FY-41AP Lite AutoPilot & OSD System

Installation & Operation Manual

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Dear Customer :

Thank you for choosing FY-41AP Lite as your autopilot system. Please read this manual carefully to ensure correct installation & operation.

User Agreement

The use of FY-41AP Lite is prohibited for any illegal intentions and purposes. The user will be fully responsible for the use of this product and FY-Tech will not be held liable it's misuse either in its original or altered state by the customer (including the direct, indirect, or third party losses caused by a faulty plane or plane crash).

Please read this manual carefully before using this product. If you have any questions, do freely contact us and we will attempt to provide you with a satisfactory clarification and/or resolution should it be required. The products' functions maybe changed only by firmware upgrades which is available from our website from time-to-time. Please do check our website for available firmware upgrades. The company reserves the right to alter the contents of the product firmware.

This agreement takes immediate effect upon the purchase of the product.

Attention

● The installation and use of this device require some skill and knowledge in flying remote controlled aircraft.

● If you are a complete beginner & have never flown one before, we do not recommend you install this device on your own. Please find an experienced RC pilot who may provide you with the basic knowledge required to use this device successfully.

● If you are already an experienced flyer, you will find the FY-41AP Lite installation to be easy & logical. Follow this manual & you won't go wrong.

● If you need further technical support, contact us at: **service@feiyu-tech.com**

1. FY-41AP Lite AutoPilot System Introduction

FY-41AP Lite Module

FY-41AP Lite is an inertial attitude measurement instrument used for FPV flight on fixed-wing aircrafts. It has an integrated OSD video overlay system that presents critical flight information such as power management, airspeed, altitude, and flight direction via its sensors and GPS module, allowing for a clear visual flight while ensuring key information is within sight.

The new FY-41AP Lite with its enhanced altitude control and GPS module, can now realize improved pinpoint inertial navigation and automatic piloting.

Flight stabilization is achieved via an integrated 3 axis gyro, 3 axis accelerometer, and a barometric pressure sensor. This enables the module to accurately measure flight attitude, earth azimuth & relative altitude to achieve:

- Extremely stable conventional flight pattern
- Stabilized 3D flight
- Automatically return to home (RTL)
- Fixed altitude flight
- Heading lock flight
- Auto circling over a fixed GPS location.

GPS Module

GPS module enables the FY-41AP Lite to calculate the flight course & sense the exact location of the aircraft. GPS data allows aircraft return to home (RTL), auto circle, and control straight line navigation.

Airspeed Module

The FY-41AP Lite can be connect to the airspeed sensor (When don't connect the airspeed sensor, the FY-41AP Lite also can work normally).The airspeed sensor can measure the airspeed of the aircraft. Compared to the GPS speed the airspeed have the characteristics which is small delay and small affected by the wind. This characteristics can achieve the effective control of the throttle, improve the efficiency of flight and flight safety

OSD System

FY-41AP Lite has integrated OSD hardware with optimizing display interface. Critical flight parameters are displayed like altitude, speed, direction, flying voltage and amp draw, and most display parameter outlay can be changed via RC control.

Power Manager Module

FY-41AP Lite can connect power manager module which is integrated with current sensor module and Voltage-Regulating module. Current Sensor is used to check voltage, Amp draw. The integrated Voltage-Regulating module provides stable +12V to FPV video camera and video transmitter.

Altitude Control

Altitude control is achieved using a high sensitivity barometric sensor which measures relative height. Altitude is fixed via elevator servo control and throttle management.

Heading Control

Under the condition of without GPS module, heading control is achieved by the inertial device. Both the aileron & rudder servo is used to control flight heading. But it will t influence of wind deviation from the original route.

Under the condition of connect to the GPS module, GPS data is used to automatically correct heading even in windy conditions.

Speed Control

Under the condition of without airspeed sensor but connect to the GPS module, GPS module provide the speed and altitude information for the throttle control to achieve the control of the speed.

When connect to the airspeed sensor, the airspeed information will available and use for controlling the throttle, and the speed control is more reliable and accurate.

2. Function Introduction

2.1 FY-41AP Lite Single Module Function

Note: **Not use the GPS module**

● **Activated Mode**   In this mode, the FY-41AP Lite auto stabilization is turned off. The aircraft is completely under pilot control.

● **Stabilized Mode**   Level flight is automatically maintained, making flight simple, especially for beginners. If a pilot feels the plane is out of control, simply reduce input control and the plane will automatically recover level flight.

● **3D Mode**   If no input is given by the pilot (all sticks in the middle position), 3D mode will lock the current aircraft attitude. Therefore the aircraft can be easily maneuvered to complete a variety of 3D flight with added stability & smoothness.

● **Fixed altitude & Heading lock Mode**   This mode maintains aircraft flight course & holds the altitude on activation.The system automatically corrects flight course deviation & maintains straight-line flight.

● **Auto Circling Mode**   On activation, the plane will maintain altitude and flight speed, while initiating a counterclockwise circle, but this is not hovering around a fixed point, is likely to be blown away from the original place of circle.

2.2   FY-41AP Lite With GPS Function

● **Fixed altitude & Heading lock Mode**   This mode maintains aircraft flight course & holds the altitude on activation. By using GPS data, the system automatically corrects flight course deviation & maintains straight-line flight.

● **Auto Return To Launch Mode (RTL)**   Upon activation of this Mode, the aircraft will automatically return to the Home point, maintaining is current altitude. Upon reaching the Home point, it will initiate auto circling.

After the aircraft back to the target point ,if the altitude greater than 100 meters , the aircraft will down to 100 meters while circling. For the FY-41AP Lite , there is 50 meters protection altitude for return home .If the altitude below 50 meters when activate into RTL, the aircraft will climb to 50 meters while return.

● **Auto Circling Mode**   On activation, the plane will maintain altitude and flight speed, while initiating a clockwise circle. The centre of the circle is the point of activation at a default radius of 80 meters (can be changed via FY GCS).

● **GCS software**   By using a field computer and connecting the FY41AP Lite to an FY Data Radio via the UART port, you can set the FY41AP Lite flight parameters, monitor the flight progress & record / reply the flight via the FYGCS software. For more information, please refer to the FY Data Radio manual.

NOTE:

1) In the navigation mode, the remote control lever (AIL ,ELE,THR,RUD) no longer can control the aircraft except **Fixed altitude & Heading lock Mode**.

2) In **Fixed altitude & Heading lock Mode**, operation the throttle lever is invalid, in this mode operation AIL,ELE,RUD lever are effective.

3) In the navigation mode, when the flight altitude below a certain altitude, the flight speed below a certain speed, the throttle will automatically shut down.

2.3 OSD Video Overlay System Function

First Person View (FPV) FY-41AP Lite has an integrated OSD video overlay system that presents critical flight information on the video for easy enjoy FPV, at the same time, Auto stable, Fixed altitude & Heading lock, Auto Return To Home function will make FPV operation more easy.

2.4 FY-41AP Lite Can Be Connected To A Data Link

Connecting to a Data Link can increase flight distance. Additionally, when used with FY-GCS (Ground Control Station) system you can view telemetry data of flight conditions and more effectively, you are able to make changes real-time including change parameter, flight attitude etc

3. FY-41AP Lite Configuration

NO.	Module	Introduction
1	FY-41AP Lite	FY-41AP Lite module Size: 61mm*39mm*14mm Weight: 20g
2	GPS	GPS receiver module Size: 32mm * 32mm * 13.5mm Weight: 24g
3	Power Manager 电源管理器模块	Integrated with Current Sensor and regulate voltage module to provide stable +5V to FY-41AP Lite and provide stable +12V to FPV video camera and transmitter at the same time. Size: 50mm*24mm*18mm Weight: 35g

4	Airspeed Meter 空速计	To measure airspeed Size: 64.5mm * 13.5mm * 13.5mm Weight: 9g
5	USB Data Cable USB线	For FY-41AP Lite firmware upgrade For connect data link to PC For connect remote adapter to PC
6	2*4P Receiver Connecting Wires 2*4P RC接收机配线	For connect FY-41AP Lite to remote receiver
7	Video Connecting Wires 视频连接线	For connect video camera or video transmitter
8	Power Supply T-Head 电源T头	Can weld to power manager module for connect the batter and ESC
9	GPS Extension Cord GPS延长线	GPS extension wire

4. FY-41AP Lite Connection Summary
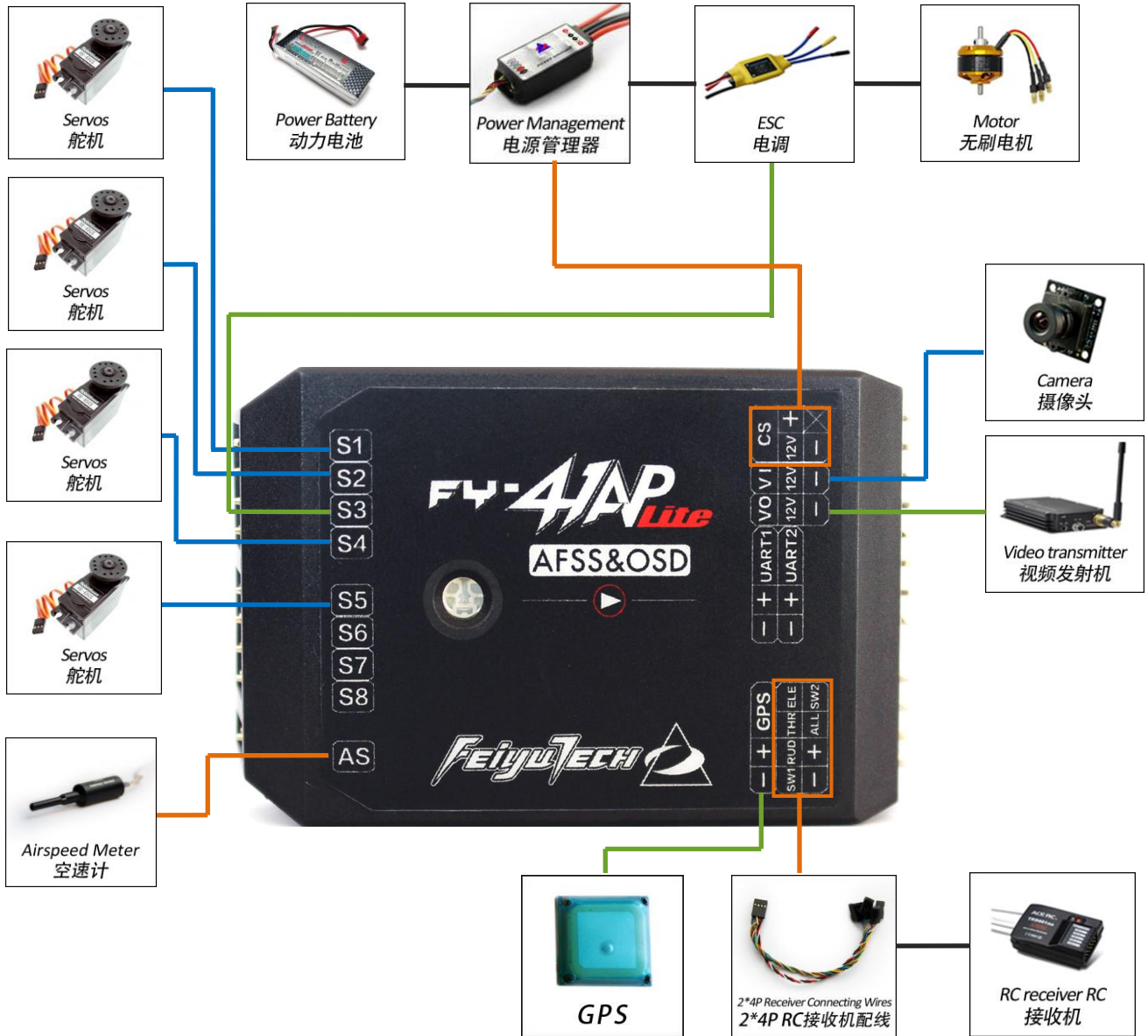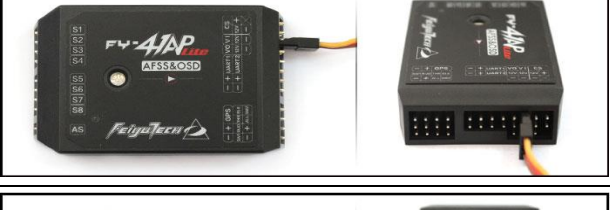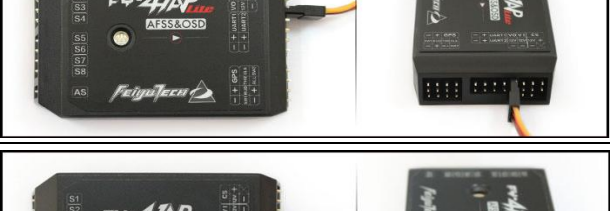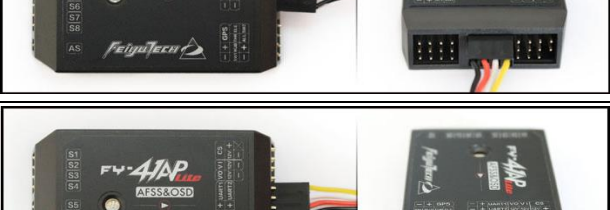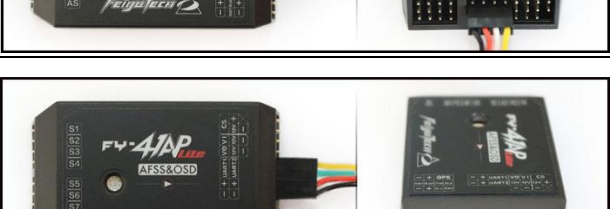
5. S1~S8 Servo Interface Connection Instructions

No.				
Type	**Traditional**	**Flying wing**	**V tail**	**Airship**
S1	Aileron servo 1	Aileron &Elevator mix control servo 1	Aileron servo 1	Not use
S2	Elevator servo	Aileron &Elevator mix control servo 2	Elevator &Rudder mix control servo 1	Elevator servo
S3	Throttle servo/ESC	Throttle servo/ESC	Throttle servo/ESC	Throttle servo/ESC
S4	Rudder servo	Not use	Elevator &Rudder mix control servo 2	Rudder Servo
S5	Aileron servo 2	Not use	Aileron servo 2	Not use
S6	Not use	Not use	Not use	Not use
S7	Not use	Not use	Not use	Not use
S8	Not use	Not use	Not use	Not use

NOTE: When using remote adapter, S7 and S8 output the channel 7 and channel 8 signal of the RC receiver directly.

6. Connection Introduction

Connection Picture	Introduction
	S1～S8 servo wiring connection Pay attention to the signal wiring sequence
	Power manager wiring
	GPS module wiring

	2×4P RC receiver wiring For FY-41AP Lite **Black Red White** —— **AIL** **Orange** —— **ELE** **Green** —— **THR** **Yellow** —— **RUD** **Brown** —— **CH5** **Blue** —— **CH6**
	Airspeed sensor wiring
	Video camera wiring Yellow-video signal Red--+12V Black--GND
	Video transmitter wiring Yellow-video signal Red--+12V Black--GND
	Connect the USB data cable to UART1 port to firmware upgrade for FY-41AP Lite control module
	Connect the USB data cable to UART2 port to firmware upgrade for OSD module
	Data link wire Connect the FY-602 data radio to UART1 port
	Vibration absorbing pads (dampers),use for FY-41AP Lite vibration damping installation.

7.　Main Module Installation

7.1　FY-41AP Lite Module Installation

When installing, please keep FY-41AP Lite horizontal and as close as possible to the "Centre of gravity" (COG) of the aircraft. The modules orientation can be changed by FY-GCS (Ground Control Station) system: arrow to front, back, left or right.

Efficient anti-vibration components are very important and to be used when installing. You can use the included 'vibration absorbing dampers' or your DIY equipment. Please note: For Nitro planes, flying without using efficient 'anti vibration dampers', will lead to FY-41AP Lite working abnormally.

Arrow forward（**Default direction**）

Nose of the plane

Arrow towards to left

Arrow towards to right

Arrow towards to back
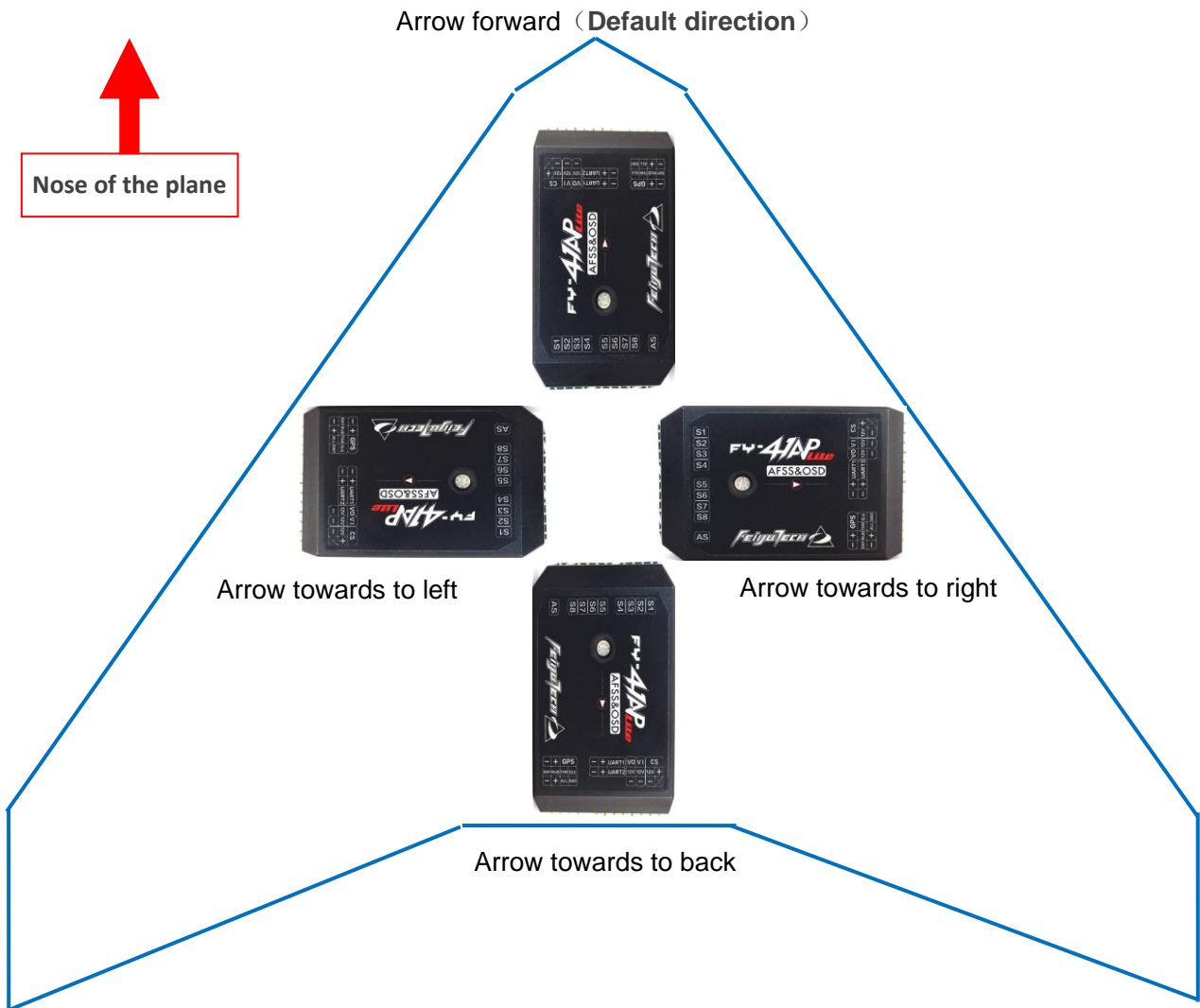
7.2 GPS Module Install

GPS receiver module has integrated plate type GPS passive antenna with stronger reception ability shielding the false signal by ground reflection efficiently. Don't install next to metal or carbon fiber & other shielding material, which may block satellite signal reception. Install the GPS module horizontal and away from electromagnetic sources such as ESC's, power wires, servo wires & video transmitters which can interfere with GPS signal.
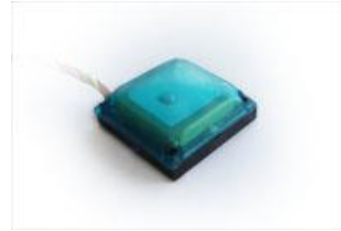
7.3 Power Manager Module Install

Power manager module supports 2S ~ 6S lithium battery input. The integrated current sensor can measure APM draw and voltage; DC-DC module offers 5V to FY-41AP Lite meanwhile 12V to video camera and video transmitter. But servo power is supplied by ESC or S1~S8 any port access.

7.4 Airspeed Sensor Module Install

The airspeed sensor need to pull ahead the front of the pneumatic opening and in the line with the direction of flight, cannot tilt. You can install the Airspeed sensor to the wing or in the front of the nose, do not block the front of the air inlet, we can use the glue to fix the airspeed sensor. But can't completely obturate the end of the airspeed sensor, to maintain pressure connected with the outside world. Note: Make sure that after installation, the fuselage in flight airflow can not interfere with air intakes.

Dynamic Pressure Port

Static Pressure Port
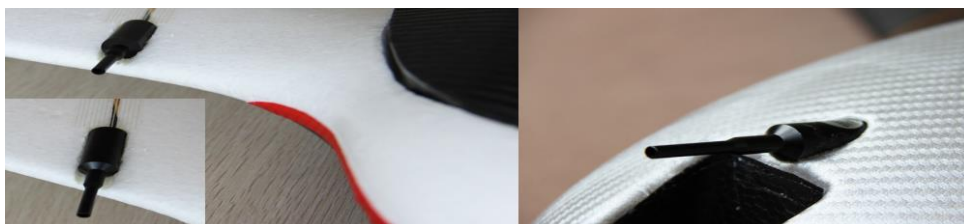
7.5   Remote Control Setting: SW1&SW2

FY-41AP Lite needs remote control and receiver with at least 6 channels, including 4 normal channels for AIL,ELE,THR,RUD, and two for SW1,SW2 to control flying mode.

You need to choose normal fixed wing plane mode canceling all mix control modes, meanwhile setting CH5,CH6 to two three-switch.

FY-41AP Lite need two three-switch to control flying mode:SW1 for deactivated mode, stable mode, 3D mode; SW2 for return to home and fixed attitude and head locking mode (default mode),or circle mode(need reset).
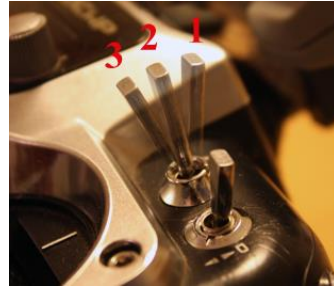
After setting the Switch, you can double check by monitoring the indicator light on the module against selected flying mode. Detail please see the "FY-41AP Lite indicator light instruction".

SW1&SW2 default set:

SW1			SW2		
Deactivated	🔴	▲	RTL	🔵	▲
Stable	🔴🔴	▬	NULL		▬
3D	🔴🔴🔴	▼	ADH	🔵🔵	▼

NOTE: SW-2 has priority over SW-1. Only when **SW-2** is in the 'Null' Mode can **SW-1** work. Therefore 'Null' should be one of the options for **SW-2**, otherwise **SW-1 will not work**.

7.6   Gyroscope Reset

If the following conditions occur, the FY-41AP Lite initialization is recommended:

1.   The device has not been used for a long time.

2.   There is a change in environmental temperature of over 30 degrees since last flight.

3.   The **purple** LED flashes continuously even when the FY-41AP Lite remains stationary and you never activate the motor.(When in the non navigation mode, which means SW2 is on the position "NULL").

Note: For the better flight, we suggest that to do the gyro reset before each flight.

There are three way to realize the gyro reset. (The FY-41AP Lite must keep stationary during the gyro reset procedure)

(1) Through SW1:

On SW1, switch ABM to Deactivated Mode 6 times, time interval has to be less than 3 seconds as follows:

ABM→ Deactivated Mode → ABM → Deactivated Mode → ABM → Deactivated Mode → ABM → Deactivated Mode → ABM → Deactivated Mode → ABM → Deactivated Mode.

After doing this operation, the LED will bright white light about 1S.Wait for the LED go out, then the gyro initialization finish.

(2) Through OSD video overlay menu "INIT GYRO" option.

(3) Through the " FYGCS 5.11 for 41& DOS "setting software "Initialize the gyro" button which in the "Autopilot Configuration Wizard" option.

(Note: Making gyro initialization via the OSD menu and the "**FYGCS 5.11 for 41&DOS** " setting software, won't appear the phenomenon of the LED bright white light.)

7.7 FY-41AP Lite Indicator Light Instruction

FY-41AP Lite with three colors LED which can send out red, blue, green light. Also yellow, white, purple and other colors light through the combination.

Operators can know the FY-41AP Lite's operating mode by judging the different colors which the LED sends out and the flash frequency. Green light flash means GPS location fixed, red and blue light indicate FY-41AP Lite working mode.

| Operating Mode	LED	Gyro Needs Reset or module senses movement	GPS lock (>4 Satellites)
Manual Mode	🔴	🟣	🟢
Stabilized Mode	🔴🔴	🟣🟣	🟢
3D Mode	🔴🔴🔴	🟣🟣🟣	🟢
Return To Launch Mode		🔵	🟢
Fixed Altitude & Heading Lock Flight Mode		🔵🔵	🟢
Auto Circling Mode		🔵🔵🔵🔵	🟢
During Gyro reset		Flash white light for one second	
Too much vibration		Red light Stay on solid	

Note: When the FY-41AP Lite needs Gyro Reset or FY-41AP Lite module is in a state of motion, the LED will bright purple light.

e.g.   Red   Manual Mode, GPS not lock
            Red—Red—Green   Stabilized Mode, GPS lock
            Purple—Purple—Green   Stabilized Mode, GPS lock,
                                                          If it stay static means need Gyro Reset.
            Blue—Blue—Green   Fixed altitude & Heading lock Mode, GPS lock

7.8.   OSD Interface Instruction

The integrated OSD module supports PAL or NTSC form video input.
OSD display interface:
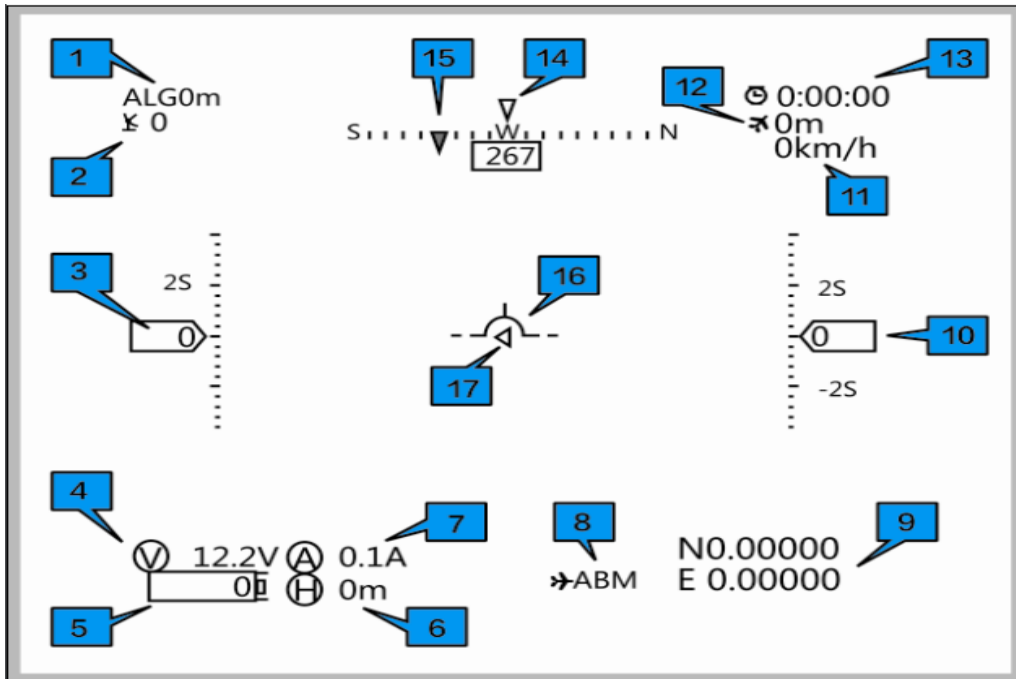
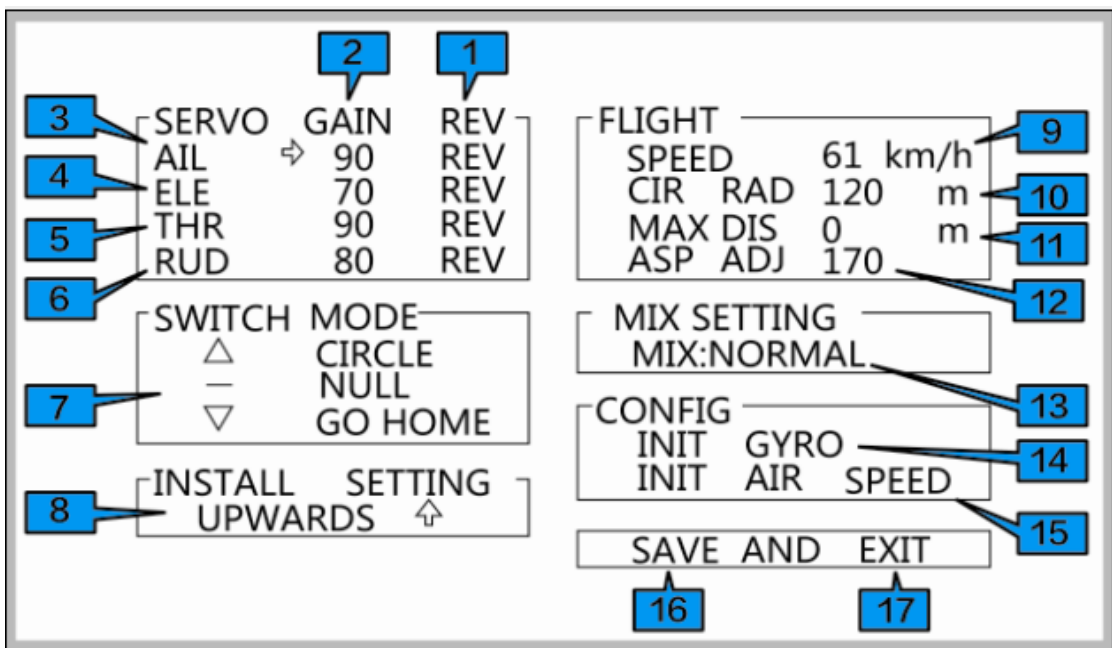| No.	Instruction	No.	Instruction
1	GPS altitude(Unit: m)	10	Relative altitude (Unit: m)
2	The quantity of satellite used for positioning	11	GPS speed (Unit: km/h)
3	Airspeed/GPS speed (Unit: km/h)	12	Flight total mileage (Unit: km)
4	The battery voltage (Unit: V)	13	Total flight time (Format:h:m:s)
5	Battery power consumed (Unit: mA/h)	14	Current course of flight (Unit: deg)
6	Distance to Home Point (Unit: m)	15	The angle of turning to the Home Point (Unit: deg)
7	Power battery current (Unit: A)	16	Attitude table
8	Flight mode	17	Relative position of Home Point (Icon in the middle position when the aircraft is around Home Point.)
9	Current latitude & longitude of the plane (Format: dddmm.mmm)		

Flight mode instruction

Name	Introduction	Name	Introduction
RC	Deactivated mode	RTL	Return to home
3D	3DAerobatic Flight	ADH	Fixed altitude & Heading lock Mode
ABM	Stable mode	ACM	Circle mode

8.　FY-41AP Lite Setting

There are two ways to set the FY-41AP Lite, one is via remote control and OSD overlay menu settings. Another solution is connected via USB cable to the computer by using the setting software to set up. Here we introduce the use of these two methods.

Method one:　Setting FY-41AP Lite via remote control and OSD overlay menu

1）Activate the OSD setup menu: switch "ABM" to the "3D mode" 6 times in SW1, between two switching it has to be less than 3 seconds, the process is as follows:

ABM → 3D mode →ABM →3D mode → ABM → 3D mode → ABM → 3D mode →ABM → 3D mode →ABM→ 3D mode.　This will activate OSD setup menu interface.

2）Move Elevator stick to the project you want to set.

3）Move aileron stick to the project you want to set.

4）Please put elevator stick to SAVE, after your setting. Through the stick of ailerons carried out to save the action, when saving, "SAVE" will flicker for two seconds, the end of the flashing, been saved successfully.

| NO.	Setup instructions	NO.	Setup instructions
1	Auto-control rudder surface reverse	10	Circling radius setting
2	Control gain	11	Farthest flight distance setting
3	Ailerons	12	Airspeed adjust setting
4	Elevator	13	Rudder mixing mode
5	Throttle	14	Initialize gyroscope
6	Rudder	15	Initialize airspeed sensor
7	Three-switch mode selection	16	Save the settings
8	FY-41AP Lite install setting	17	Exit the Settings interface
9	Cruising speed setting		

Method two:

Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software

1) Please visit the official website: www.feiyu-tech.com. Download the newest setting software "FYGCS 5.11 for 41&DOS" and the USB driver at the download page which related to FY–41AP Lite products.

2) After successfully install the USB driver, insert the USB-TTL interface cable into computer USB COM port(don't connect TTL port to any other device) , the system will correctly identify the USB -TTL data cable, then you will find there is more than one port(COM and LPT), the port COM6 in the "Silicon Labs CP210x USB to UART Bridge (COM6)" is the Virtual serial number.

　　Inserter a few times for confirmation the virtual serial number. After that, you can use the new USB data cable normally.
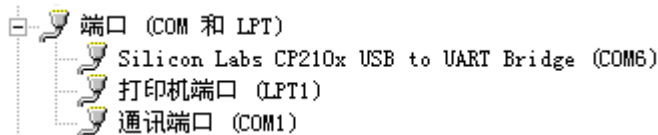
3) Install the software "FYGCS 5.11 for 41&DOS". The software in addition to can use for setting up and configuring FY-41AP Lite also included other functions. For example, Electronic mapping, Telemetry data monitoring of flight parameters, Flight attitude, Flight speed, Altimeter, Location, Recording and Playback of telemetry data into Ground Control Station, Map loading ,etc .

　　a) Double-click " " installed by default.

　　b) After installation, double-click " " to open the FYGCS5.11 software, you can see the following interface.
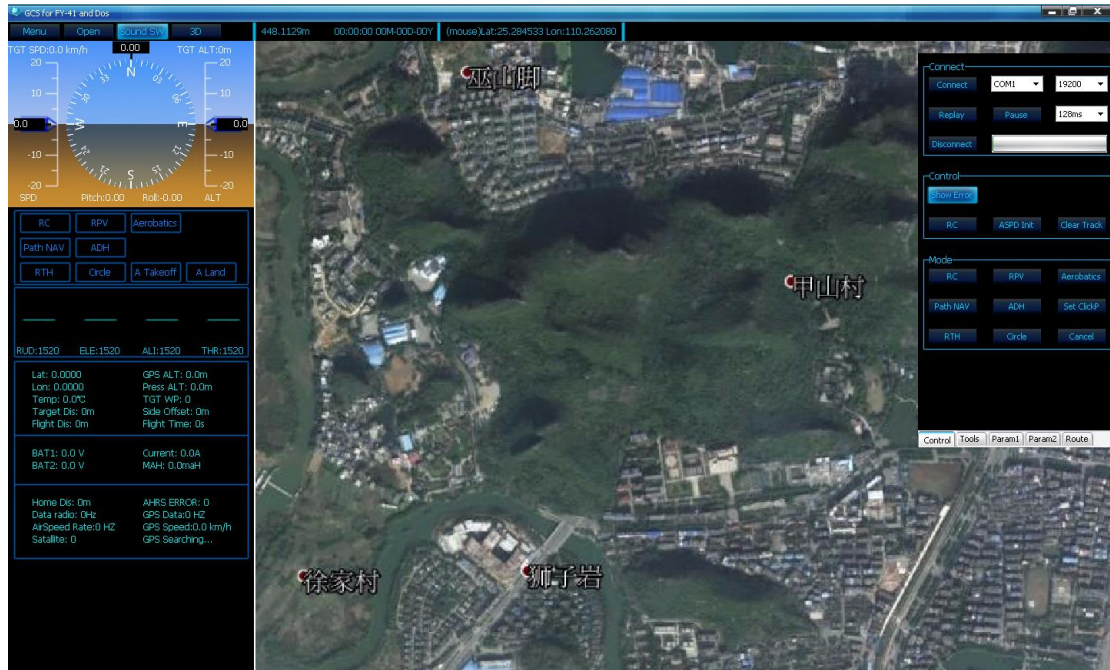
Note: **If you can't open FYGCS5.11 successfully in Vista, Win7, or Win8 operating**
system . Please find out executable file, right click the mouse and run as
administrator.

Please according to the picture below, through USB data cable to connect FY-41AP
Lite to PC.
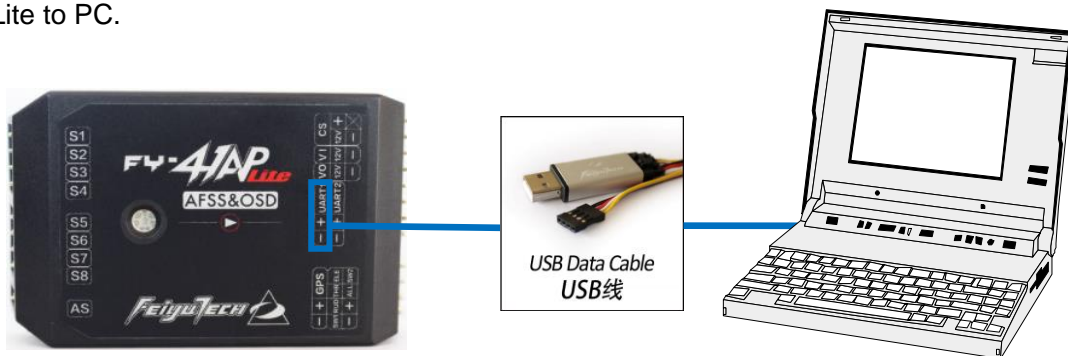
Connect FY-41AP Lite to your PC, select corresponding COM port. Baud rate has to
be"19200", click "connect" button. After FY-41AP Lite establish connection with the GCS
software successfully .Select the "Menu-> Autopilot Configuration Wizard" ,you can finish

the setting in the configuration wizard. The last,you can click the button " Finish and Save "
to save the setting into the FY-41AP Lite controller.
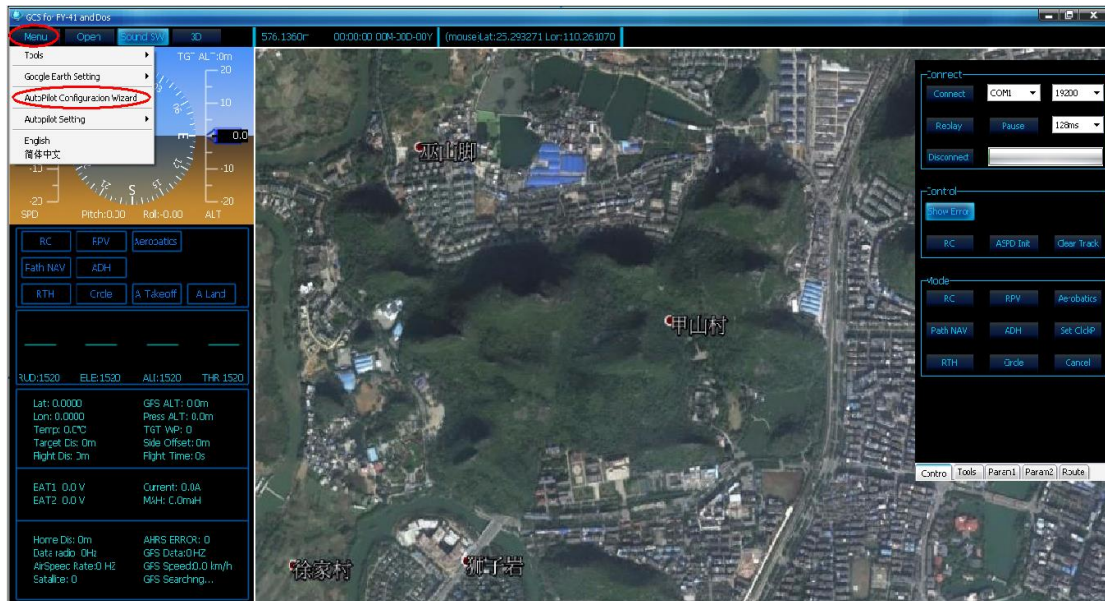
Step One: Installation direction setting

First you should set the correct mounting direction according to the FY-41AP Lite mounting direction on the plane(The default setting is Arrow forward).After choose the correct mounting direction, pitch and roll inclined the plane and checking through the attitude chart whether the posture and aircraft state is identical.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

Setting via the "Install Setting" option in the OSD menu.

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software
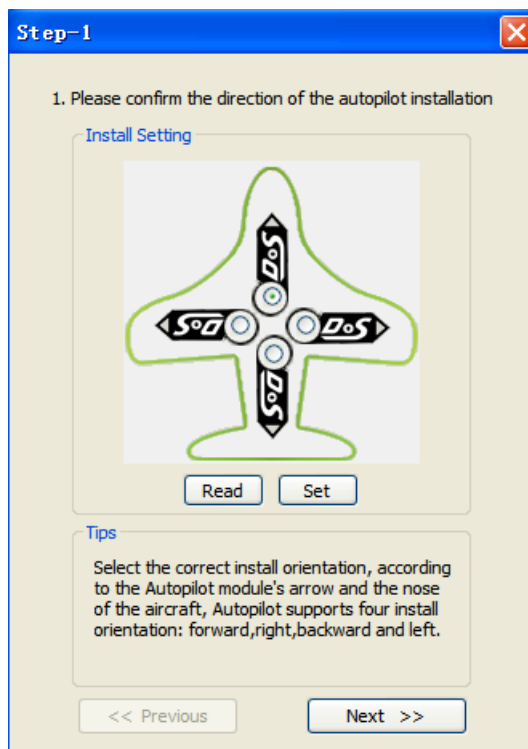
Step Two: Servo's output mix control mode setting

No.				
Option	*Normal*	*Elevon*	*V-Tail*	*Normal*

"AIL NAV"means using only aileron make a turn in navigation mode.

"RUD NAV"means using only rudder make a turn in navigation mode.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

Select the correct rudder output based on the aircraft model. Setting via the "MIX SETTING" option in the OSD menu.

Aircraft Config	Mix Setting Selection	Remark
Traditional aircraft layout with Aileron	1.Normal	Navigation control using aileron.
	4.Normal(RUD NAV)	Navigation control using rudder.
Flying wing aircraft	2.Elevons	Navigation control using aileron. Used for most kinds of flying wing planes.
	5.Elevons(RUD NAV)	Used for flying wings with independent rudder for Navigation.
V-Tail aircraft with Aileron	3.V-Tail	V-Tail with navigation via aileron.
	6.V-Tail(RUD NAV)	V-tail planes with independent Rudder for navigation control.
Traditional aircraft layout with no Aileron	1. Normal	The rudder servo must be connected to FY-41AP Lite aileron servo output (AIL)
V-tail without aileron	2. Elevons	V-tail servo has to connect to FY41AP Lite Differential Servo 1 & 2 output.
Airship	4.Normal (RUD NAV)	Due different airship configurations, use with caution. Carry out test flights to confirm normal function.

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software
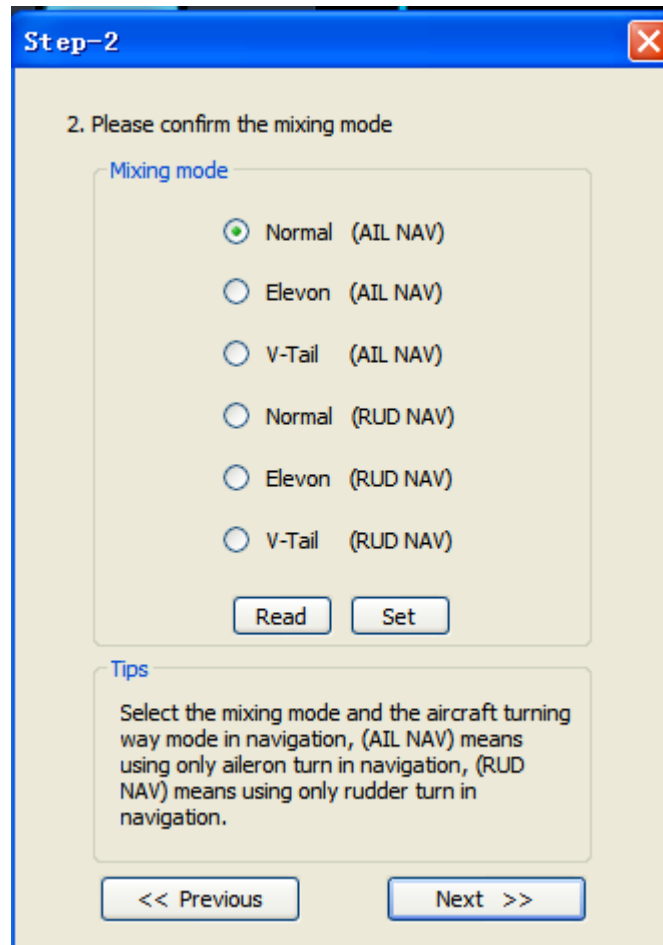
Step Three: The remote control switch setting & checking and setting the direction of the rudder surface automatically control .

FY-41AP Lite requires a minimum of 6-channel RC receiver.

1)   First, the remote control is set to fixed-wing aircraft of conventional layout mode, do not set any mixing. The rudder angle of the remote control is set to 100%, and fine-tune gyrus.

2)   Need two three-position switch or rotary switch settings for CH5, CH6 used to connect SW1 and SW2. Use for switch the flight mode.

3)   Connection is completed, switch CH5, CH6 to check the settings whether can correct setting control mode. Also you can confirm it via the status of the lights, or OSD display mode.

4)   Switch to manual mode, check the control surfaces of the joystick remote control aircraft direction whether is correct, if not correctly, adjust the rudder surface reverse control on the remote control to correct it.

5)   Switch to the "**Auto Balance Mode**", check the control direction according to the following steps carefully.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

In the OSD menu, you can change the direction of the rudder control via the "REV" list of the "Servo Gain REV" option.

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" Software
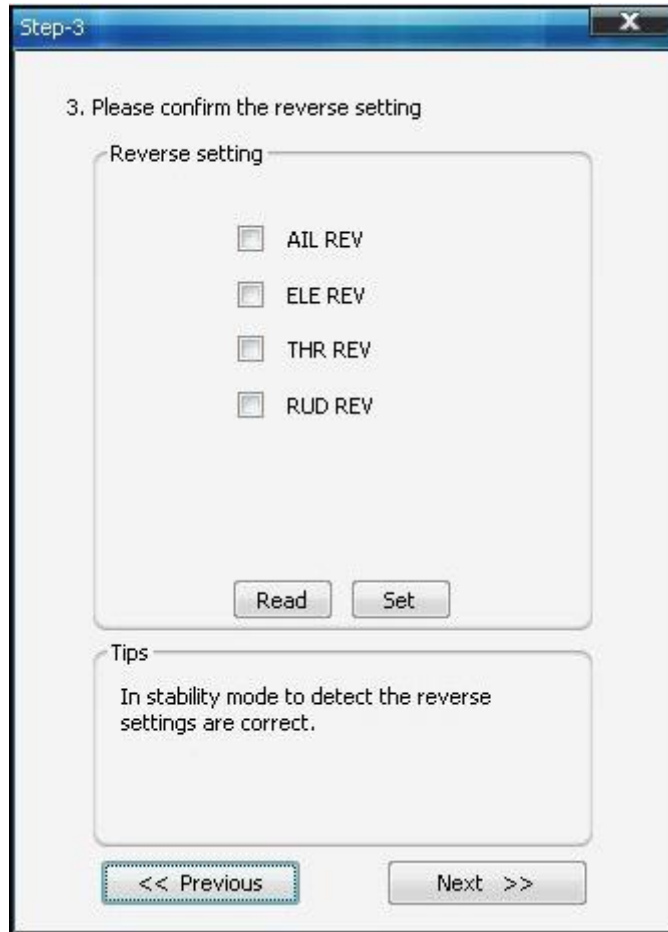
（1） AILERON (Check in "Auto Balance Mode")

RIGHT Roll the plane, the right aileron should automatically move downwards, while the left aileron move up.

LEFT Roll the plane, the left aileron should automatically move downwards, while the right aileron should move up.

If the servo movement is incorrect, you need to reverse the automated servo movement, please select "AIL REV".
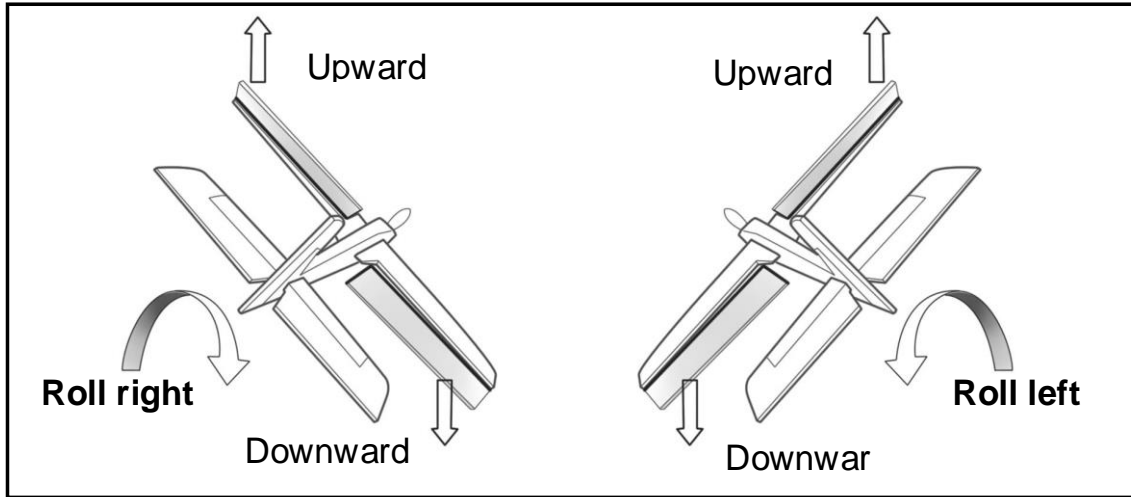
（2） ELEVATOR (Check in "Auto Balance Mode")

UPWARD incline the plane nose, the elevator should automatically move downwards.

DOWNWARD incline the nose, elevator should automatically move upwards.

If the servo movement is incorrect, you need to reverse the automated servo movement, please select **"ELE REV"**.
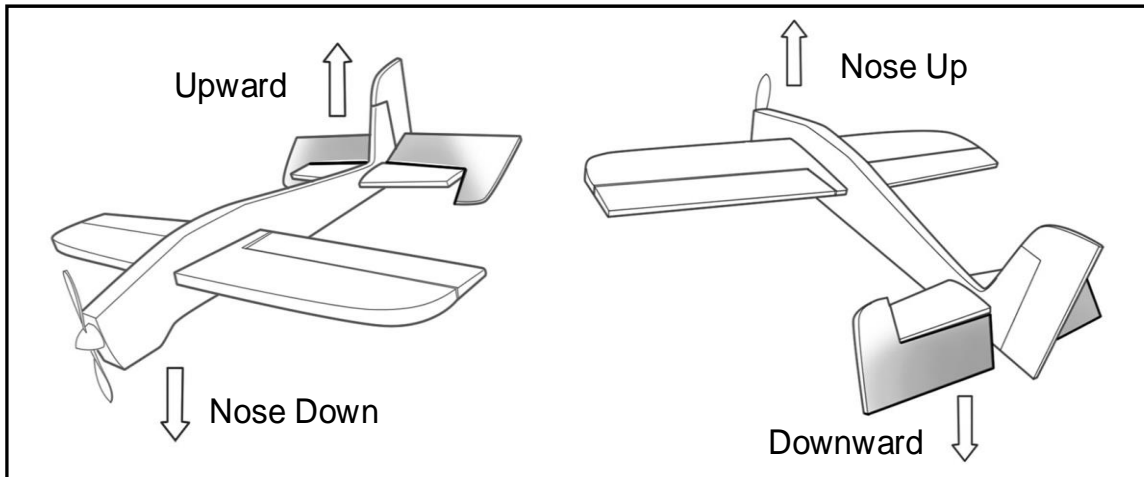
（3） Rudder (Check in "Auto Balance Mode")

CLOCKWISE rotate your plane, the rudder should move to the Left.

COUNTERCLOCKWISE rotation, the rudder should move to the Right

If the servo movement is incorrect, you need to reverse the automated servo movement, please select **"RUD REV"**.

Turn right — Rudder moves to the left

Turn left — Rudder moves to the right

(4) Throttle

Push throttle from light to strong, if the servo display chart of the remote control is display (-100 to 100) please don't select the" throttle reverse" option in the rudder reverse, if display chart display from big to small (100 to -100), please select the" throttle reverse" option in the rudder reverse.

In general, use ESC for throttle controlling can be choose the default settings (NOR), without ESC reverse setting.
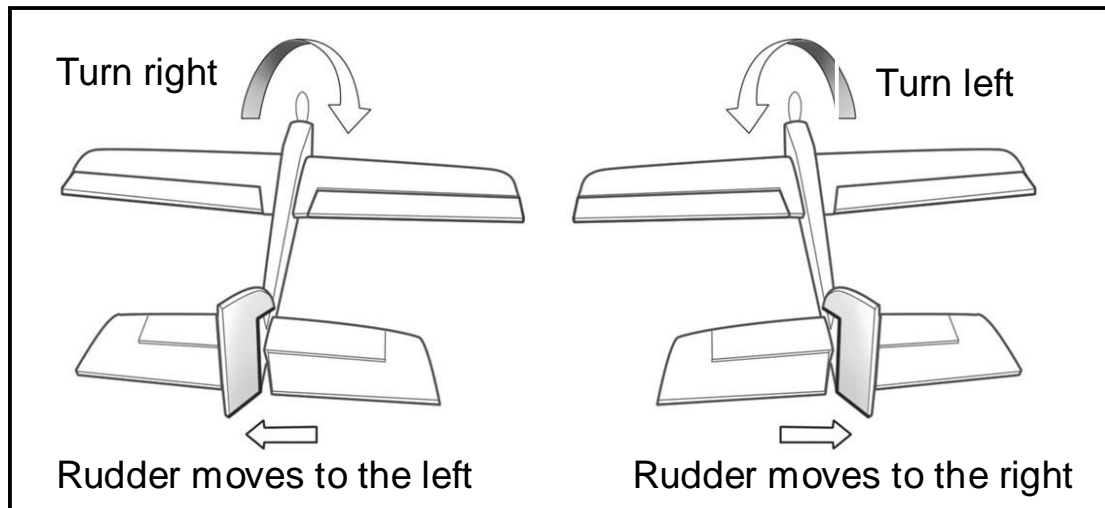
Step Four: Basic sensitivity setting for automatic control

We suggest that the first flight should be in default value, then adjust the value according to the actual flight.

Adjustment principle: check the gain of stability whether it is normal in the "**Auto Balance Mode** ".

Control aircraft in roll, then loosen the rocker, observe that whether the plane can be automatic recovery level. Control aircraft in pitch, then loosen the rocker, observe that whether the plane can be automatic recovery level. If the automatic recovery control can not strong enough, you can tone the gain of stability. If the pitch and roll swings back and forth, it means the parameters is too big, it need decrease to a small amount.

The greater gain of RUD the weaker effect of the servo when in making a turn .

In general gain of the throttle do not need to adjust, if the airspeed have a small space velocity shock in automatic navigation, you can decrease the parameter to suitable.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

In the OSD menu, you can change the gain of the rudder control via the "Gain" list of the "Servo Gain REV" option.

1) Every channel's gain can be set separately (AIL,ELE,THR,RUD), setting range:0-99.

2) Min:0, equivalent shut down auto balance function.

3) Gain means the sensitivity of automatic control, will affect the navigation control and the effect of the automatic balancing directly. If setting too small the effect of the automatic balance is not good, and if setting too much will cause the plane shaking.

4) General condition, we suggest that use the default parameters(50).Please do not set control gain to a very large number at your first flight .The best way is adjusting according to more test flight. Under the condition of allowing, we suggest that the parameter should be adjust to bigger value as far as possible, so that conducive to balancing of the plane.

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software
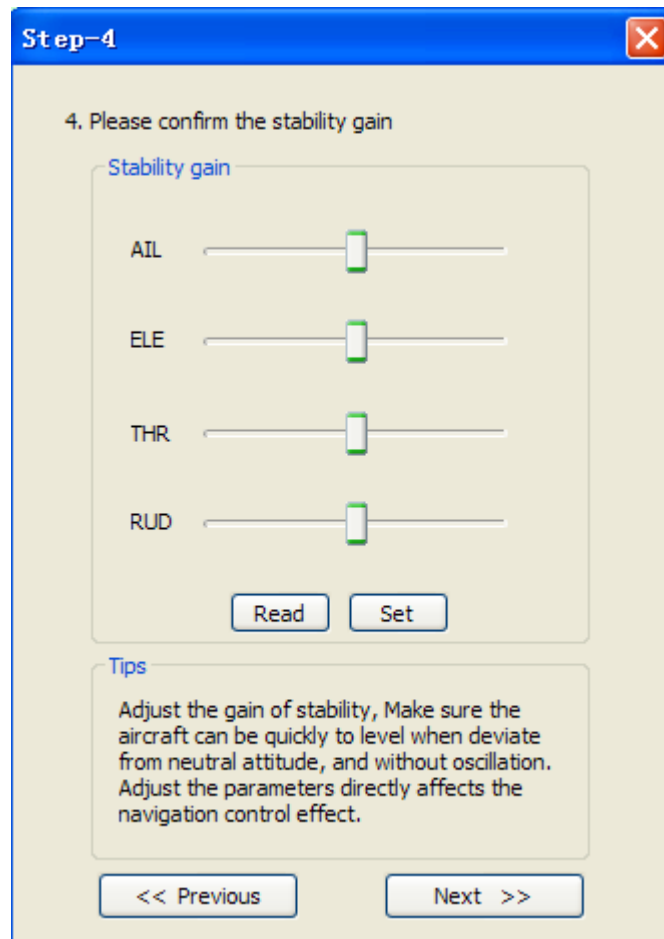
Step Five: The cruise speed and hovering flight radius setting

Target speed setting (Default setting is 60km/h): The flight speed is very important, it cannot be set optional. The speed should be make the aircraft keep normal flight. We suggest not increase the settings too high, it may cause very unusual flying behavior and

may result in damage of your aircraft due to excessive throttling.

You can observe the "GPS velocity" on GCS software when in flight, and to evaluate the aircraft's cruising speed.

Circle radius: It means the radius of the hovering flight. Speed of the plane which achieve 60 km/h, the circle radius should be set to more than 80 meters .We suggest that the circle radius should be set more than 1.6 times of the flight speed. Such as the speed of the plane is 100 km/h, the circle radius suggest that set in 160 meters. If the circle radius is set too small, hovering flight may not be able to normal, maybe the plane will decrease flight altitude, even cause the dangerous of air crash.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

You can set the" **Target speed**" and the "**Circle radius**" via the "Flight" option in the OSD menu (Speed: **Target speed**, CIR RAD: **Circle radiu**).

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software
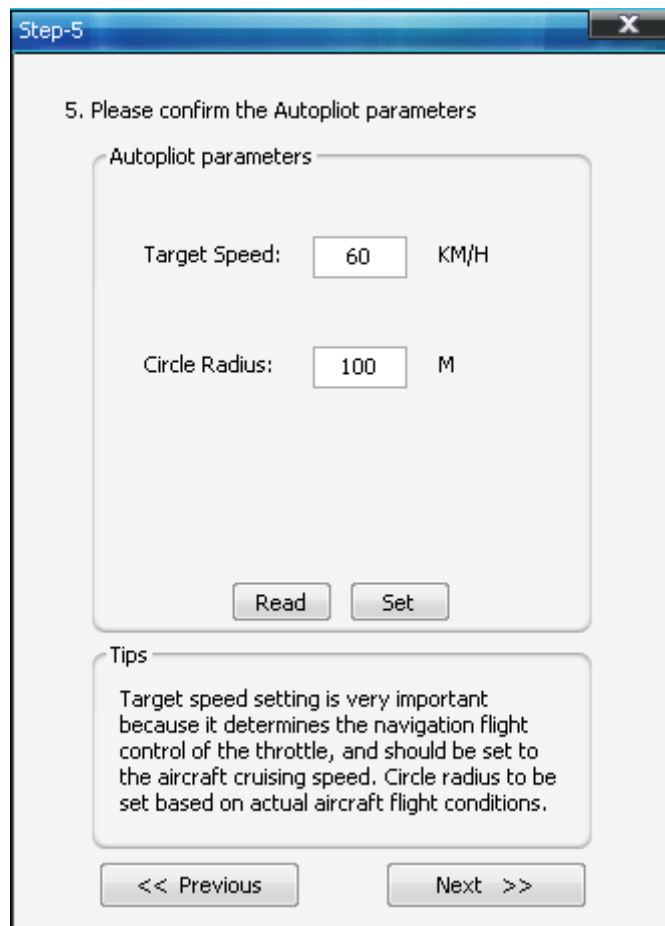
Step Six: Gyro and airspeed sensor initialization

Gyro Initialization: When doing the gyro reset, please keep the aircraft static. It's better to do the gyro reset before each flight.

Airspeed sensor initialization: The aircraft keep static, you can use your hand to cover the port of the airspeed sensor, and do not let the wind interfere with the airspeed sensor, then execute the initialization operation. After that please check whether the airspeed showing on GCS is in the vicinity of 0-3.Due to the sensor error, there are some tiny airspeed value on the ground is normal.

Method one: Setting FY-41AP Lite via remote control and OSD overlay menu

The "COMFIG" option in the OSD menu (INIT GYRO).

Method two: Setting FY-41AP Lite via "FYGCS 5.11 for 41&DOS" software
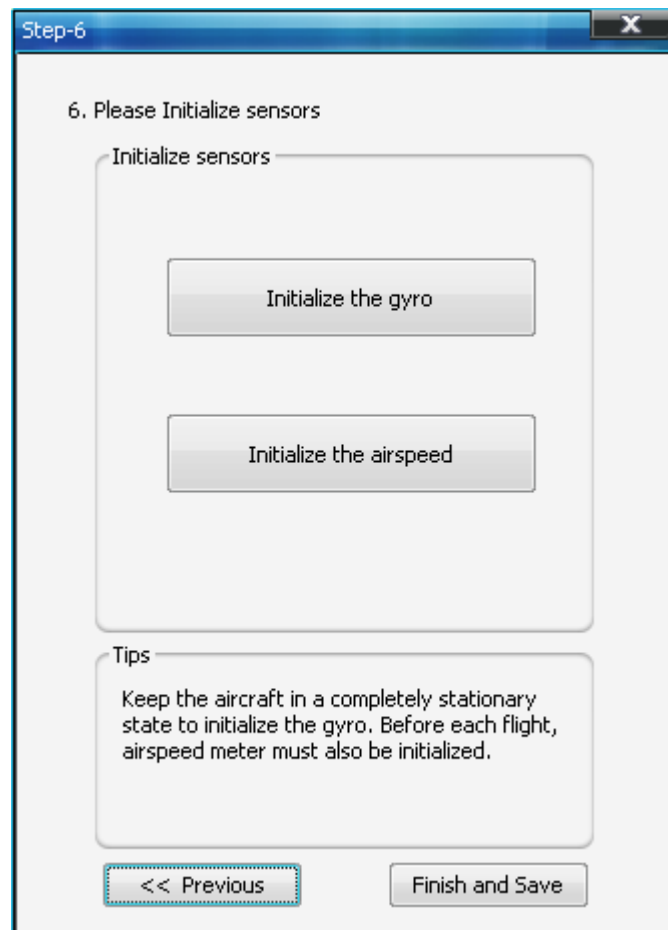
Step Seven: Record attitude

The default attitude angle is "0" (zero). After finish the installation, the aircraft place to the level flight attitude, then record the attitude. This function is used to eliminate any installation deviation from the default.

When record the level flight attitude on the ground via toggle switch, it will initialize the gyro at the same time, so ensure the aircraft absolute static. Please according to following steps to complete the recording.

1） The aircraft put on the ground in level flight attitude, keep static.

2） Under the RC mode, the remote control rocker position in the middle, the throttle rocker position to the lowest ,adjust rudder surface to leveling.

3） Switch to the ABM mode ,then switch from ABM mode to the RC mode 8 times, the LED light from white to green, and then the aileron rudder surface will execute an operation that a tilt and then back to the flat to prompt the success of the recording. "ABM→RC→ABM→RC→ABM→RC→ABM→RC→ABM→RC→ABM→RC→ABM→RC →ABM→RC".

This operation will finish the recording and save permanent automatically.

Note: The first flight or after upgrading firmware, you need to record level flight attitude. But don't need to record before every flight.

> **Other settings can temporarily use the default settings, the following can be flown for the first time. After each set and do not forget the "Save parameters"**

9. FY-41AP Lite First Flight Test Checklist

Take off

Take off in manual mode. If you are confident, after completing the basic check, you can take off in ABM, This is more suitable for the remote control skills are not enough skilled operator.

Adjustment of the aircraft

Fine-tuning adjustment after take-off in balanced mode, leveling the aircraft the throttle placed into cruise throttle position. If the manual mode level flight trimming, and the level of the balanced mode fly to fine-tune a lot of difference, it is recommended that record level flight attitude again. If the manual mode leveling switch to balance mode, the aircraft bow, you need to elevate the head record level flight attitude, and vice versa pad low head re-recorded.

Auto balance mode test

a) This paragraph explains the interactions between pilot input, Auto Balance Mode (ABM) and autonomous flight (Navigation Mode).

b) In ABM, the FY41AP Lite will constantly want to keep the aircraft flying level and straight. Any pilot input will go against this stabilizing action, in order for you to change the course, altitude or angle as you fly the plane.

c) The higher the Gain setting: AIL, ELE & RUD, the more you will feel the aircraft fly 'less flexible', this is normal. The higher the Gain, the **stronger** will be the leveling action of the FY41AP Lite. And the smaller the RC input you have on the aircraft.

To counter this, reduce the Gain until you feel the plane's flying attitude is comfortable for your flying style.

d) Alternately, if the Gain setting is too low, the aircraft self leveling will be weak and the greater the pilot manual control will be.

Cruising speed setting

You can adjust this cruising speed as per your model's requirement. Fly the plane in the speeds most comfortable for cruising and set that value via the setting software.

Return to launch test

Switch SW2 to Return To Launch (RTL) mode to watch the aircraft automated return to home or not. Upon reaching the home point it will automatically engage auto circling, while it waits for your further instructions.

Landing

Now that we have completed the basic test, landing or other features of the test.

10. Other Functions And Settings

10.1   Switch (SW2) Function Setting

You can select the Auto Circling Mode which control by SW2.The navigation models of FY-41AP Lite show in the table, we can just select two modes for SW2 at the same time.

SW2 Mode	Function	Remark
Null	SW-2 Deactivated	SW-2 set to NULL, Flying mode is controlled by SW-1.
Go Home	Auto Return To Launch	On activation, plane will automatically return to launch (RTL) point.
Line	Fixed altitude & Heading lock flight Mode	With no controlling input from the pilot, the plane will automatically lock current heading & maintain altitude.
Circle	Auto Circling Mode (ACM)	Automatically fly, circling a fixed point. Centre is at point of ACM activation.

You can set the SW2 functions by using "FYGCS 5.11 for 41&DOS" software. After FY-41AP Lite connect to the GCS software successfully, you can select "Menu->Autopilot Setting->RC Setting" to finish the switch mode setting.

10.2   RC Max Distance Setting

The RC Max Distance Setting **will not allow** the plane to fly beyond the distance you have set. Upon reaching this distance, the FY-41AP Lite will automatically engage RTL and fly back to you.

The default RC Max Distance Setting programmed into the FY-41AP Lite is 4000 meters. You can adjust this parameter via "FYGCS 5.11 for 41&DOS" software. After FY-41AP Lite connect to the GCS software successfully, you can select "Menu->Autopilot Setting->RC Setting" to finish the RC Max Distance Setting.

10.3   Circling Radius Setting

The FY41AP Lite can fly over a set GPS point upon activation of Auto Circling Mode via switch SW-2.

The default circling radius is 80 meters. You can adjust this circling radius using the Setting Software function. Press 'Set' button to confirm and save your updated circling radius.

10.4   The Altitude Of Return To Launch Instructions

When activated in this mode, if the current altitude is greater than 50meters, the FY-41AP Lite will automatically fly the plane back to the home point. Then after the aircraft back to the target point,   if the altitude greater than 100 meters , the plane will down to 100 meters while circling .For the FY-41AP Lite , there is 50 meters protection altitude for return home. If the current altitude below 50 meters when activate into RTL, the aircraft will climb to 50 meters to return.

10.5　FAIL-SAFE Setting

　　The RC receiver remote control mode uncontrolled return of function, you need to use with runaway protection function remote and the receiver.

　　Failsafe remote control receiver when no signal is received, output a default set of rudder. Various models of remote control set runaway protection have said, the reference to the remote control manual.

　　Return channel CH6 need to set connected to SW2 is out of control out of control protection switch to the status of the return. Aileron, elevator, rudder channel is set to loose rod status, throttle setting have two situation

　　(1)　If connect the airspeed sensor to the FY-41AP Lite controller, the throttle don't need setting, the controller will output a proper controlled quantity according to the target speed.

　　(2) If you are not use the airspeed sensor ,the throttle　need to set to cruise throttle position.

　　If debugging balanced mode have been done well, the following steps will show you the setting runaway protection (Take the Futaba remote control T10CHG for example).

　　Settings, turn off the power to the aircraft, to avoid setting the motor starts.

　　First enter the remote control setup menu to find the set of "F / S"; into the F / S menu, the lever into the neutral position, rudder trimming to maintain the status adjusted, the throttle lever to the cruise throttle position(apply to situation (2)), the CH6 cut to return mode. Then in all open channel F/ S, and often set by the "PUSH" button, set successfully as shown.
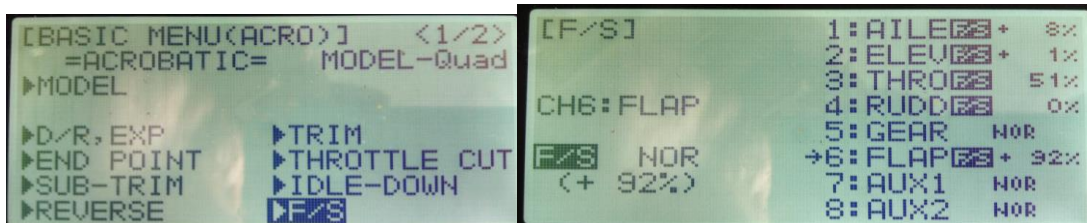
　　After setting the aircraft, powered off the remote control and check whether it can successfully entered the return mode. **Pay attention to safety, to prevent the Failsafe motor rotation, met items cause damage.**

10.6　Fixed Altitude & Heading Lock Mode Instruction

　　Fixed altitude & Heading lock Mode – This mode maintains aircraft flight course & holds the altitude on activation. By using GPS data, the system automatically corrects flight course deviation & maintains straight-line flight.

Attention: Please make sure the RC stick is released when you switch into Fixed altitude & Heading lock Mode. **The FY-41AP Lite can record current RC stick position and lock the flight course and altitude when your RC stick released.**

10.7   3D Mode Instruction

3D Mode – If no input is given by the pilot (all sticks in the middle position), 3D mode will lock the current aircraft attitude. Therefore the aircraft can be easily maneuvered to complete a variety of 3D flight with added stability & smoothness.

Attention: Please make sure the RC stick is released when you switch into 3D Mode. **The FY-41AP Lite can record current RC stick position and lock the flight attitude when your RC stick released.**

10.8   Auto Circling Mode Instruction

Auto Circling Mode – On activation, the plane will maintain altitude and flight speed, while initiating a counterclockwise circle. The centre of the circle is the point of activation at a default radius of 80 meters (can be changed via FY GCS).

10.9   Link Mode (RC Receiver Control Mode/Data Radio Control Mode)

FY-41AP Lite there are two remote control mode, the default setting for the RC receiver mode. Directly connected to an RC receiver RC mode, selected data transmission with a remote control adapter plate and several transmission radio remote control radio remote control mode (you need to buy another ground station upgrade package).

Appendix

Appendix： Flight Area Map Making

（1） Download the FY Offline Map from our official website and open it.
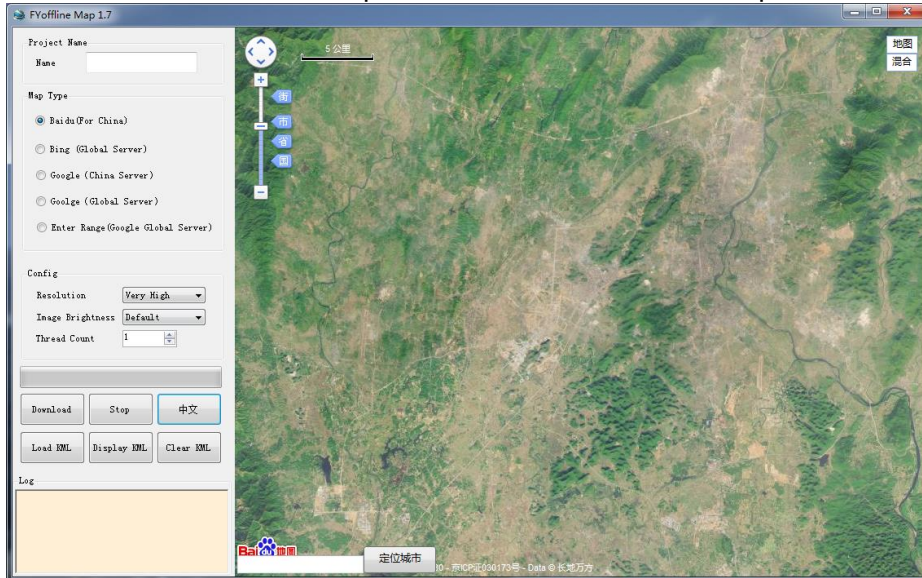
（2） Name the map on the "project names".

（3） Map types:
  A. For Chinese users, Baidu HD Satellite is suitable and better, it can offer high quality Map in some areas. But the Map cant be found in some other remote areas.
  B. Google Satellite(China Server) is suitable and better for Chinese users.
  C. Google Satellite(Global Server) is suitable for people from all over the world expect China and a few other countries, the latter people cannot use the global ser ver successfully.
  D. If you cannot load the appointed area on the Map for the reason of the Explorer, you can use the function of "Enter Range"(Google Global Server), and input the loading area on the software. But Chinese and a few users from other countries may cannot use this function successfully.

（4） Choose the map resolution.

（5） Click the right mouse bottom both at the upper left corner and the bottom right corner of the suitable area, then it will display a yellow selection area or six coordinate points enclosing a rectangular.

（6） The procedure begins to work when you click the function "download". The green words in the log indicatting that you have loaded Map tiles successfully. If

it shows red words indicatting that the download is fail for the reason of network connections or the problem of server access. A complete Map is generated after downloading successfully, and three files with suffix (.gst /. jpg /.tab) will be generated and saved at appointed software directory. That is to　say, the files will be saved at "Offline Projects". Note that users can not change the directory to save files.

- **Please install IE 10 and above before using.**
- **The language of the software can be changed by clicking "Englsih".**
- **The KML file can be loaded by clicking "Load KML".**
- **The image resolution cannot be too high if the selected area is very large. The more thread counts, the faster download speed, and the more overload on　the computer, this may easily cause the Map unsuccessfully loaded.**

—— END ——

Note: We reserve the right to change this manual at any time! And the newest edition will be shown on our website www.feiyu-tech.com.