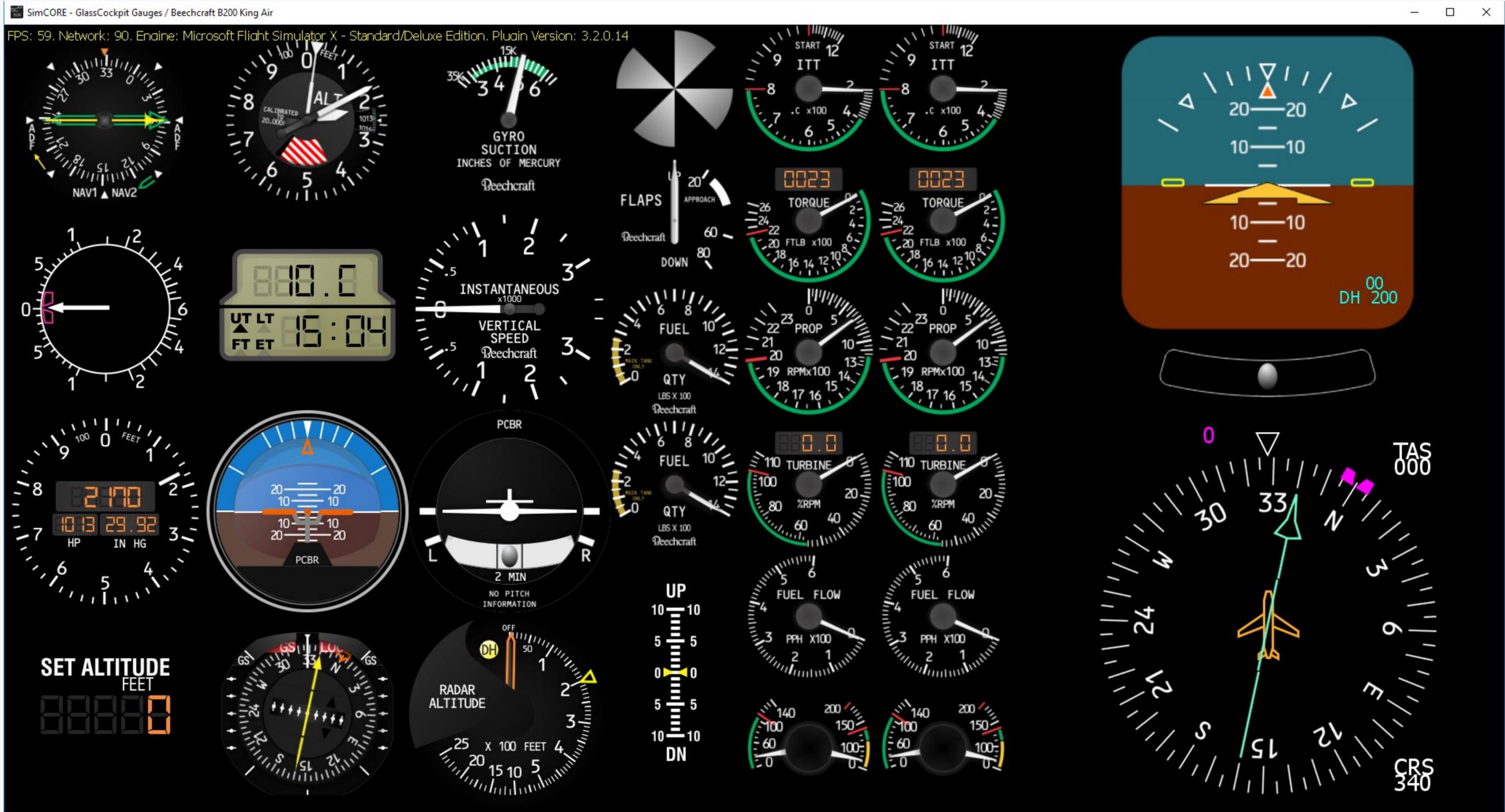
The screenshot displays the SimCORE Instructor Station interface, which is a software tool for managing a flight simulator. The main window is titled "SimCORE Instructor Station v.3.2.0.14" and shows a radar display with various flight parameters and navigation data. The interface is divided into several sections:

- Top Bar:** Contains tabs for "Radar", "Approach", and "FDR".
- Left Panel:** A vertical menu with buttons for "Main", "Airport", "Environment", "Simulation Options", "Failures", "Payload", and "Options".
- Right Panel:** A vertical menu with buttons for "Pause", "Freeze", "Maintenance", and "Exit".
- Simulation Options Panel (Left):** A list of checkboxes for various simulation features:
  - Airway Lower
  - Airway Upper
  - Elevation
  - Fix
  - Glideslope
  - Localizer
  - Map
  - Marker Beacon
  - NDB
  - Runway
  - Tracker
  - VOR
- Altitude and Heading Controls:** Sliders for "Altitude: 2173" and "Heading: 328".
- Flight Parameters:** "IAS: 0", "Pitch: 0", and "Bank: 0".
- Buttons:** "On Ground", "Auto Center Aircraft", and "Reset Tracker".
- Bottom Bar:** Displays the current time and date: "12:47:19 AM - 06/11/2018" and the simulator version: "Simulator: Microsoft Flight Simulator X - Standard/Deluxe Edition | FPS: 29.9".

The radar display shows a central aircraft with a heading of 328.1 degrees and an altitude of 2173.4 feet. The display includes various navigation aids, waypoints, and flight paths. The top right corner shows "FPS: 58 Zoom: 512".



# SimCORE Gauges for Beechcraft B200 King Air



# DEMONSTRAÇÃO

# CONCLUSÃO

Muito obrigado a todos presentes, e equipe QtConBR 2018

Seção de perguntas.

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