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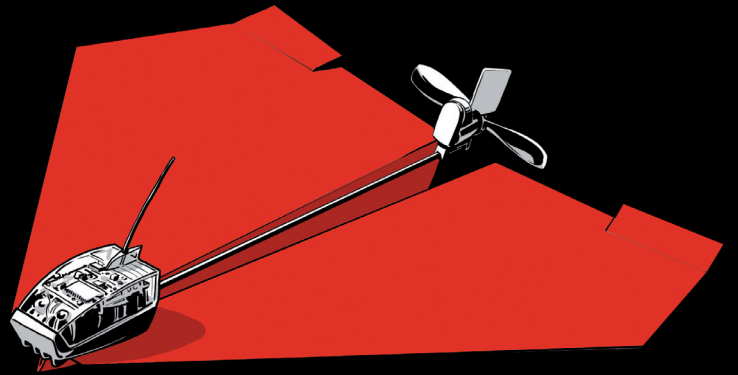
PowerUp® 3.0

Smartphone Controlled Paper Airplane

User Guide



Version 1.0
March 2014

Bluetooth® SMART

PowerUp® 3.0

Smartphone Controlled Paper Airplane

User Guide

www.poweruptoys.com

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Safety Information

Age Recommendation: Not for children under 14 years. This is not a toy. Keep these instructions for future reference - do not discard. Nevertheless, be sure to take the following precautions:

- Individuals with long hair should pull their hair back and fasten it with an elastic band. If hair becomes caught in the propeller, detach the propeller from the motor to release the hair.
- Never allow the propeller to get close to anyone's eyes.
- Before holding the airplane in your hand or making any adjustments to it, move the throttle slider in the smartphone app to minimum so that the propeller stops turning.
- Never hold propeller while throttle is raised. If propeller is jammed reduce throttle immediately. Resolve the reason before raising the throttle again.
- To avoid damaging the PowerUp Smart Module, always attach it to a paper airplane before activating the propeller.

Charging Warnings

Read the following safety instructions and warnings before handling, charging or using the Li-ion battery.

Caution: All instructions and warnings must be followed exactly. Mishandling of Li-ion batteries can result in a fire, personal injury, and/or property damage.

- By handling, charging or using the included Li-ion battery, you assume all risks associated with lithium batteries.
- If at any time the battery begins to balloon or swell, discontinue to use immediately. If charging or discharging, discontinue and disconnect. Continuing to use, charge or discharge a battery that is ballooning or swelling can result in fire.
- Always store the battery at room temperature in a dry area for best results.
- Always transport or temporarily store the battery in a temperature range of -20°C to 35°C. Do not store battery or aircraft in a car or direct sunlight. If stored in a hot car, the battery can be damaged or even catch fire.
- Always charge batteries away from flammable materials.
- Always inspect the battery before charging and never charge damaged batteries.
- Always disconnect the battery after charging, and let the charger cool between charges.
- Always constantly monitor the temperature of the battery pack while charging.
- **Only use charger specficially designed to charge Li-ion batteries.** Failure to charge the battery with a compatible charger may cause fire resulting in personal injury and/or property damage.
- Never cover warning labels with hook and loop strips.
- Never leave charging batteries unattended.

- Never charge batteries outside recommend levels.
- Never attempt to dismantle or alter the charger.
- Never allow minors to charge battery packs.
- Never charge batteries in extremely hot or cold places (recommended between 0°C to 45°C) or place in direct sunlight.

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio and television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

This Class B digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

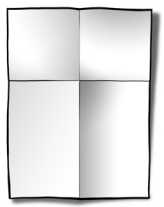
FCC ID: WL2500004TTL

The declaration of conformity and further information can be found at **www.poweruptoys.com**

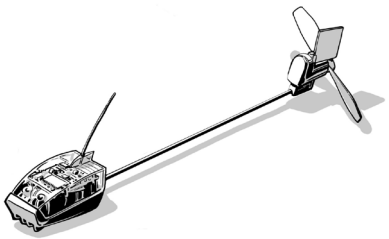
The wheelie bin symbol indicates that the product and batteries must not be disposed of with other household waste, as they may contain elements which can have a harmful effect on the environment and humans. Please use designated collection points of recycling facilities when disposing of the item and the batteries. To help locate your nearest facility, see: www.recyclenow.com

Contents of the Kit

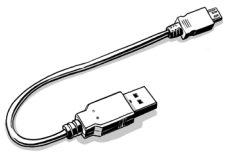
To remove the Smart Module from the packaging, carefully unlatch the rotating tabs that are affixed to the plastic base.



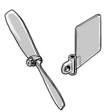
4 A4 colorful printed templates
1 waterproof paper



PowerUp 3.0
Smart module



Micro-USB cable for charging
Smart module

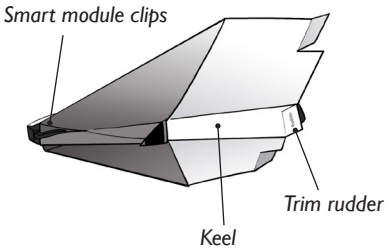


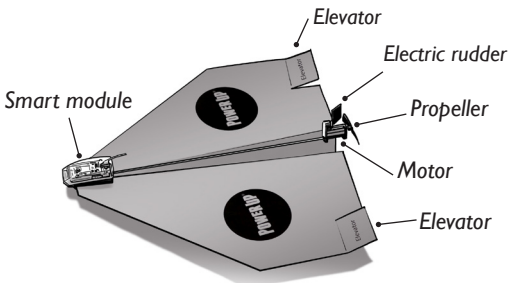
Spare propeller
and Rudder

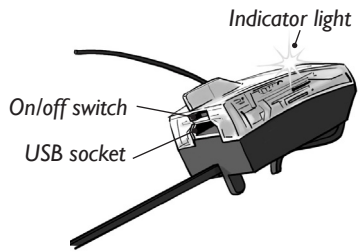
Note: A lithium-ion charger for charging the Smart Module is available separately.

Welcome to the PowerUp 3.0 Smart Module & Smartphone App

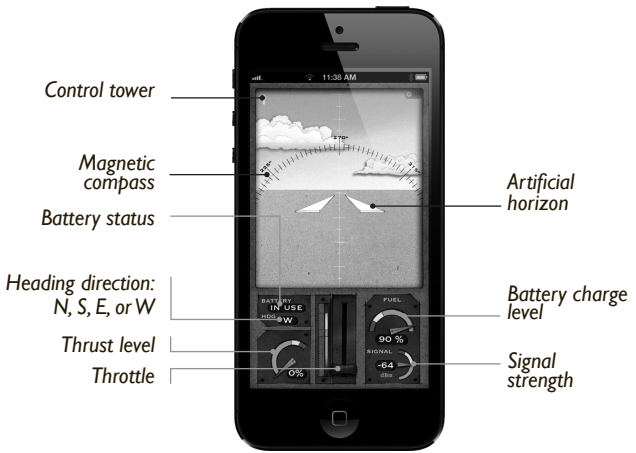
With the PowerUp® 3.0 Smart Module, you can fly the world's first smartphone-controlled paper airplane.







The PowerUp smartphone app enables you to communicate with the Smart Module and control your airplane.

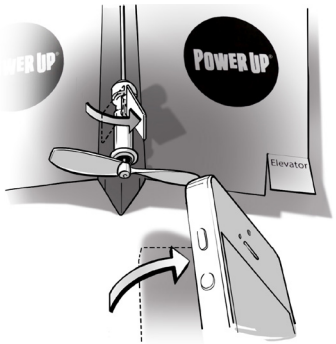


The app is compatible with smartphones that have Bluetooth Smart. For the complete list of compatible smartphones check **www.poweruptoys.com**
For downloading instructions, see the section Before Your First Flight. The throttle controls the motor's thrust. Full thrust makes the airplane climb.

Note: You can raise or lower the throttle by sliding your finger up or down anywhere in the lower part of the screen. You don't have to drag the actual throttle.

Controlling the throttle

Tilting the smartphone makes the airplane bank.



Quick start
video tutorial

Tapping the control tower icon adds some spice to your flight, with simulated announcements from a control tower.

Preflight

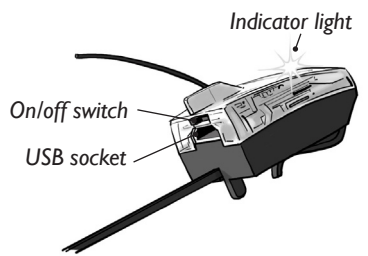
Before Your First Flight

1. Turn on the Smart Module, the indicator light starts to flash.
2. Charge the Smart Module's battery.

Important: If the micro-USB plug is inserted into the Smart Module incorrectly, the plug can damage the module.

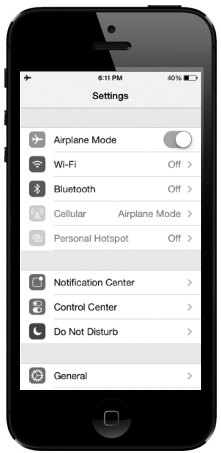
a. Insert the micro-USB plug into the socket on the rear of the Smart Module.
b. Plug the other end of the USB cable into any USB power source (such as a power bank, a computer, or the PowerUp 3.0 lithium-ion charger, available separately).

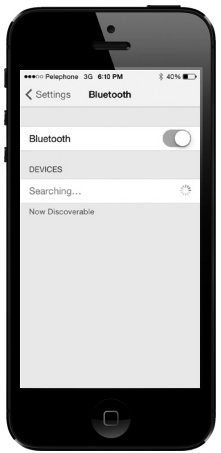
The indicator light on the Smart Module starts to flash rapidly. After about 20 minutes, the Smart Module is fully charged, and the indicator light stops flashing rapidly. A message on the smartphone app will change from **Charging** to **In Use**, fuel gauge will indicate 100%.



For information about the Smart Module's indicator light, see Appendix A page 41: Indicator Light on Smart Module.

3. On your smartphone, turn on Bluetooth.
4. If possible, turn off WiFi in your smartphone, because WiFi can interfere with the Bluetooth connection.





5. Download the PowerUp 3.0 app for your smartphone.

Download free app

6. Open the PowerUp smartphone app.
   The app searches for the Smart Module and automatically prepares it for the first flight. The indicator light on the Smart Module double-flashes. This one-time process takes 3 minutes.

When the double-flashing stops, your PowerUp 3.0 Smart Module is ready for use.

Before Every Flight

1. Fully charge the Smart Module's battery (see the section Before Your First Flight).
2. Turn on the Smart Module.
   The indicator light on the Smart Module flashes slowly.
3. Open the PowerUp smartphone app. The screen says **Searching**.
4. Wait until a connection is established, about 10 seconds.
   A message on the smartphone app says **In Use**, and the indicator light on the Smart Module double-flashes slowly.
5. On the app screen, make sure that the battery level is full.

Note: The battery charge level indicator is only for reference. Always make sure that the indicator light has stopped flashing rapidly before you disconnect the Smart Module from the power source.

Folding a Paper Airplane

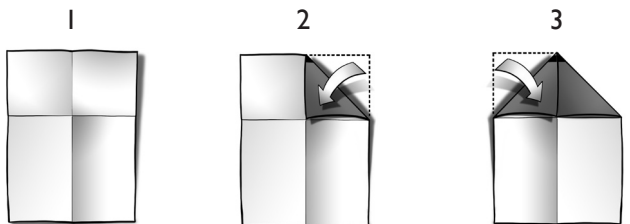
You can download and print various templates from the PowerUp website.

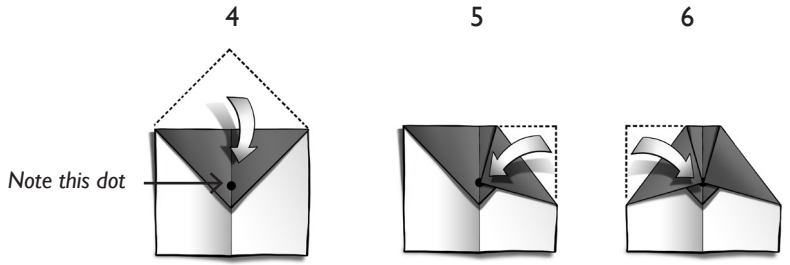
Note: When you print a template, make sure it is in the center of the paper. If not, you're better off making a symmetric airplane than following off center guidelines in the diagram.

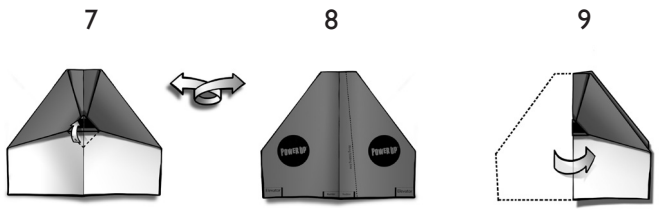
Nakamura airplane folding instructions

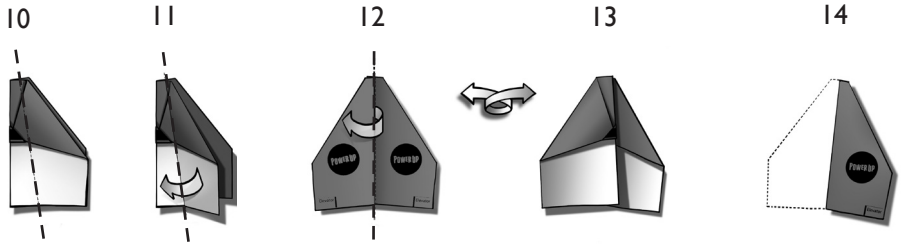
For first flights, we highly recommend that you use the Invader model shown in Appendix D page 47-48: Invader Airplane Folding Instructions.

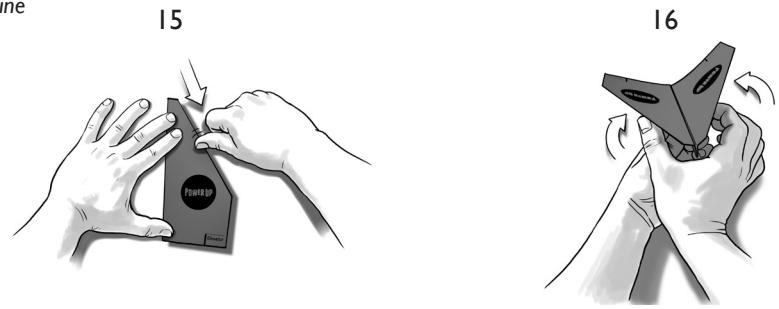
Nakamura Airplane Folding Instructions





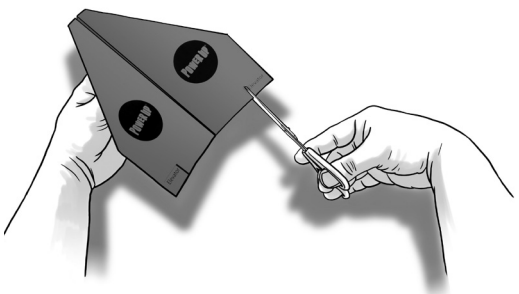




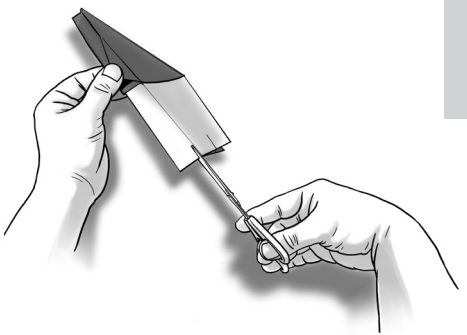


Preparing the Airplane's Control Surfaces

1. Cut elevator tabs

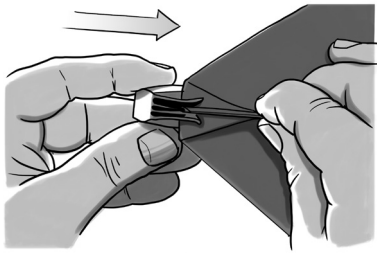


2. Cut a trim rudder

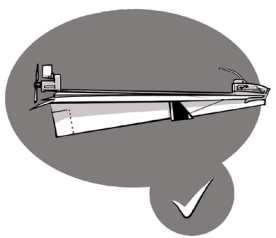


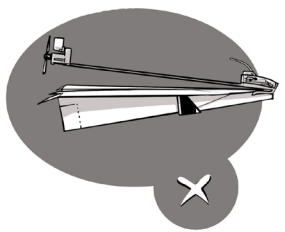
Assembling the Smart Module

Insert the front of the airplane's keel (the nose of the airplane) into the clips of the Smart Module, making sure that the keel goes all the way into the clips. The clips should be on the underside of the plane, and the fin should be between the wings.



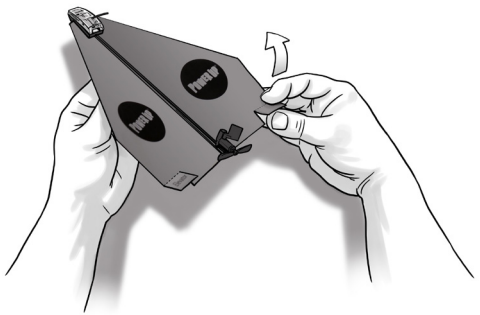
Note: If the rod of the Smart Module sticks out above the body of the airplane, you can tape the rod to the plane.





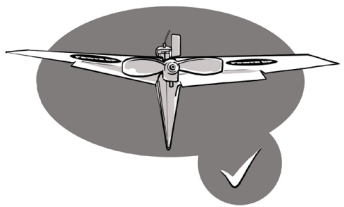
Adjusting the Airplane's Control Surfaces

• **Elevator tabs:** Raise the elevator tabs slightly.

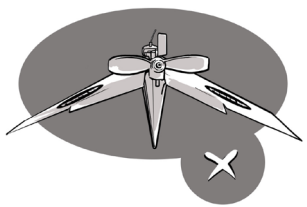


• **Wings:** Raise the wings slightly to create a small dihedral angle.

Dihedral



Anhedral



Test Flights

- **Trim rudder:** Make sure that the trim rudder is slightly to the right to compensate for the yaw caused by the motor torque. This position gives the electric rudder its full range.
- **Check the electric rudder's functionality:** When you tilt the smartphone to the right, the rudder should turn to the right, and vice versa.

Note: If the rudder moves in the wrong direction, follow the instructions in Appendix B: Smartphone App Settings.

Keep in mind:

- The field where you fly should be at least 500 × 500 feet (150 ×150 meters) without obstacles like trees and buildings - for example, a soccer field or baseball field.
- The wind should be calm. Strong wind can cause turbulence.

Testing the Airplane: Motor Off

To make sure that your airplane flies well, first test it without using the motor.

1. Face the wind.
2. Without turning on the motor, launch the airplane into the wind.
3. Observe the flight.
4. Identify the behavior of the airplane, and adjust the control surfaces accordingly (see the section Observe, Identify, Adjust later in this guide).

When the airplane glides steadily, you are ready to fly with the motor running. Do not perform any maneuvers.

Testing the Airplane: Motor On

Your goal in this test is to achieve straight, level flight, without any unwanted behavior by the airplane. Do not perform any maneuvers.

1. Check:
   - Is the battery charged?
   - Are the control surfaces adjusted correctly?
   - Does the electric rudder move correctly when you tilt the smartphone?
2. Face the wind.
3. Choose a distant target to fly to.
4. Double-tap the throttle to unlock it.
5. Raise the throttle until the thrust indicator reaches 60%.
6. Hold your smartphone level, and keep it level during the entire test flight.
7. Launch the airplane with a gentle push.

Note: If it's windy, use very little power to launch the airplane.

8. Observe your airplane until it lands; identify unintended behavior, and adjust accordingly. After a successful straight, level flight, you are ready for your first flight with you in command.

Warning: Whenever the Smart Module is turned on, make sure that the throttle is locked (lock it by double-tapping the screen of the smartphone app). Just before launching the airplane, unlock the throttle (by double-tapping the screen).

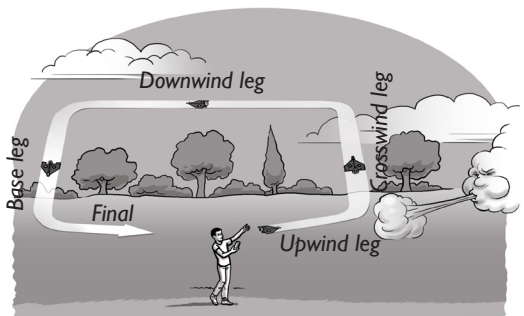
Flight

Planning Your Flight Path

Before taking off, plan your flight path.

A good path for beginners is what pilots call the airfield traffic pattern - the path that pilots follow when approaching an airport or taking off from it. This flight path will help you keep the airplane in range during the flight.

Airfield Traffic Pattern



Taking Off

1. Check:
   - Battery level

Note: If the battery charge level indicator is in the yellow area, you have only about 15 seconds left. Recharge the Smart Module.

   - Control surfaces
   - Electric rudder
2. Face the wind.
3. Double-tap the throttle to unlock it.
4. Set the throttle to 70%-75% thrust.
5. Hold your smartphone level.
6. Launch!

Flying

Flying at a Constant Altitude

The power from the Smart Module's motor controls your airplane's altitude. When the throttle is high, the plane ascends. When the throttle is low or all the way down, the airplane descends (or glides).

Note: The amount of thrust that the airplane needs varies according to the wind conditions and the particular paper airplane that you are using.

- When the airplane is in the air, adjust the thrust gradually (using the throttle) until you find the right amount of thrust to keep the airplane flying at a constant altitude.

Banking

- To turn your airplane, tilt your smartphone gently to the left or right until the airplane is going in the desired direction, and then hold your smartphone level.

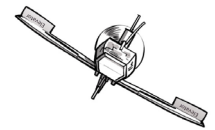
Note: If FlightAssist is turned on, the thrust adjusts automatically to keep your airplane flying steadily while it is banking. This automatic adjustment is necessary because lift is lost when the wings are not level.

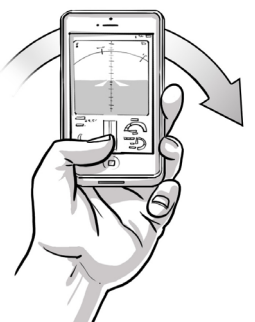
Controlling an Airplane When It Is Coming Toward You.

The biggest challenge with remote-controlled flying is controlling the airplane when it is coming toward you. When trying to make a left turn, you might end up making a right turn instead.

To control an airplane when it is headed toward you, try one of these methods:

- Make the airplane level by tilting your smartphone to the side with the lower wing.
- Hold your smartphone in the exact direction of the airplane, and keep your phone in that position.





Tilt the smartphone to the lower wing side to make the airplane level

You will have to move all the time so that your body stays in the same direction as the airplane. If the airplane is behind you, turn only your head to see the plane. When your body is imitating the airplane's direction in this way, controlling the airplane should be easier.

Landing

If you are following the airfield traffic pattern (see page 26), the airplane will be headed toward you on your final approach. To maneuver the plane more easily in such a situation, follow the recommendations in the section Controlling an Airplane When It Is Coming Toward You.

1. To land safely, direct your airplane to a soft area of the ground.
2. Set the thrust to 0%.
3. Wait for the airplane to land, and then double-tap the app screen to lock the throttle.

Important: Never pick up your airplane by the wings. Grasp it only by the Smart Module or the keel.

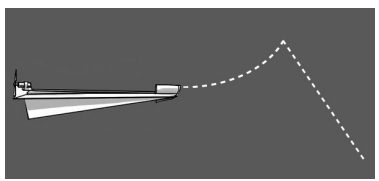
4. If this is your last flight of the day, turn off the Smart Module.

Observe, Identify, Adjust

Your first attempts may not succeed, but by making the right adjustments, you will eventually get your airplane to fly perfectly. The key steps to improving your airplane's flight are observe, identify, adjust, and try again.

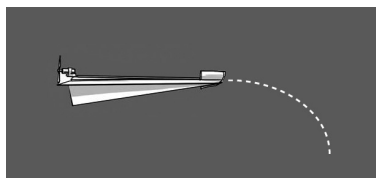
Observe carefully to determine what the airplane is experiencing during flight, and then make the suggested adjustments.

Stalling



What to do: Lower the elevators slightly.

Diving

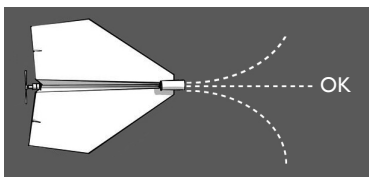


What to do: Raise the elevators an equal distance.

Flying Upside Down (Inverted)

If your airplane is flying upside down, there is no way to turn it right-side up during flight. To prevent an airplane from flying upside down:
Make sure that the airplane's wings form a dihedral angle. (see page 21)

Unwanted Left or Right Banking



1. Make sure that your smartphone is level.
2. To correct left banking, gently tilt the trim rudder to the right.
   To correct right banking, gently tilt the trim rudder to the left.

Correcting Problems

To solve problems that occur before and during flight, follow the recommendations in this section in the order in which they appear.

Failure to Charge

What you see:

The Smart Module is connected to a power source, but the module's indicator light does not flash rapidly.

What you should do:

1. In the smartphone app, check whether the battery is fully charged. If it is, the indicator light does not flash rapidly.
2. If you are using a charger, make sure that it is charged and properly connected to the Smart Module.
3. Connect the cable to another device to check whether the cable is damaged. If so, replace it.
   If the problem persists, your Smart Module is damaged.

No Communication Between Smart Module and App Before Flight

What you see:

- The smartphone app continues to say **Searching**.
- The app shows signal strength and battery charge level at 0.

What you should do:

1. In your smartphone, make sure that Bluetooth has been turned on.
2. In your smartphone, turn off WiFi.
3. If the problem persists, follow the procedure in the section Loss of Communication During Flight.

Loss of Communication During Flight

What you see:

- The motor stops working, the electric rudder aligns with the keel, and the airplane stops responding.
- The smartphone app says **Searching**.
- The app shows signal strength and battery charge level at 0.

What you should do:

- Restart the smartphone app, and wait while it reconnects with the Smart Module.

If the problem persists:

a. Close the app, and turn off the Smart Module.
b. Turn on the Smart Module.
c. Open the smartphone app.

- If the problem persists, restart your smartphone, open the PowerUp app, and wait while it reconnects with the Smart Module.
  If the problem persists, your Smart Module is damaged.

Total Loss of Control with Uninterrupted Communication

What you see:

- The airplane does not respond to your commands.
- The smartphone app does not say searching.
- The smartphone app shows the signal strength and battery charge level.

What you should do:

1. Restart your app and the Smart Module.
2. Wait while the smartphone reconnects with the Smart Module.

3. If the problem persists, replace the Smart Module.

Loss of Control of the Rudder

What you see:

The airplane does not bank when you tilt your smartphone, but the motor still responds.

What you should do:

1. Lower the throttle to 0 (turning off the motor), and land.
2. Check the rudder. If it is stuck, gently release it.
3. If the problem persists, replace the rudder.
4. If the problem persists, your smart module is damaged

Loss of Control of the Motor

What you see:

The motor does not respond to your commands, but the rudder does.

What you should do:

1. Land the airplane.
2. If the propeller is stuck, gently clean it.
3. If the problem persists, replace the propeller
4. If the problem persists, your smart module is damaged

Incoming Calls During Flight

An incoming call can be a distraction while you are flying your airplane. To avoid receiving calls, it is recommended that you set your smartphone to flight mode. If you do receive a call during flight, the PowerUp app continues to function:

- You can tilt your phone to control the airplane.
- Thrust is maintained at the same level throughout the call.

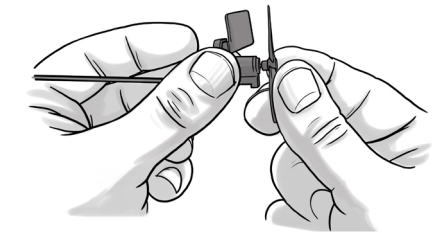
When the call ends, the smartphone displays the PowerUp app and you continue flying as usual.

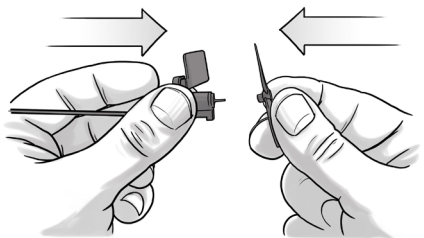
Maintenance

Attaching the Propeller

If the propeller gets detached from the motor or becomes damaged, follow these steps to reattach your propeller or install a new one.

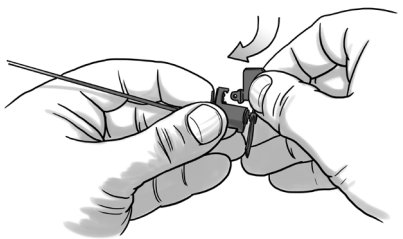
1. Turn off the motor.
2. Hold the propeller so that the side with the bump is facing the electric rudder, and attach the propeller to its shaft.

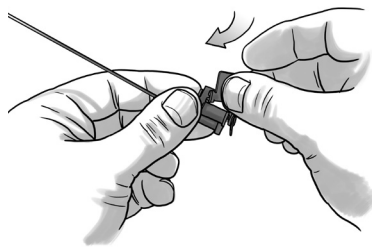




Reinstalling the Electric Rudder

1. Insert the upper mount pin on the rudder into the upper hole.
2. Gently push the rudder into its proper position between the lower and the upper holes.





Dos and Don'ts of Flying

Dos

- Make adjustments gradually, correcting one problem at a time.
- Ensure that the airplane flies well before you install the Smart Module. Start by folding some paper airplanes and trying them out until your model is ready for its first motorized flight.
- Use a PowerUp template for folding an airplane, and make sure that the template is printed in the center of your paper.
- When all else fails, fold a new airplane! Also fold a new one if your airplane gets bent out of shape after several flights.

Don'ts

- Do not land your airplane on hard surfaces. They may damage the PowerUp Smart Module.
- Avoid flying in windy conditions. Strong wind can cause turbulence.
- Never hold your airplane by the wings. Grasp it only by the Smart Module or the keel.

Appendix A: Indicator Light on Smart Module

Indicator Light	Meaning
Slow flashing	The Smart Module is searching for a Bluetooth connection with your smartphone.
Rapid flashing	• The Smart Module is charging. • On first use of the Smart Module, this mode also indicates that a firmware update is taking place.
Double-flashing	A Bluetooth connection between the smartphone and the Smart Module has been established.
No flashing	The battery is completely empty.

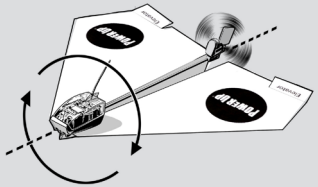
Appendix B: Smartphone App Settings

Touch and hold anywhere in the artificial horizon window on the upper part of the screen to bring up the Settings screen.

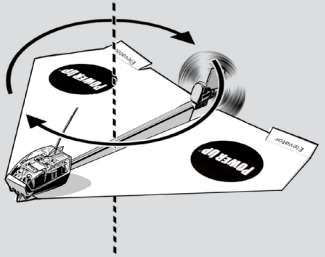
- Rudder – Not in use.
- Trim (angle) – Not in use.
- Reverse – Changes the direction in which your rudder moves when you tilt your smartphone (in the rare case that the rudder is wired in the wrong direction).
- Flight Assist – When turned on, increases thrust during banking to compensate for lift loss. In this way, Flight Assist helps maintain the airplane's altitude when it is banking.

Appendix C: Glossary

Term	Definition
Anhedral and dihedral	See illustrations on page 21.
Bank	A change in the direction of an airplane, occurring at a constant rate.
Control surface	A moveable part (located on the back of a wing) that enables a pilot to change the airplane's attitude. By adjusting a control surface, the pilot increases or decreases the lift force that the wing creates.
Elevator	A control surface that is located on the back of a wing.

Term	Definition
Glide	A flight pattern in which the airplane descends without the motor running and uses air speed to create lift.
Inverted	A flight pattern in which the airplane flies upside down.
Roll	

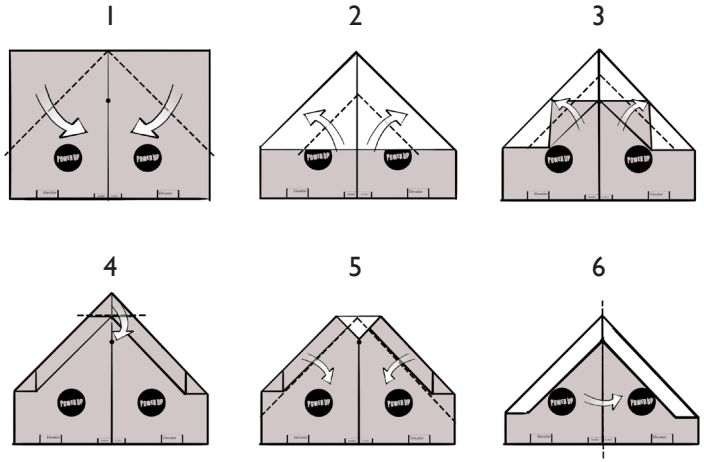
Term	Definition
Rudder	A control surface on the back of the vertical wing. In paper airplanes, the rudder is at the back end of the keel and creates yaw (which causes banking).
Throttle	A lever that controls the amount of thrust.
Thrust	The force created by the motor's rotation of the propeller.
Torque	A force created by a rotating mass.
Trim	A mechanical process that balances the forces on a the airplane when the pilot adjusts a control surface.

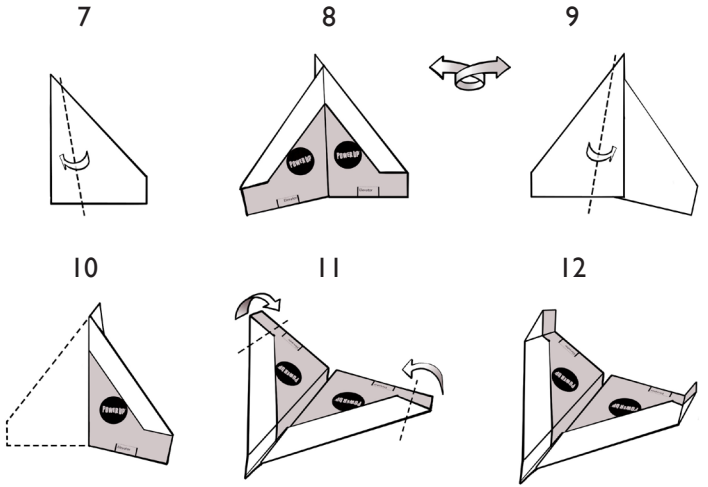
Term	Definition
Trim rudder	On PowerUp paper airplanes, a rudder that you make by cutting the keel. The trim rudder eliminates the effect of the motor's torque on the airplane.
Yaw	

Appendix D: Invader Airplane Folding Instructions

For first flights, we highly recommend that you use the Invader model, shown here.

Invader airplane folding instructions

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