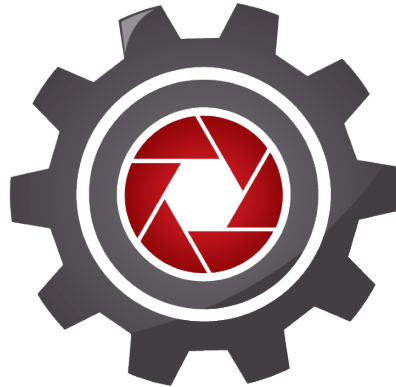# Develop Air

Operating Manual

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V1.0

Introduction

Develop Air is a drone designed for conveniently developing, integrating, and deploying hardware and software to take flight on a drone. Develop Air can be equipped with sensors, processors, IoT devices, gimbals, tethers, sprayers, deployment mechanisms, or just about any hardware and software the user can create and integrate via the side plates or quick release project rail.

A complete ready to fly and modify drone, Develop Air is accessible to makers at nearly any level, like tech enthusiasts or hobbyists creating a high flying passion project, professional hardware or software engineers developing drone systems in the lab, or STEM students and educators facilitating the world of research and education.

In this manual, operators will find specifications for Develop Air, learn how to get Develop Air off the ground, understand the use of Develop Air's internal components, and discover how to expand Develop Air's capabilities with hardware and software projects. Warranty information is listed and included separately with Develop Air.

Standard Specifications

Flight Controller (FC) / Processor: Holybro Pixhawk 4
          Flying with the Pixhawk 4, Develop Air can operate autonomously and control electrical or electromechanical payloads.

Power Distribution Board (PDB):   Holybro PM06 v2
          Facilitating 7V - 42V input and 5V/3A output, the Holybro PM06 v2 ensures Develop Air and connected projects are supplied with reliable, continuous power.

Battery Eliminator Circuit (BEC):   iFlight Micro 2-8S BEC
          Able to step down an input voltage of up to 36V, the two iFlight Micro BECs ensures Develop Air and connected projects have access to 12V 2A or 5V 3A currents.

GPS: Pixhawk 4 GPS Module
          Built with a Ublox Neo-M8N module and IST8310 compass, the Pixhawk 4 GPS enables Develop Air to navigate autonomously.

Brushless Motors: KDE2315XF-885

Rated to operate at up to 240°C continuous (340°C maximum) temperatures, the KDE 2315XF-885 motors enable comfortable operation in tropical or arid climates.

Electronic Speed Controllers (ESCs):   KDEXF-UAS20LV
The KDEXF-UAS20LV ESCs are tuned with Dynamic PWM and Motor Advance Timing algorithms to deliver highly efficient performance for stable operations.

Receiver: FrSky RX6R
Using the FrSky RX6R receiver, Develop Air is compatible with many transmitters for manual remotely controlled operations within a 1.5mi (2.41km) range.

Telemetry Radio: HolyBro 915 Mhz 500 mW
With a 915 Mhz 500mW HolyBro telemetry radio, Develop Air is capable of autonomous remotely controlled operations within a nearly 2mi (3.2km) range.

Skateboard / Airframe: Nylon-12 SLS
Develop Air was designed by iVue Robotics to be weather resistant, lightweight, and rugged with a SLS printed Nylon-12 skateboard and EPDM Rubber Foam gasket.

Propellers: 9.4" Master Airscrew MR Series
Including a built-in nut for ease of installation, the 9.4" Master Airscrew MR Series propellers are designed to maximize performance while also minimizing noise.

Battery: MaxAmps LiPo 6000XL 3S 11.1v
The Max Amps LiPo 6000XL 3S 11.v boasts a 100C rating for quickly and safely discharging the waterproof, high capacity battery.

Side Plates: Blank
The blank side plates can be replaced with Dual Power, DB9, and Signal side plates for data and power pass through to mounted sensors and electronic payloads.

Quick Release Payload Rail: Zinc Plated Steel Mini DIN Rail
Payloads like sensors and deployment mechanisms can be conveniently mounted on Develop Air with the Quick Release Project Rail designed by iVue Robotics.

Position & Status Indicator Lights: 4 Position & 5 Status LEDs
Quickly check the orientation, status, and position of Develop Air before, during, and after flight operations with the onboard position and status LEDs.

Options Included

Radio Controller / Transmitter: Eachine TX16S 16CH Radio Transmitter

     Pre-bound to Develop Air, the Eachine TX16S transmitter enables control of Develop Air and connected payloads via joystick, dial, and switch inputs.

Buck Boost Converter: DROK DC-DC Buck Boost Converter

     With an input voltage range of DC 5-30V, the DROK DC-DC Buck Boost Converter will provide a constant 12V output for use with the Dual Power side plate.

Side Plates: Dual Power

     Develop Air can be configured with a Dual Power side plate for providing 5V and 12V power pass through to mounted sensors and electronic payloads.

Part 1
Off the Ground with Develop Air

Getting Started

Out of the box, Develop Air is fully assembled, tested, and ready to fly. To operate Develop Air autonomously, a ground control device like a phone, tablet, or PC running Windows, Linux, MacOS, Android, or iOS with QGroundControl is highly recommended. While Develop Air can be used with other ground control software, QGroundControl is recommended due to its compatibility across devices, open source architecture, and operator friendly interface.

Once QGroundControl is downloaded and installed on a compatible ground control device of choice, QGroundControl can be opened and the HolyBro telemetry radio can be plugged into a USB port on the ground control device. Please note that iOS devices are not natively compatible with USB telemetry radios, so connectivity via a bluetooth serial port or a non-iOS device capable of running QGroundControl may be required.

Alternatively, Develop Air can also be flown and operated via manual user input with ACCST D16 and ACCESS transmitters like the RadioMaster/Eachine TX16s or the FrSky

QX7. If Develop Air is purchased with a transmitter, Develop Air is pre-bound and ready to fly as soon as the transmitter is turned on and Develop Air has power from its battery.

Binding a Transmitter

If using a transmitter not purchased with Develop Air, bind it to the FrSky RX6R receiver in Develop Air by turning on the transmitter and setting it to the binding mode according to the transmitter's user manual. Following the transmitter being set to bind mode, turn on the receiver by holding down the F/S button. The red LED light on the receiver will then flash to indicate the binding process has been completed. Once the binding has been completed, the transmitter can be taken out of the binding mode, turned off, and then Develop Air is ready to fly next time the transmitter is turned on and setup with the desired joystick, switch, and dial input channels.

Preparing for Takeoff

In preparation of flying Develop Air, the battery should be secured by using the battery brackets and battery straps underneath Develop Air. Once the battery is properly secured and orientated so the XT60 battery connector on Develop Air's fuselage and the battery is aligned on the same side, the propellers can be connected to each motor by spinning them clockwise or counterclockwise until they are snug and will not tighten any further without noticeable force.

For the operator's safety, the transmitter should be turned on before plugging the battery in, arming, and initializing manual control of Develop Air. Similarly, be sure QGroundControl is open on the phone, tablet, or PC prior to powering on and arming Develop Air when operating it autonomously.

Using QGroundControl for autonomous flight, Develop Air takes off to the preset altitude specified by the operator with a swipe of the finger on a touchscreen device or a click and drag with a PC trackpad or mouse.

Operation in Flight

In flight, Develop Air can operate in three different modes:

Mission Mode - In mission mode, Develop Air can autonomously fly a preset flight plan using QGroundControl or another compatible ground control software. While Develop Air is primarily controlled by GPS waypoints set in the autonomous flight plan when in

mission mode, Develop Air's flight can also be overridden with operator input on a transmitter.

Position Mode - In position mode, Develop Air can fly using GPS positioning and be remotely controlled with operator input on a transmitter. With GPS positioning being used in position mode, Develop Air is able to hover in a location without the operator providing input on a transmitter.

Manual Mode - In manual mode, Develop Air can fly and be controlled with operator input on a transmitter. No GPS positioning is used when operating in manual mode, therefore, the operator must constantly provide direction to Develop Air for sustaining a hover position or movement.

Part 2
Develop Air, Inside & Out

Removing the Cover

The electronics enabling Develop Air to fly and operate autonomously are inside Develop Air's skateboard. Operators may access the inside of Develop Air by removing the eight screws on the top cover with a Phillips head screw driver. When removing the cover, operators will find the GPS assembly is connected from the dome on the top cover. Operators should not disconnect the GPS or any other wiring within Develop Air's airframe/skateboard and also be careful to not over tighten the screws when reattaching the top cover.

Position & Status Lights

Position Lights - On the bottom side of each motor mount, a NeoPixel light will be found to make operators and spectators on the ground aware of Develop Air's orientation in flight. Arranged like the position lights on a manned aircraft, Develop Air has a red light on the front left motor mount, a green light on the front right motor mount, and two white lights on the rear motor mounts.

Status Lights - Develop Air has a total of five status lights, two located near the rear boom arms and three located on the GPS dome fixed to the top cover.

The status lights near the rear boom arms indicate the battery status, with a green light to indicate the battery has enough charge for flight and an amber light to indicate the battery is low and needs to be changed before carrying on flight operations.

The status lights on the GPS dome indicate the motor arming and GPS connectivity statuses. A solid blue light indicates Develop Air is armed with no GPS connectivity. A solid green light indicates Develop Air is armed with GPS connectivity. A blinking blue light indicates Develop Air is ready to be armed with no GPS connectivity. A blinking green light indicates Develop Air is ready to be armed with GPS connectivity. A blinking red light indicates Develop Air has encountered an error when trying to arm.

Viewing Flight Logs

On the rear left side of Develop Air, the USB-C port can be used for uploading flight logs from the Pixhawk to a PC without needing to remove the microSD card from the Pixhawk and entering it into a computer. Flight Logs can be uploaded for review here: https://logs.px4.io/

Part 3
Build, Create, and Develop to Modify Develop Air

Expanding Develop Air

Once familiar with flying Develop Air and an understanding of its internal electronics is achieved, the operator can expand the capabilities of Develop Air. Rated to continuously carry external payloads of up to 3lbs, Develop Air is outfitted with swappable side plates and a quick release project rail to connect and mount electromechanical payloads.

Quick Release Rail System

Operators can conveniently and securely mount payloads underneath Develop Air using the quick release rail system. Payloads are only limited by the operator's imagination to create a payload, the size so it fits between the landing gear, and 3lb carrying capacity.

Replacing Parts

iVue Robotics has made the following replaceable parts available for purchase to make Develop Air the ultimate ready to fly and modify drone with ease of repair in mind:

Replaceable Parts

Telemetry Antenna

Brushless Motor

Landing Gear Assembly

Side Plate

Battery

Foot

Quick Release Rail

Battery Bracket

Fuselage

Quick Release Payload Bracket

Boom Arm Assembly

Top Cover