AMOS-AirProp User Guide rev 2

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Introduction

The AMOS-AirProp is an electric, computer controlled, rotatable air propeller that is used for propulsion and steering of the AMOS (Aquatic Mini Observation System) robot from In Nature Robotics Ltd.

It consists of a 10 inch propeller blade that is mounted to a 880 kv brushless motor, which is in turn mounted to a vertical post whose yaw direction is controlled by a waterproof servo motor.

An Electronic Speed Control (ESC) board is also included for controlling the speed of the propeller motor. The ESC and the servo motor are both controlled using pulse width modulated (PWM) signals from a host processor such as the Raspberry Pi^{TM}.

Included Equipment

Item	Quantity
10" Plastic propeller	1
Nose cone	1
Threaded motor shaft adaptor	1
Motor shaft collar (metal)	1
Plastic collar for propeller	1
C2216 880 kv air propeller motor	1
Baseplate for air propeller motor	1
Waterproof servo motor	1
6.5 V voltage supply for servo motor	1
Electronic speed controller (ESC) for air propeller motor	1
185 mm long mounting post	1
Mounting base	1
Mounting screws for base	8
Mounting screws for air propeller motor	4 (pre-attached)
Cable ties	4

Dimensions

Propeller Size	250 mm x 28 mm x 2 mm
Propeller Weight	8 g
Propeller Motor Size	30 mm long x 30 mm diameter
Propeller Motor Weight	63 g
Mounting Post	185 mm x 40 mm (max) x 11 mm
Mounting Post Weight	76 g

Mounting Base	99 mm x 98 mm x 18 mm
Mounting Base Weight	67 g
Servo Motor Dimensions	40.5 mm x 40 mm x 20 mm
Servo Motor Weight	60 g

General Specifications

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Interface / Control System	PWM
Minimum operating voltage	11.0 V
Maximum operating voltage	14.0 V
Maximum current	13 A
Propeller Motor Resistance	0.090 ohms
Propeller motor stop position	1000 µsec
Propeller motor maximum speed position	1500 µsec
Waterproof Performance	IP66
Servo operating speed (at no load)	400 ° / sec
Servo stall torque	20 kg-cm
Servo pulse width range	500 to 2500 µsec
Servo neutral position	1500 µsec
Servo dead band width	3 µsec
Typical operating frequency	100 Hz
Operating temperature range	0 to 45 °C

Assembly Instructions

The AMOS-AirProp comes mostly pre-assembled but does need to be wired to the host microcontroller that will be used to control it. The electronic speed controller (ESC) for the air propeller motor and the 6.5 V voltage supply for the servo motor come wired together and require a 12 to 14 volt power source or battery to be applied to the red (+12 V) and black (GND) leads respectively.

The thin red wire connected to the black plastic connector on the ESC provides 5 volts of power. The yellow or white wire should be connected to the PWM output of the microcontroller and the black wire should be connected to the GND level of the microcontroller. The blue wires from the ESC come pre-wired to the air propeller motor. The spin direction of the propeller can be altered by switching any two of the blue-wire connections.

GND

+12 V

RED: +5V
WHITE / YELLOW: PWM Signal
BLACK: GND

To Propeller
Motor
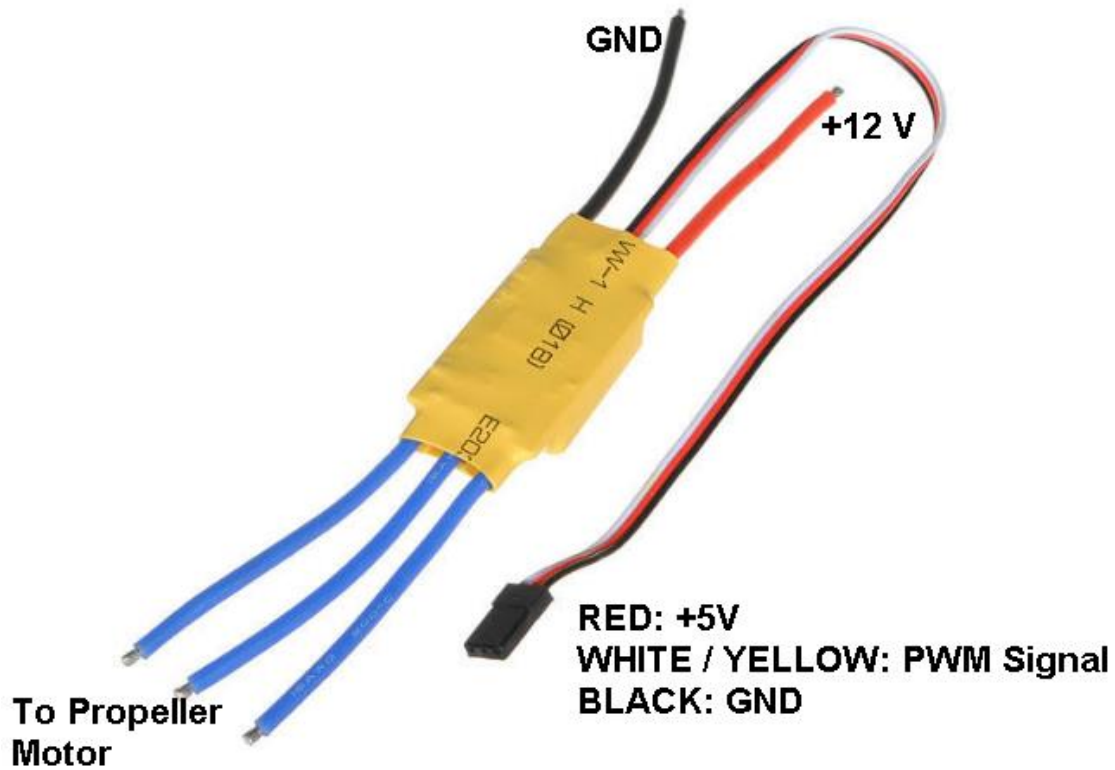
The screw potentiometer on the +6.5 V source should not be adjusted from its factory position. If you suspect that it might have been turned by accident, you can check the output voltage of the board between OUT+ and OUT- using a voltage meter. The measured voltage between these locations should be +6.5 V.

+6.5 V

GND

+12 V

GND
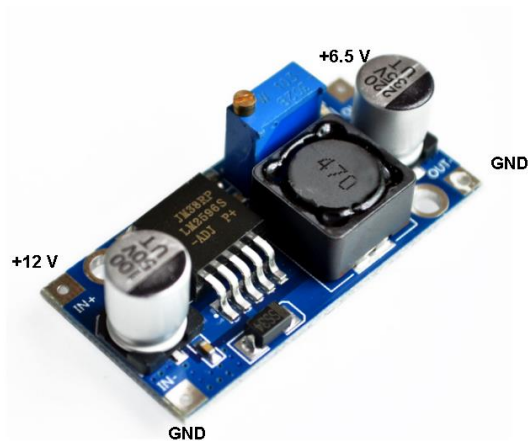
Voltages less than +6.5 V will not allow the motor to produce as much torque. Voltages greater than +6.8 V could damage the motor.

The yellow or white wire of the servo motor should be connected to a PWM output of the microcontroller. The red wire is connected to the +6.8 V line and the black wire is connected to GND.

The provided screws for mounting the base of the AMOS-AirProp are optional, and may not be needed depending on the desired mounting configuration. The typical mounting configuration used for AMOS is to use just 4 of the screws to connect the two base plates together and then epoxy the bottom plate to the outside of the AMOS battery box.

Sample Code

Example source code for the Raspberry Pi shows how to control the speed and direction of the AMOS-AirProp and can be found on the In Nature Robotics support page: https://www.innaturerobotics.com/support

If you have questions about this product or would like to contact In Nature Robotics:

In Nature Robotics Ltd.

116 Ferguson Road,

Hanwell, New Brunswick

Canada   E3E 2E5

Telephone: 506-457-8365

Email: info@innaturerobotics.com

Web: www.innaturerobotics.com

Facebook: facebook.com/InNatureRobotics

Twitter: twitter.com/nature_robotics

LinkedIn: https://www.linkedin.com/company/in-nature-robotics-ltd