# ROBOTICS SMART MACHINES

# 5-IN-1 BUILDABLE DRONE with HD CAMERA











## WARNING!

Read this entire manual before use, including all of the safety rules on page 2, to familiarize yourself with the proper use of this product. Failure to operate the product correctly may result in damage to the product or personal property and may cause serious injury. HELPFUL VIDEO!

Scan this QR code to view a video of helpful tips for using and flying your camera drone.



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Checklist:

J No.	Description	Qty.	Part No.	J	No.	Description	Qty.	Part No.
O 1	Anchor pin, black	20	7344-W10-C2D	0	22	5x3 L-rod, left	1	7066-W10-C2S
O 2	Joint pin, blue	3	7413-W10-T1B	0	23	Small gear	2	7026-W10-D2S
O 3	Connector pin, gray	10	1187-W10-E1S2	0	24	Medium gear	2	7408-W10-D2S
Ο4	Long connector, gray	2	7066-W10-A1S	0	25	Medium spindle gear	1	7408-W10-D1Y
O 5	Washer	1	R12#3620	0	26	Worm	2	7344-W10-A1S
O 6	Axle, 35 mm	2	7413-W10-01D	0	27	Large annular gear	2	7066-W10-F1S
O 7	Axle, 60 mm	2	7413-W10-M1D	0	28	Mini gear	4	7066-W10-F3S
08	Axle, 70 mm	2	7061-W10-Q1D	0	29	Large pulley wheel	2	7344-W10-N1Y
09	1-hole connector	2	7430-W10-B1D	0	30	Large O-ring	2	R12-09S
O 10	3-hole dual rod with pegs	1	7404-W10-B1S2	0	31	Motor and arm assembly, left	2	7066-W85-A1
O 11	3-hole cross rod	2	7026-W10-X1Y	0	32	Motor and arm assembly, right	2	7066-W85-A2
O 12	3-hole wide rounded rod	4	7404-W10-C1D	0	33	HD Camera	1	7066-W85-C-U
O 13	5-hole flat rounded rod	2	7443-W10-C1S1	0	34	Controller box	1	7066-W85-B
O 14	5-hole rod	3	7413-W10-K2SK	0	35	Lithium battery (3.7V)	1	7066-W85-D
O 15	5-hole cross rod	1	7413-W10-R1Y	0	36	LED light	1	7066-W85-E
O 16	5-hole dual rod	4	7413-W10-W1SK	0	37	Set of 4 propellers	2	E41#7066
O 17	7-hole flat rounded rod	4	7404-W10-C3D	0	38	Small part separator tool	1	7066-W10-F2S
O 18	7-hole wide rounded rod	4	7404-W10-C2D	0	39	Part separator tool	1	7061-W10-B1Y
O 19	Square frame	2	7413-W10-Q1D	0	40	Propeller shield ring	4	7066-W10-E1D
O 20	3x13 dual frame	2	7406-W10-A1S	0	41	Micro USB cable	1	E30#7066A
O 21	5x3 L-rod, right	1	7066-W10-C1S	0	42	Storage case (not pictured)	1	K40#7066

# GENERAL WARNINGS

WARNING. Only for use by children aged 8 years and older, due to accessible electronic

components. Instructions for parents or other supervising adults are included and have to be observed. Keep packaging and instructions as they contain important information.

WARNING. Not suitable for children under 3 years. Choking hazard — small parts may be swallowed or inhaled.

Store the experiment material and assembled models out of the reach of small children.

# **DRONE WARNINGS**

Stay away from rotating propellers and motors! Do not touch them!

Use the drone with caution! Skill is required in order to control the flight and avoid collisions with the user, objects, or third parties.

Always maintain a visual line of sight to your drone when flying.

Always pay complete attention to the drone when flying. Do not get distracted.

When running a programmed flight path, always be ready to take control of the drone or press the emergency stop button if necessary.

We recommend using this drone indoors. If you do fly it outside, make sure the weather is calm. Do not fly the drone in wind conditions above a gentle breeze (Beaufort scale 3; 12 mph wind speed) or in temperatures outside of the range of 32 ° to 104° F.

Make sure that you follow all federal and local laws and guidelines for drone operation. Do not fly in "no fly zones." You can research this online. You will need to register your drone to fly under The Exception for Recreational Flyers in the United States. Visit the FAA Drone Zone online to register. Mark your drone with your registration number.

For registration reference, this drone weighs less than 0.55 pounds (250 grams). Check the applicable registration laws in your country and local area.

Make sure the flying location is clear of magnetic and radio interference, and buildings, trees, power lines, and other obstacles.

Do not fly near people or animals, or above crowds.

Do not fly at altitudes above 400 feet.

The drone might not fly well in locations more than 13,000 feet above sea level.

An optical flow sensor on the bottom of the drone helps the drone orient itself. This sensor doesn't work well on all surfaces, which may cause flying errors. Shiny, reflective, or wet surfaces, or surfaces with small repeating patterns, may cause problems with flight.

When the battery gets low, land the drone in a safe location and recharge it.

When flying, the battery charge lasts for about eight to ten minutes and then it needs to be recharged. It takes 2 to 3 hours to charge the battery (until the red light on the battery turns off).

Do not use if any of the parts are worn, chipped, or damaged.

Make sure that the propellers are securely mounted onto the motors before use.

#### Safety for Experiments with Batteries

»» To operate the models, you will need one lithium battery (3.7V) which is included in the kit.

>>> The battery is not replaceable.

>>> The supply terminals are not to be shortcircuited. A short circuit can cause the wires to overheat and the batteries to explode.

>>> Different types of batteries or new and used batteries are not to be mixed.

>>> Batteries are to be inserted with the correct polarity. See page 8.

>>> Rechargeable batteries are only to be charged under adult supervision.

»» Dispose of used batteries in accordance with environmental provisions, not in the household trash.

>>> Be sure not to bring batteries into contact with coins, keys, or other metal objects.

>>> Avoid deforming the batteries.

As all of the experiments use batteries, have an adult check the experiments or models before use to make sure they are assembled properly. Always operate the motorized models under adult supervision.

#### DC Power Supply (Not Included)

A USB power adapter is required to charge the lithium battery.

>>> The transformer or a power supply used with the toy shall be regularly examined for damage to the supply cord, plug, enclosure or other parts, and in the event of damage, it shall not be used until the damage has been repaired.

>>> The toy shall only be used with a transformer for toys or a power supply for toys.

>>> The transformer is not a toy.

#### Notes on Disposal of Electrical and Electronic Components

The electronic components of this product are recyclable. For the sake of the environment, do not throw them into the household trash at the end of their lifespan. They must be delivered to a collection location for electronic waste, as indicated by the following symbol:



Please contact your local authorities for the appropriate disposal location.

## **IMPORTANT INFORMATION**





# Dear parents and adults,

Children want to explore, understand, and create new things. They want to try new things and they want to do this on their own. They want to gain knowledge! They can do all of this with Thames & Kosmos experiment kits. With every single experiment, they grow smarter and more knowledgeable.

With this experiment kit, you and your child can work together to build an experimental robotic drone and other camera-enabled robotic devices. Flying toys and drones have a unique set of safety precautions that you must follow to ensure that no harm comes to people and animals — and nothing else is damaged during use. Before building and experimenting, read the instructions together with your child and discuss the safety instructions. Support your child with advice and a helping hand, especially during tricky assembly steps. You absolutely must supervise your child during all drone flights. Before flying, make sure the model is securely assembled and that you have chosen a suitable location for flying, in which drone flying is allowed. The drone is primarily meant for indoor use, but if you do fly it outside, make sure that it's not windy. We hope you and your child have a lot of fun building and experimenting with the drone and other robotic models in this kit.

# GENERAL TIPS

USE THE PART SEPARATOR TOOLS TO SEPARATE PARTS THAT ARE DIFFICULT TO SEPARATE WITH JUST YOUR FINGERS. THE SMALLER GRAY TOOL IS USED TO REMOVE THE MINI GEARS AND PROPELLERS FROM THE MOTOR SHAFTS. THE LARGER YELLOW TOOL IS USED TO PRY APART LARGER PARTS, LIKE ANCHOR PINS AND RODS.

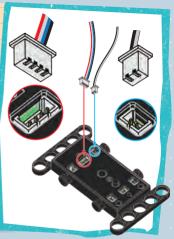






See the inside back cover for more tips on using the part separator tool.

WHEN PLUGGING THE CABLES INTO THE SOCKETS, PAY CLOSE ATTENTION TO THE DIRECTION OF THE PINS INSIDE THE SOCKETS. THE PLUGS CAN ONLY BE INSERTED IN ONE DIRECTION.



A quadcopter is a helicopter with four rotors. A rotor is a propeller that is spun around by a motor on a shaft. The four rotors in a quadcopter work together to allow it to hover and move through the air. By increasing or decreasing the speed of some or all of the rotors, the quadcopter can move in any direction. A quadcopter is a robotic device because it requires a central processing unit and sensors to control the speed of its motors to stay balanced and move through the air. Because they can hover in one spot and move around in a precise way, quadcopters are perfect for carrying eameras to take aerial photos and videos.

Eye in the Sky

Say Cheese!

abatic

# DOWNLOADING AND INSTALLING THE APP

To control and program the drone and other robots in this kit, you will need a free app. You can download the app for iOS devices from the iOS App Store, or for Android devices from Google Play.

For device requirements, see the information section on the app's download pages.

To get the app:

- 1. Scan the QR code to the right to take you to the product page for this kit (or search for the "Robotics Smart Machines Drone app").
- 2. On the product page, scroll down until you see the downloads section containing the app icon. Follow the links for the correct app store based on your device.
- 3. Follow the steps on the app download page to download and install the app on your device.
- 4. Open the app and the main menu will appear.

# **ESTABLISHING A WI-FI CONNECTION**

The app communicates with the robot (the drone) via a Wi-Fi connection. After you have assembled your robot (pages 8 and on), follow these steps to connect it to the app:

- 1. Make sure the robot is powered on and was recently charged.
- 2. Go to the Wi-Fi (or wireless) settings on your device (tablet or smartphone).
- 3. Look for the network named "Drone-" followed by some numbers. This is your robot's unique ID number. Select this network to connect to your robot.
- 4. If you don't see the network, power down your device and the robot, remove and replug in the camera wire, and turn the device and the robot back on.

# Robotics: Drone



Scan this QR code to visit the product web page to find links to the app.



# TROUBLESHOOTING THE WI-FI CONNECTION

If the wireless connection isn't working:

- Make sure the battery is fully charged and the robot is turned on (the LED light is blinking).
- Make sure Wi-Fi is enabled on your device and that your smart device satisfies the device requirements on the app download page.
- Try restarting the app, the device, and/or the robot.
- Try disconnecting and reconnecting the camera wire and/or the battery to reset the robot.
- Visit the tech support section of thamesandkosmos.com
- Contact our tech support team. (See back cover.)

# **USING THE APP**

Here is an overview of the controls in drone remote control mode. Use this mode with the drone only. Read the safety rules on page 2 and the flying instructions on page 11.

- 1. Return to main menu
- 2. Take photo
- 3. Take video
- 4. Motion control: Steer the drone by moving your smart device
- 5. Flight speed setting: Set the speed at which the drone moves.
- 6. 360 flip: The drone will do a somersault in the air. Flight speed must be set to medium or fast.
- 7. Track flight route: Draw a path in the app for your drone to follow.
- 8. LED status: Controls the light on the drone
- 9. Setup menu:
  - 10. Rotate screen
  - 11. Split screen (helpful for VR viewing)
  - 12. Reset the drone's balance
  - 13. Show/hide remote control interface

### Drone remote controls (B):

- 14. Rotate counterclockwise
- 15. Rotate clockwise
- 16. Go up (away from floor)
- 17. Go down (toward floor)

18. Auto take off: Press this when you want your drone to take off and hover

19. Selfie mode: Speak the voice command "photo" and the drone will take a picture 20. Auto landing: Press this when you want

your drone to lower itself back to the floor 21. Go left

- 22. Go right
- 23. Go forward
- 24. Go backward

**25. Rotation (yaw) trim:** If your drone keeps turning to one side, use this to compensate

26. Emergency stop

**27. Left/right trim:** If your drone keeps drifting to one side, use this to compensate

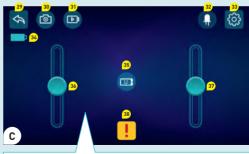
**28. Forward/backward trim:** Same as left/ right trim, but on the forward/backward axis

**Remote controls for the other models (C):** Use these controls to power the motors for the other models you can build in this kit.

Find your photos and videos in the media folder (D).

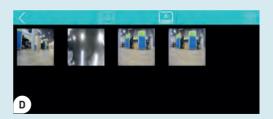












Using the App

# **PROGRAMMING THE DRONE WITH THE APP**

You can program your drone to follow a predetermined set of instructions in the **drone programming** mode. Here's an overview of the controls in this mode:

- 1. Return to main menu
- 2. Take photo: When the program is running, you decide when the drone takes a photo by pressing this button.
- **3. Take video:** Manually start and stop the video capture when the program is running.
- Program sequence area: This is where the active program commands are arranged in order from left to right.
- 5. Change the LED status
- 6. Emergency stop

#### Program commands:

- 7. Rotate counterclockwise 90 degrees
- 8. Rotate clockwise 90 degrees
- 9. Go up half a meter (about 1.5 feet)
- 10. Go down half a meter
- 11. Go left half a meter
- 12. Go right half a meter
- 13. Go forward half a meter
- 14. Go backward half a meter
- 15. Start (run) the program
- 16. Stop the program
- 17. Save the program. Saved programs can be accessed via the program menu (20).
- 18. New command steps are entered into the blank space in the program sequence area (18).

# Here's an example that shows you how to write a program:

- A. In programming mode, the program always starts with the take off command (19).
- B. Press the **go up** button to enter a command into the program that will tell the drone to go up half a meter (21).
- C. Add a go forward command (22).
- D. Add another go forward command, and then a **go right** command (23).
- E. Add a rotate clockwise command (24).
- F. After tapping start to run a program, you need to swipe the unlock bar (25) to confirm that you want to run the program and it is safe to do so. Make sure you follow all of the safety rules on page 2 and the general flying instructions on page 11.



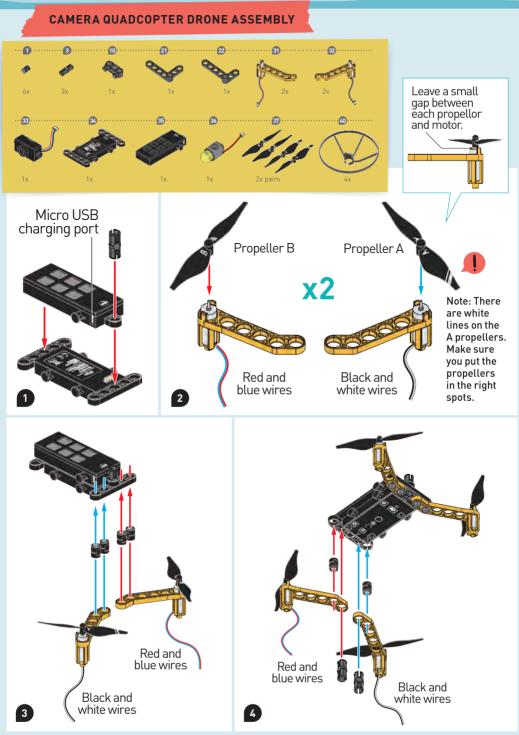


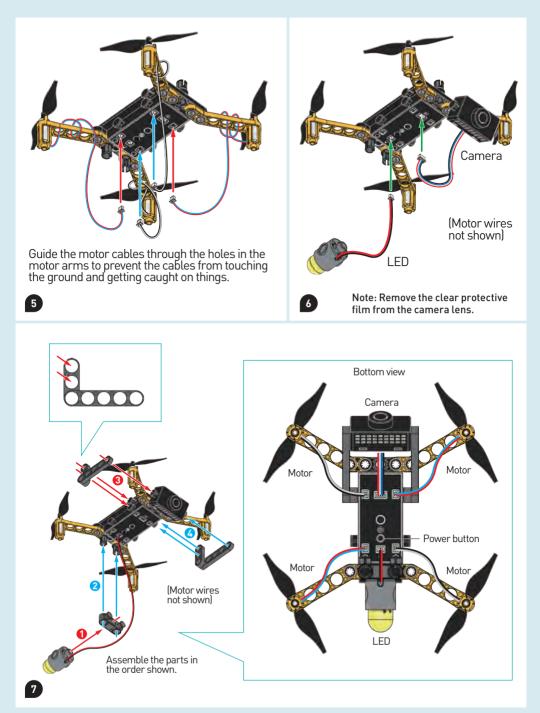




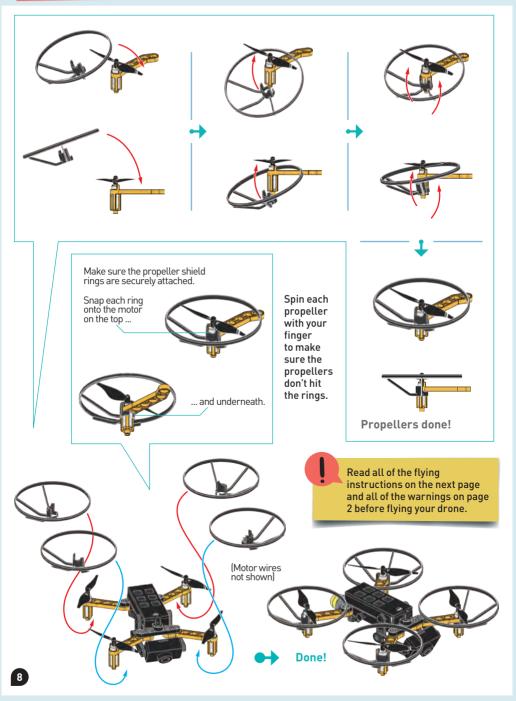








# CAMERA QUADCOPTER DRONE ASSEMBLY



# FLYING YOUR CAMERA QUADCOPTER DRONE

- Before flying your drone, read all of the warnings and safety info on page 2 and perform a final preflight check, making sure that:
  - a. all of the pieces of the model are **securely attached**, especially the propellers,
  - b. the **motors cables** are threaded through the holes in the motor arms and completely out of the way of the propeller, and
  - c. the battery is fully charged. Use the included micro USB cable and your own USB power adapter to charge the battery. It takes 2-3 hours to charge. It is fully charged when the red light on the battery goes out.
- 2. Press the **power button** on the bottom of the drone for **two seconds** to turn it on. The LED light will flash on and off
- Place the drone in a wide open area. Then stand at least six feet behind the drone at all times.



- 4. Connect to the **drone's** Wi-Fi network from your device settings. It will be named "Drone-" followed by your drone's unique ID number.
- Open the Robotics: Drone app. The main menu will appear on screen.
- Tap the button for the drone remote control mode. The drone remote control mode opens and you should see live-streaming images from the drone's camera.
- Tap the auto takeoff button. The drone will immediately lift off the floor to a height of about 5 feet. See the diagram to the right for a description of what is happening when the drone is hovering.
- Use the controls in the control pads to fly the drone. See the next page for descriptions of the controls. Tap and slide the circle in the center of



the control pad in the desired direction. Start slowly to get a feel for how the drone responds to the commands and so that it doesn't fly out of control.

- Tap the take photo button or take video button to take a photo or video. You will need to give the app access to your device's photo/video library when you do this the first time.
- 10. To land the drone, press the **auto landing** button.
- 11. If there is an emergency and you need to stop the drone immediately, press the **emergency stop** button.



12. To turn off your drone, press and hold the **power button** on the bottom of the drone for two seconds, until the LED light goes out.



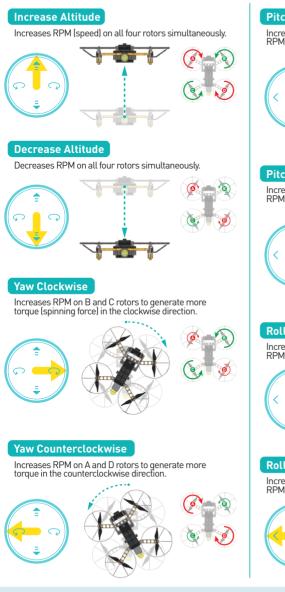
# HOVER

The A and D rotors rotate clockwise. The B and C rotors rotate counterclockwise. The RPM of the four rotors is the same. The RPM is enough to provide lift to make the drone hover. The torque is in equilibrium so there is no

The torque is in equilibrium so there is no yaw (turning).

RPM = Revolution(s) Per Minute (a measure of speed)

Here is an explanation of the resulting behaviors when you slide the circles on the control pads in each of the four directions:



## Pitch Forward

Increases RPM on C and D (rear) motors, and/or decreases RPM on A and B (front) motors, to move forward.



## Pitch Backward

Increases RPM on A and B (front) motors, and/or decreases RPM on C and D (rear) motors, to move backward.





## **Roll Right**

Increases RPM on A and C (left) motors, and/or decreases RPM on B and D (right) motors, to move right.

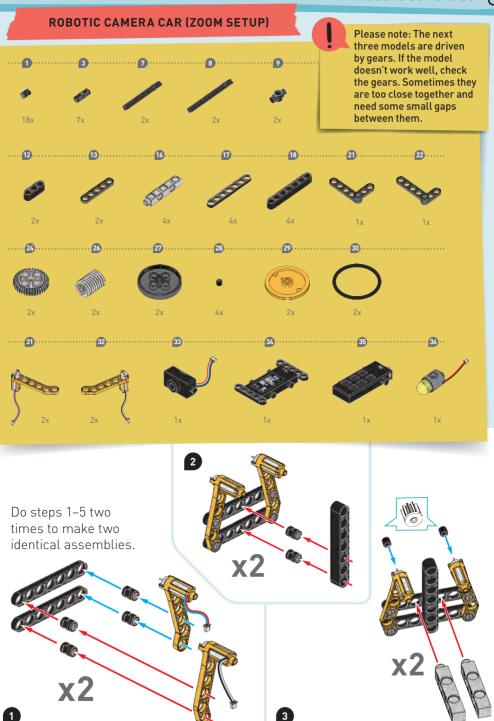


# Roll Left

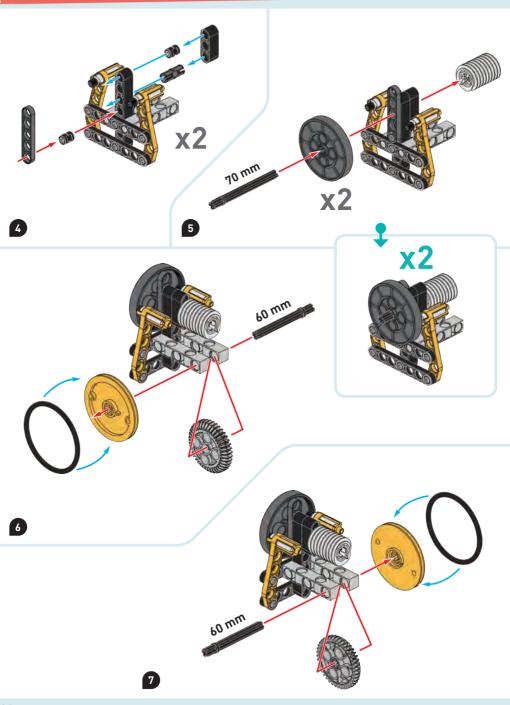
Increases RPM on B and D (right) motors, and/or decreases RPM on A and C (left) motors, to move left.

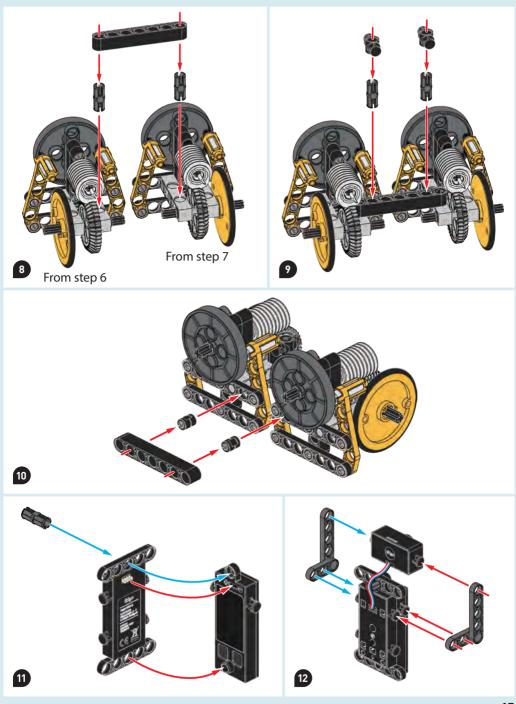


To program your drone to fly in a preset pattern, see the programming information on page 7.

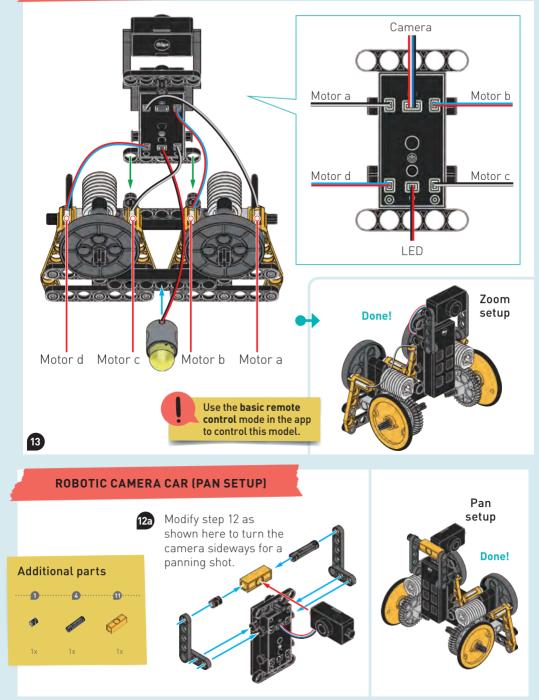


# **ROBOTIC CAMERA CAR (ZOOM SETUP)**

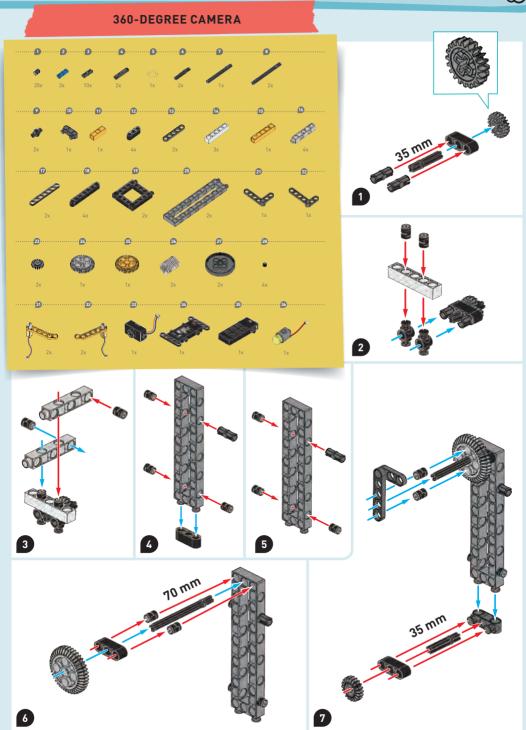




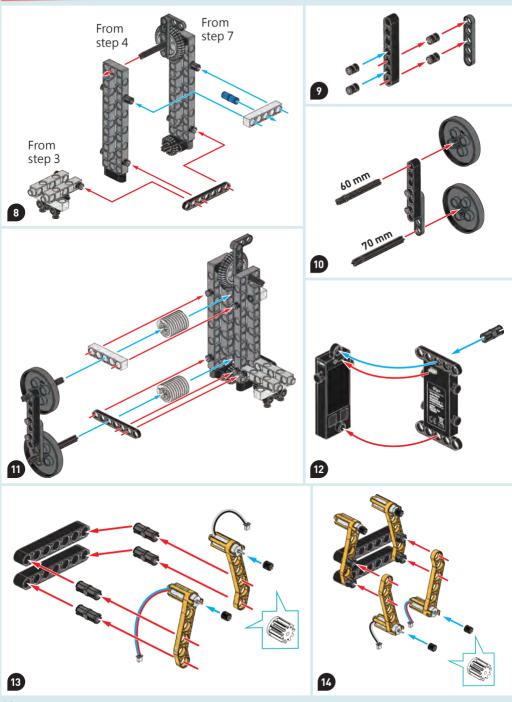
# **ROBOTIC CAMERA CAR (ZOOM SETUP)**

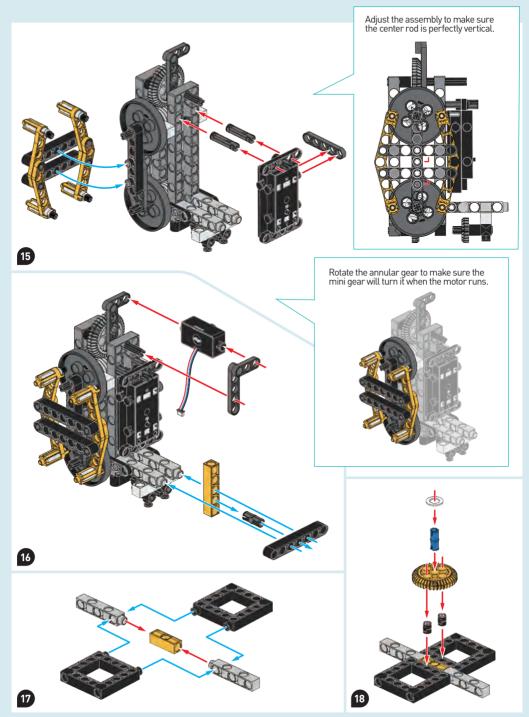


360-Degree Camera 🔗

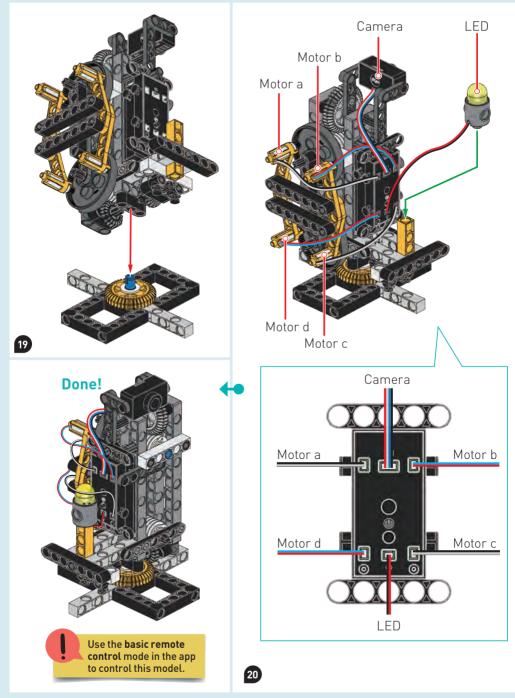


# **360-DEGREE CAMERA**

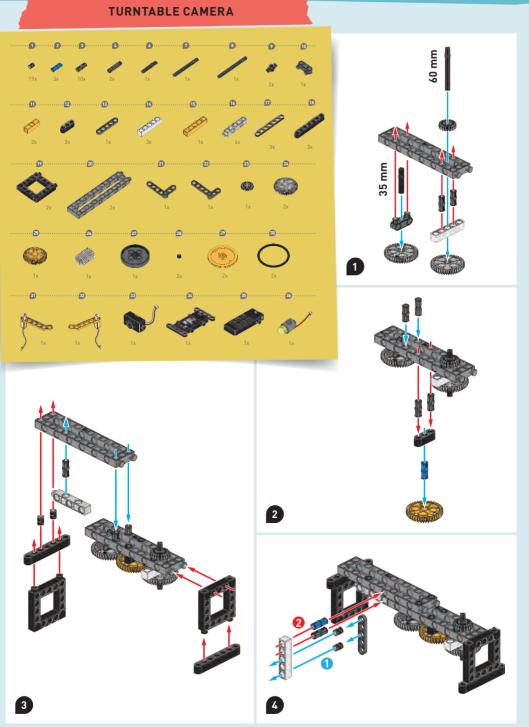




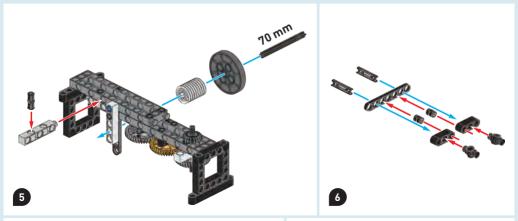
## **360-DEGREE CAMERA**

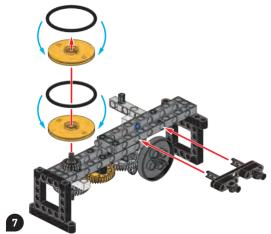


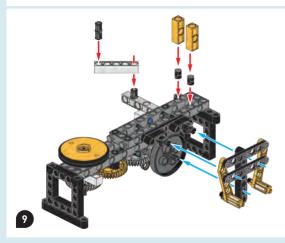
Turntable Camera 🔗

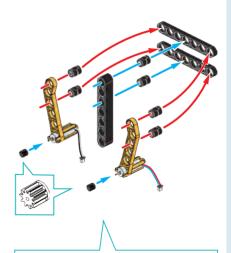


# TURNTABLE CAMERA

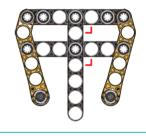




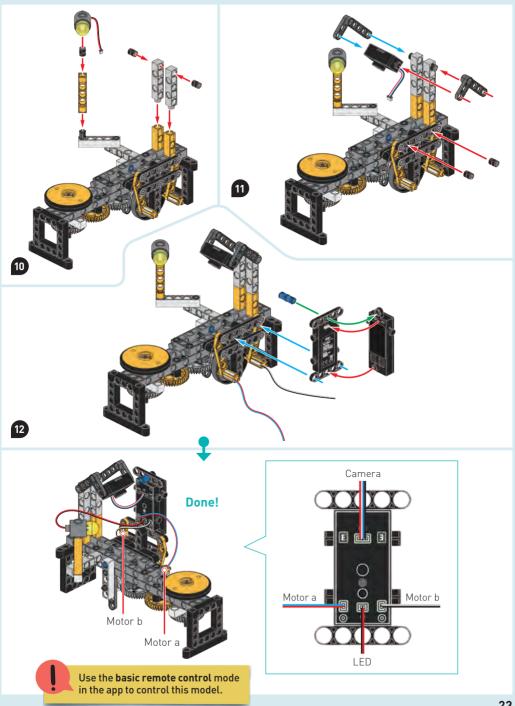


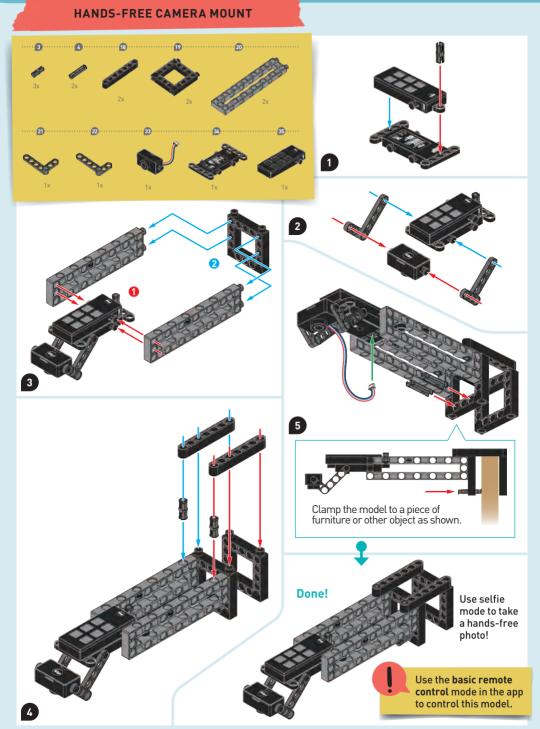


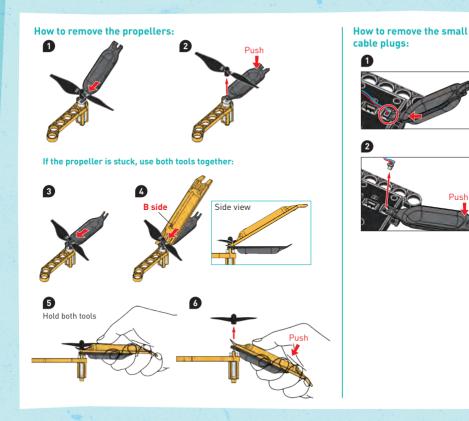
Adjust the assembly, making sure the center rod is perfectly vertical.



8







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#### FCC Part 15 Statement

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 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 Bidigital 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 or 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 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

#### FCC RF Exposure Statement

To comply with the FCC RF exposure compliance requirements, this device and its antenna must not be co-located or operating in conjunction with any other antenna or transmitter.

For body worn operation, this device has been tested and meets FCC RF exposure guidelines when used with an accessory that contains no metal and that positions the device a minimum of 20 cm from the body. Use of other accessories may not ensure compliance with FCC RF exposure guidelines.

#### CAN ICES-3 (B)/NMB-3(B)

#### IC Statement

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme NMB-003.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

(1) l'appareil ne doit pas produire de brouillage, et

[2] l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

RF Radiation Exposure Statement: This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator and your body. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Déclaration d'exposition aux radiations: Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

Do you have any questions? Our technical support team will be glad to help you!

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