



VOLTES FLY

User Manual

Group 3

Hector Bermudez
Joe Paolini
Manuel Arredondo

Introduction

Voltes Fly is a low cost vestibular cueing flight simulator which allows the user to take part in a virtual world where they become pilots of a Cessna 172 and other smaller aircraft. This project have been developed at the University of Central Florida by three members; Hector Bermudez, Joe Paolini and Manuel Arredondo. Throughout two semesters these members researched, designed, prototyped, and implemented a fully functional fly simulator. This user manual includes a brief hardware description, system setup instructions, software execution, and parts replacement.

Hardware Description

The Printed Circuit Board was designed with the purpose of having an easy access to all components; in the event that any of them needed to be replaced, it could be done easily and quickly. Figure 1 shows the final prototype of the PCB.

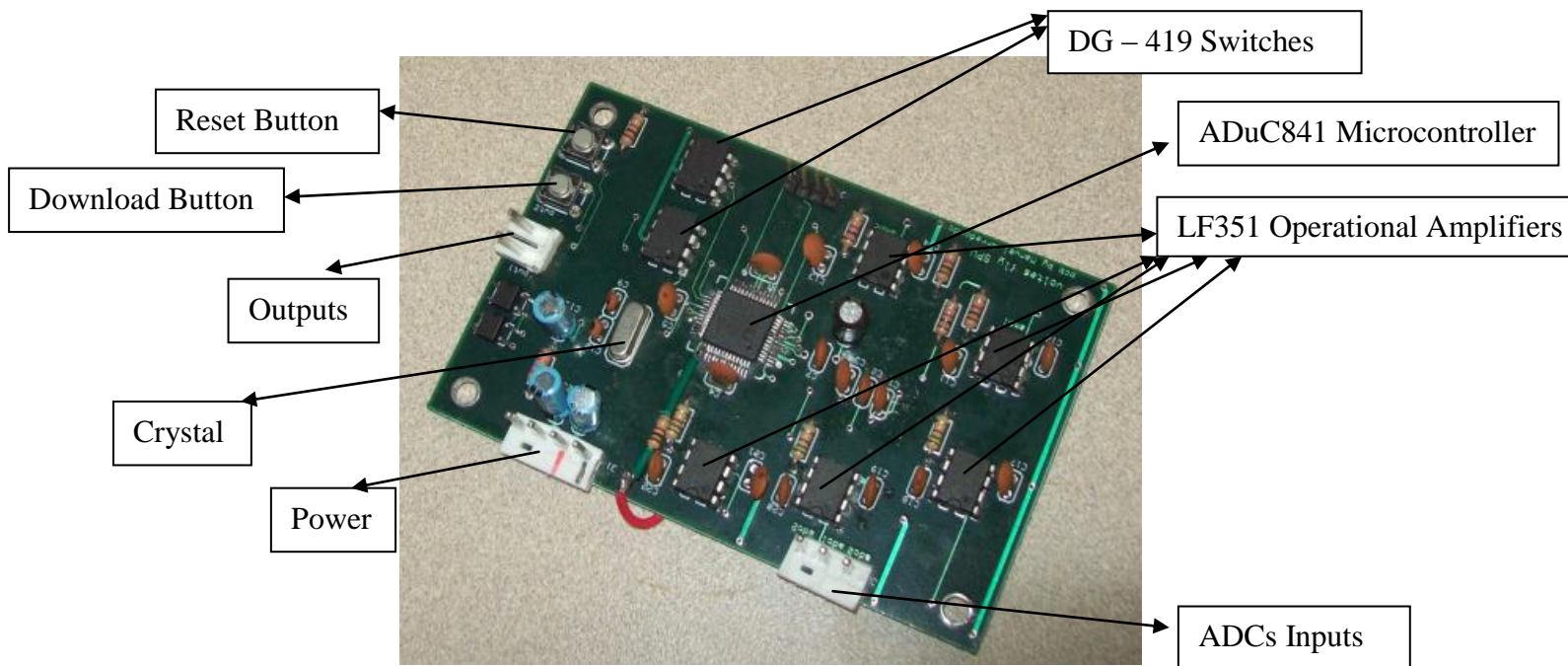


Figure 1 Printed Circuit Board Main Components Layout

Table 1 shows a detailed list of all the components needed to build the PCB and their values.

Hardware Component	Value
C1 – C7, C11 - C14, C17 – C22	.1uF
C8	.47uF
C9, C10	20pF
C15, C16, C23	10uF
Cristal	11 Mhz
2 Diodes	-
R1 – R5, R10	1K
R6	1.6 K
R7 – R9	1.5 K
U1	ADUC841
U2 – U5, U8	LF351

Table 1. Parts List

It is important to mention the fact that the 2 DOF Motion Base was provided by **Servos & Simulation Inc[1]**, a company located in Orlando, Florida. Therefore, if someone wants to reproduce this project, a platform like this should be acquired a priori.

Recommended minimum hardware requirements to RUN the IOS:

- **Windows XP or higher.**
- **AMD Athlon 64x2 running at 2.51GHz or equivalent.**
- **Nvidia Geforce 6150SE nForce430 graphics card.**
- **2 GB of RAM.**

Parts Replacement

If any parts stop functioning, replacements can be ordered not only from any electronic local stores but also online. The mounting of all parts requires a bit of soldering, and might be difficult for a novice welder, specifically if especially if the part that needs to be replaced is the microprocessor.

If the board goes bad, a new board would have to be milled, as it was custom made during out project and cannot be purchased from a vendor. The CAD files are available in our documentation and website.

System Setup Instructions & Software Execution

<u>Step</u>	<u>Instruction</u>
1.	Attach power to Printed Circuit Board.
2.	Attach Serial RS232 cable from Flight Computer to Printed Circuit Board.
3.	Run IOS. See Figure 2.
4.	Turn on Flight Computer. Figure 3 – Start Flight Computer Button.
5.	Turn On Instrument Computer. Figure 3 – Start Instrument Computer Button.
6.	Remotely execute XPlane. See Figure 3 – Start XPlane Button.
7.	Verify that every sub system is properly functioning under the Health Tab. See Figure 3.
8.	Set flight parameters on XPlane.
9.	Run Motor Test. Figure 3 – Run Motor Test Button.
10.	Start simulation. See Figure 3 – Start Button.
11.	Verify that the simulation is running properly by checking every parameter under the Flight Parameters Tab. See Figure 4.



Figure 2. Loading IOS

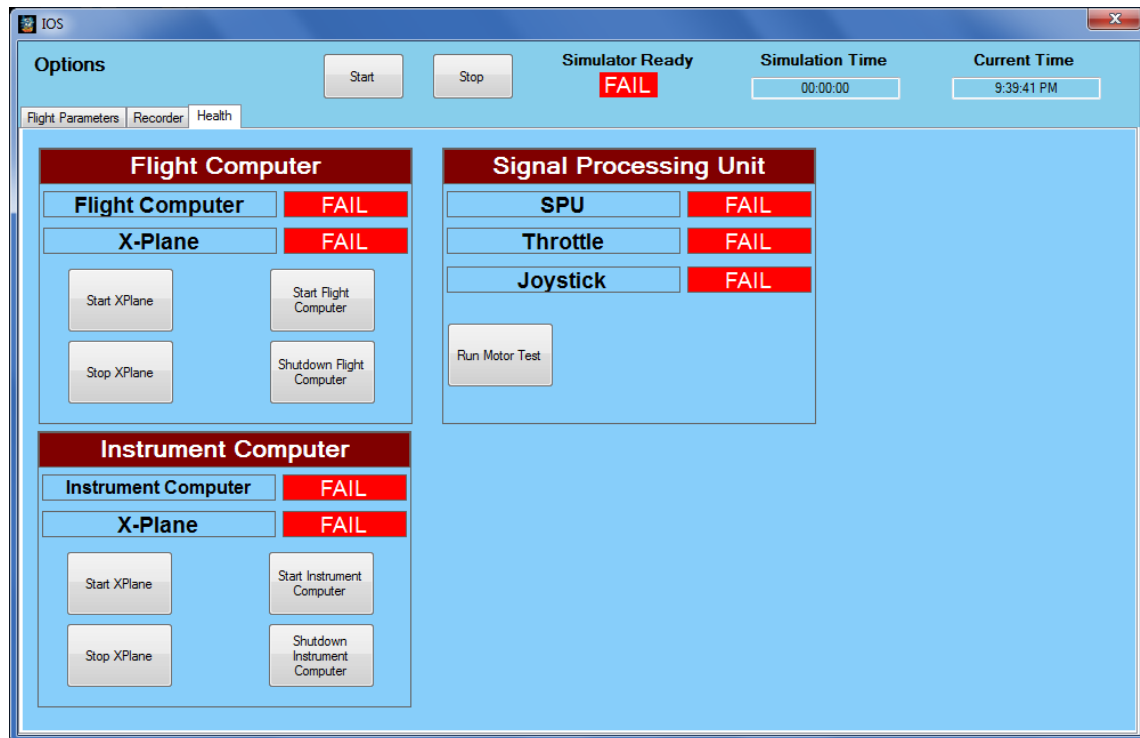


Figure 3 IOS's Health Tab

Note: Once the IOS finishes loading and the operator confirm that every subsystem is up and running, the operator can access the Flight Parameter Tab in order to check if the simulation is running properly. The Heartbeat parameter is very important since is an indicator that the communication between the IOS and the SPU is flowing properly.

If the operator wishes to record some of the flight variables, the only thing that he should do is open the "Recorder Tab" and make click on the "Start Button". The data may be seen once the operator make a click on the "Stop" button and then click on either "View Results" or the "View Plot" button (See Figure 5).

IOS

Options

Start

Stop

Simulator Ready

Simulation Time

Current Time

FAIL

00:00:00

9:37:58 PM

Flight Parameters

Recorder

Health

Pitch	0.0000	deg	Engine RPM	0.0000	degrees
Roll	0.0000	deg	True Speed	0.0000	kts.
True Heading	0.0000	deg	Heartbeat	0	
Mag Heading	0.0000	deg	Joystick Status	0	
Comp Mag Heading	0.0000	deg	Throttle Status	0	
Elevator	0.0000	deg	Throttle Pot. Pos.	0	
Aileran	0.0000	deg	Joy Pot. Pos. X	0	
Throttle Position	0.0000	part	Joy Pot. Pos. Y	0	
Cmd Throttle Pos	0.0000	part	Motor 1	-4095	
Qdot	0.0000	rad/s	Motor 2	-4095	
Pdot	0.0000	rad/s			
Lat.	0.0000	degrees			
Long.	0.0000	degrees			
Altitude	0	ft.			

Figure 4 IOS's Flight Parameters Tab

IOS

Options

Start

Stop

Simulator Ready

Simulation Time

Current Time

FAIL

00:00:00

9:39:05 PM

Flight Parameters

Recorder

Health

AboveGroundLevel
AileranPosition
Altitude
BaseMSL
ClosestAirportTemperature
CommandedPitch
CommandedRoll
CommandedThrottlePosistion
ComputedHeading
ControlLoaderHeartbeat
DebugInt1
DebugInt2
ElevatorPosition
EngineRPM
FlightComputerStatus
HighAltitudeWindDirection
HighAltitudeWindLayer
HighAltitudeWindSheer
HighAltitudeWindSheerDirection
HighAltitudeWindSpeed
HighAltitudeWindTurbulence
JoystickPotPositionX

Flight Recording

Start

Save

RECORDING OFF

Flight Test Results

View Plot

View Results

11262011101527
11272011102858
11282011152644
11282011152921
11282011152932
11282011153223
11282011153342
11282011153642

Figure 5 IOS's Recorder Tab