propeller aeropoints

USER MANUAL

An up-to-date version of this manual is available at:
propelleraero.com/aeropoints-help.

Propeller PPK users should refer to the PPK user manual at:
get.propelleraero.com/ppk-user-manual
for additional information on how to use their AeroPoints.

AeroPoint 2.0

Contains FCC ID:2AC7Z-ESP32WROVERE

Battery: 5000 mAh 3.2 V (16 Wh) LiFePO$_4$

IC RSS-102 Compliance

This system has been evaluated for RF Exposure per RSS-102 and is in compliance with the limits specified by Health Canada Safety Code 6. The system must be installed at a minimum separation distance from the antenna to a general bystander of 8 inches (20 cm) to maintain compliance with the General Population limits.

L'exposition aux radiofréquences de ce système a été évaluée selon la norme RSS-102 et est jugée conforme aux limites établies par le Code de sécurité 6 de Santé Canada. Le système doit être installé à une distance minimale de 8 pouces (20 cm) séparant l'antenne d'une personne présente en conformité avec les limites permises d'exposition du grand public.

IC RSS-Gen 8.4 Compliance

This device complies with Industry Canada license-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.

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

Cet appareil numerique de la classe B est conforme a la norme NMB-003 du Canada.

Disposal and Recycling Information

The symbol on the product or its packaging indicates that this product must not be disposed of with your other household waste.

Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment.

For more information about where you can drop off your waste for recycling, please contact your local authority, or where you purchased your product.

⚠ Warning

This equipment is not suitable for use in locations where children are likely to be present.

Caution

The user is cautioned that 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 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 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.

This equipment complies with FCC's RF radiation exposure limits set forth for an uncontrolled environment. End user must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

CONTENTS

INTRODUCING AEROPOINTS

AeroPoints are the world's first **smart ground control points**. Purpose-built for **drone surveying**, each AeroPoint includes a solar panel, battery, GPS, and WiFi inside a fully sealed, durable, lightweight shell.

One-button operation

Just place and press. Indicator light displays current status.

Solar powered

Low maintenance. Charges while running. Powerful LiFePO$_4$ battery for long storage life.

Rugged and durable

Water-resistant. Aerodynamic shape prevents shifting and aids water runoff.

Charging port

Charge up your AeroPoints in just three hours using the charging port.

In-built GPS

Records positioning data every 5 seconds.

Lightweight

1.5kg (3.3lb). Each set includes a carry bag for easy transport.

Large memory

Store data from 100-plus flights before upload is required.

Strategic design

Optimized for recognition by processing software.

Specifications

Size	544 x 544 x 26 mm	**Battery**	16 Wh LiFePO$_4$
Weight	1.5 kg	**Charging**	3W Solar + 12 - 36 V DC input
Temperature range	-10 – +50 °C	**Charging time (solar - full sun)**	8 hours
Certifications	FCC, IC, CE, RCM	**Charging time (charger)**	3 hours
		Battery life	100 hours logging

Specifications

GPS	L1/L2 GPS + GLONASS + Galileo + Beidou
Minimum PPK flight time	2 minutes
Accuracy	Horizontal: 10mm + 1ppm Vertical: 20mm + 1ppm
Maximimum baseline distance	50 km
Time to fix (corrections network)	10 minutes
Time to fix (PPK)	2 minutes
Maximum capture time	8 hours
WiFi	802.11 b/g/n
Bluetooth	Yes
Storage	256 MB error correcting solid state flash (100 hours)

Care instructions

AeroPoints are built tough, but you can extend their life by keeping them clean and dry when not in use. Simply remove dirt and dust with a damp cloth once your job is complete or soon after.

Like a phone or a watch, AeroPoints are water-resistant (they can handle some mud, splashes, or light rain) but not waterproof (they shouldn't be submerged or left out in heavy rain).

Reduce the risk of sand or gravel scratching the solar panels by stacking and storing AeroPoints with the undersides together (illustrated on left). Keep your AeroPoints healthy by charging them to full regularly after use and before long-term storage.

Take care of the charging port on your AeroPoint by assuring that it's clean and always closed unless charging. This will limit the possibility of dust/liquids corroding the port.

Above: Stack and store AeroPoints with their undersides together.
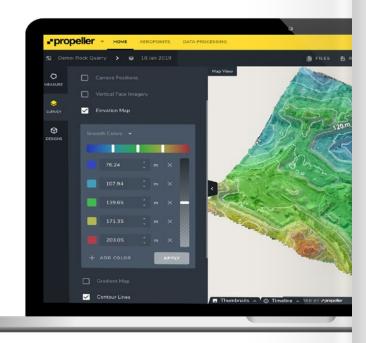
Warranty

AeroPoints are covered by a standard international warranty for one year from activation.

INTEGRATED CLOUD-BASED PROCESSING

If you're looking to visualize your drone survey data, we recommend using AeroPoints together with Propeller's cloud-based visualization and analysis platform.

(Access to the Propeller Platform is available only with a software license purchase. Without it, you only have access to the AeroPoints dashboard, where you can process and export data to use elsewhere.)

With the Propeller Platform, you can upload your geotagged images and 24 hours later you'll get a 3D map of your survey area. Powerful measurement tools and calculators let you track, map, and measure your site from you browser and share data with stakeholders.

TURN YOUR DRONE IMAGES AND GROUND CONTROL DATA INTO 3D MAPS WITH THE PROPELLER PLATFORM

If you want more out of your AeroPoints data, Propeller's cloud-based analysis and visualization platform is the perfect solution.

With the purchase of a Propeller Platform software license, we'll process your drone images in 24 hours and integrate your corrected AeroPoints data to deliver accurate 3D site models.

Want to learn more? Find detailed articles on the drone image upload process and the Propeller Platform at help.propelleraero.com or on our blog at propelleraero.com/blog.

ACTIVATE ONLINE

Each set of AeroPoints must be activated before first use. Go to propelleraero.com/activate-aeropoints and enter the unique eight-character code included with your AeroPoints Group.

If you have more than one code, please use all codes simultaneously to assure AeroPoints are grouped together on your user portal.

Under Portal Name, enter the business/entity you wish your AeroPoints to be assigned to.

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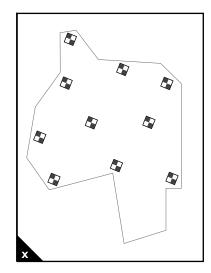
CONDUCT A FLIGHT

Before your flight

Go to propelleraero.com/aeropoints-coverage-map to see whether your site is covered by the Propeller Corrections Network.
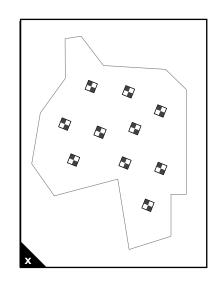
If you're flying inside the Network, proceed as normal. If not, turn to Appendix I (page 16) to learn about alternative correction methods.

Distribute **the full set** of AeroPoints (10 units) around your site, paying special attention to the perimeter.
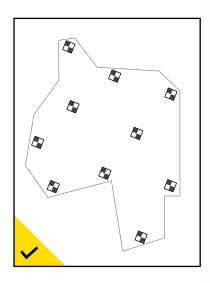
For best results, place an AeroPoint near each corner and distribute the remainder around the center, aiming to cover both high and low elevations.

Fail: AeroPoints are missing from one part of the site (protruding area at bottom).

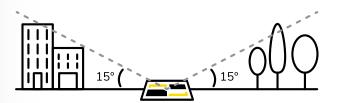Fail: AeroPoints are too far away from the site perimeter.

Success: AeroPoints are distributed evenly around the site perimeter, with remainder near the center.

After you place your AeroPoint, press the power button to start recording. The logging light will turn on indicating that the AeroPoints are in "recording mode".

Avoid placing AeroPoints beneath trees, walls, buildings, power lines, or near running machinery or site vehicles. For the best results, they should have an **unobstructed view of the sky** in every direction above a 15 degree angle (illustrated above).

Avoid placing AeroPoints where they will be disturbed by people, animals, or vehicles. (You should notify site manager/personnel that AeroPoints are in use.)

AeroPoints will begin recording data 60 seconds after you press the button to start. Avoid adjusting the position of an AeroPoint after this time.

Important: AeroPoints (and/or AeroStencil marks) should have an unobstructed view of the sky in ever direction above a 15° angle.

Made a mistake?

If you change your mind about the position of a AeroPoint and want to start over, that's fine.

Just push the button once to stop recording, move your AeroPoint, then push button again to start recording.

During your flight

Each AeroPoint should be left in place to record **at least 30 minutes** of data, and the maximum recording time is 8 hours.

To maximize recording time, we recommend carrying out preflight drone checks and safety routines after you lay out AeroPoints, and packing up your drone before collecting AeroPoints.

Be aware that AeroPoints will automatically turn themselves off (sleep mode) **after eight hours**.

After your flight

Collect AeroPoints **in reverse order** to how you laid them out (i.e. pick up the last-placed AeroPoint first; finish with the one you placed first).

Press the power button on each AeroPoint to finish recording and start "WiFi search mode." AeroPoints can store 100 hours of GPS data **before** requiring the data to be uploaded.

Data from separate locations will be automatically grouped in your portal.

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UPLOAD YOUR AEROPOINTS DATA

Establishing a WiFi network

When you press the power button on AeroPoints to finish recording, they enter "WiFi search mode," indicated by the light blinking.

In this mode, AeroPoints will search intermittently for a WiFi network called "propeller" with the password "propeller."

Turn to Appendix II (page 19) for instructions on how to set up this WiFi network using the hotspot functionality on your smartphone or device. Alternatively, you can use a wireless router.

If AeroPoints find the propeller WiFi network within 24 hours, they'll enter "upload mode" and automatically connect to the network to upload recorded data. This mode is indicated by the network light staying solidly lit.

If more than 24 hours have passed since AeroPoints finished recording, you'll need to wake them up from "sleep mode" (light off) in order to upload data. To do this, simply press the power button twice (once to switch to "recording mode"; again to switch to "WiFi search mode").

Connecting AeroPoints

In "upload mode," the AeroPoint's network light will stay solidly lit, indicating that it is connected and uploading data to Propeller. At the same time, you'll see a blue bar at the top of your device screen (only on iOS), indicating that your hotspot connection is active.

If you've downloaded the AeroPoints App, you can monitor upload progress there (see Appendix III for AeroPoints App instructions).

It takes approximately one minute to upload each hour of recorded AeroPoint data (but can take longer with a slow connection). When upload is complete, the AeroPoint light will turn off (sleep mode).

Uploading Using iOS:

iOS devices allow only five concurrent connections to your Personal Hotspot.

If you're using an iOS device, we recommend uploading your data five AeroPoints at a time.

Above: A blue bar will indicate that your Personal Hotspot is active as AeroPoint data uploads.

APPLY CORRECTIONS AND SHARE YOUR AEROPOINTS DATA

After uploading AeroPoints data, you need to choose the corrections method appropriate for your flight.

Open the AeroPoints dashboard

Log in to your Propeller portal, and click AeroPoints in the top navigation bar to open the interface.

Select your AeroPoints Group from the left-hand menu.

Click "Show all AeroPoints" to see the unique ID code associated to each AeroPoint, along with the time of the most recent upload, and the battery level at the time of the most recent upload. (Note: battery level is not a live indicator.)

Check all uploads are complete

Under your flights, you'll see a list of completed surveys performed using your selected AeroPoint set.

Make sure that data from each of your 10 AeroPoints units is visible for each survey.

If you're missing data from any of your AeroPoints, it's possible that your upload may have failed. In this instance, refer to Troubleshooting (page 15) for further instruction.

Apply corrections

Click Process Now for your selected flight and indicate the appropriate corrections method for your site. Refer to Appendix I (page 16) to understand the correction options available.

Expect a short delay (up to a few hours) while corrections are retrieved and applied.

"Waiting for correction data"

For some locations, retrieving Propeller Corrections Network data can take a little longer (several hours). In this case, your interface will display the above message.

Please contact the support team by clicking the button in the top right of your portal if this message persists past a few hours.

Share AeroPoints data

Information is most useful when it's shared, and sharing your AeroPoints data with a colleague or client is easy. To grant another user access, click on User Permissions next to the AeroPoints Group name, and enter a valid email address. An email will be sent to that address, inviting the recipient to view your AeroPoints data.

To download corrected AeroPoints data, just click Download.

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AEROSTENCILS: FOR FREQUENT FLYERS

Do you fly the same site every day? If so, you can avoid placing and picking up your AeroPoints each time by using **AeroStencils** to mark your AeroPoint positions semipermanently.

AeroStencil marks work best on hard, flat surfaces that won't move or be disturbed.

Use heavy-duty aerosol paint (like that used for line-marking) in a high-contrast color like pink or yellow.

For PPK users, please refer to the PPK User Manual for specific guidance on AeroStencil use.

First flight:

Distribute the full set of AeroPoints around your site as usual. But before placing each unit, spray an AeroStencil mark (including outside corners) then place your AeroPoint on top (using the corner marks to align).
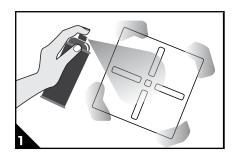
Press the power button on each AeroPoint to start recording, and complete your survey as normal.
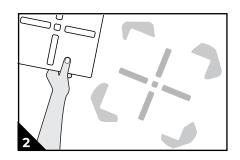
Subsequent flights:

Carry out your drone flight without distributing AeroPoints, and Propeller will use your existing AeroStencil marks to calibrate your data set instead.

Alternatively, you can use a combination of AeroStencil marks (in stable areas) and AeroPoints (in unstable areas, like a pit floor) for subsequent flights.
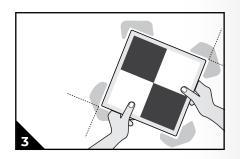
You can rely on AeroStencil marks for **up to three months**. After this time, we recommend you complete another survey using AeroPoints to maintain the highest accuracy.

1 Before you place each AeroPoint, spray an AeroStencil mark (paying special attention to the outside corners).

2 Remove AeroStencil and allow paint to dry.

3 Place AeroPoint on top of AeroStencil mark, using painted corners to align exactly. Activate each AeroPoint and complete flight as usual.

FAQ

For more AeroPoint FAQs, visit propelleraero.com/aeropoints-faq.
Can't find an answer to your question? Email us: hardwaresupport@propelleraero.com.

Do I need a Propeller platform license to use AeroPoints?

No. If you're just processing AeroPoints' data, you need access to your AeroPoints dashboard. Twelve months' access is included in your first AeroPoints purchase. After that, we charge an annual fee of $600 USD. The Propeller Platform license allows you to go a step further to visualize your drone survey data as a 3D model. Note that this license does include access to the AeroPoints dashboard for free.

Can I use AeroPoints with other cloud- or desktop-based processing solutions?

Yes. You can export AeroPoints data in CSV, KML, and PDF formats.

The site is windy. Will my AeroPoints get blown out of position?

Their aerodynamic design means AeroPoints should be unaffected by anything other than extreme winds. It isn't safe to fly a drone in such conditions and we recommend delaying your flight.

How big an area can I cover with one set of AeroPoints?

A set of 10 AeroPoints can achieve accurate results for an area up to 80ha/180 acres. For larger areas (up to 120ha/360 acres), we recommend using two sets.

Something went wrong when I was uploading my AeroPoints data. Have I lost my data?

It's pretty much impossible to "lose" data from an AeroPoint. AeroPoints will retain all recorded data until it is completely and successfully uploaded to Propeller.

Data is automatically removed from AeroPoints once uploaded.

The AeroPoints App can also be used to verify data was successfully captured, or is uploading. See appendix III for more information.

Where does an AeroPoint measure from?

AeroPoints' measurements are taken from top of the unit, where the checkerboard intersects.

What kind of support do I get with my AeroPoints?

AeroPoints customers have access to hardware support, which includes 24-hour chat support through the AeroPoints dashboard and email support via hardwaresupport@propelleraero.com during Propeller business hours (7am–5pm MST; 9am–5pm AEST).

TROUBLESHOOTING

One of my AeroPoints isn't turning on.

Your AeroPoint may have an empty battery. Place it in the sun to charge for 8–10 hours.

Only a long, continuous period of use without sun exposure will cause an AeroPoint battery to deplete faster than it recharges. Before you store it, make sure the AeroPoint has uploaded all of its data to avoid draining the battery due to network search.

You can also plug your AeroPoint in for three hours to charge the battery back up to full capacity.

Propeller is missing data from one of my AeroPoints.

Your data upload may have failed. To try again, first restart your device, then activate your WiFi hotspot (instructions on page 10). Press the power button twice (once to turn it on; a second time to commence upload).

A small number of users have reported difficulty uploading data using an iOS device. If this is you, please try again using a Windows 10 Hotspot. *(Find information on various hotspot setups at help.propelleraero.com.)*

I can't see any of the AeroPoints in my images.

It may be that your image resolution isn't high enough, your images are blurry, or your ground sample distance (GSD) is too high.

Ensure your drone is set up to capture images at a sufficient resolution and flight height. You can use the GSD Calculator (linked in your AeroPoints dashboard) to achieve a GSD of <5cm pixel, which is optimal for AeroPoints.

Alternatively, your AeroPoints may have been obscured by trees, walls, or other objects.

Make sure that AeroPoints are placed with an unobstructed view of the sky in every direction (page 9).

APPENDIX I: AEROPOINTS CORRECTION METHODS

For accurate positions, corrections must be applied to AeroPoints data using one of the methods below. (Note: some methods have specific logging and/or placement requirements that should be adhered to.)

a | The Propeller Corrections Network

If you're flying within the Propeller Corrections Network, then take advantage of our fully automated AeroPoints correction. This is the simplest way to use AeroPoints.

In countries like Australia, where a national survey system is in use on most worksites, this data will be accurate and aligned with other site data and information.

In countries like the USA, the Propeller Corrections Network is ideal for accurate general mapping, but most worksites use a local calibrated system, and should therefore use the known mark correction method if possible.

Go to propelleraero.com/aeropoints-coverage-map to see if your site is covered by the Propeller Corrections Network.

No? Let us know—we're continually expanding our network coverage.

Global accuracy:
20mm/20mm/50mm (the best available)

Consistency:
20mm/20mm/50mm (the best available)

Internal accuracy:
10mm or less (precise internal reconstruction)

b | Using A Known Mark

You can place one AeroPoint at a known survey mark or benchmark location.

If you have access to GPS rover equipment, you can use it to create a new known mark. This is the best approach for worksites using their own site calibration.

Be sure to place an AeroPoint on the known mark first, and pick it up last—it must be recording data for the duration of your flight.

We can use data from this AeroPoint, combined with the coordinates of the known mark, as the reference point for the other AeroPoints used in the survey.

Global accuracy:
20mm/20mm/50mm
(the best available—dependant on accurate placement of AeroPoint and accuracy of known mark itself)

Consistency:
20mm/20mm/50mm
(the best available—dependant on using the same known mark each time)

Internal accuracy:
10mm or less (precise internal reconstruction)

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Local Site Calibration:

If your site has its own local calibration, we can correct your AeroPoints to positions in your local site coordinates.

You'll just need to upload a local site calibration file (e.g., a Trimble .CAL) or send us or a point pair file (i.e. a list of points in both global and local coordinates).

If you're interested in using this correction method, talk to us: **support@propelleraero.com**.

c | Using an AeroPoint to create a known mark

If there are no known marks available, the global accuracy of your data will be reduced. However, you can still use AeroPoints to get results that are internally accurate and consistent over time.

Find a hard, flat surface that will not move or be disturbed, and establish your own "mark" (we recommend using heavy-duty aerosol paint like that used for line-marking). Place one AeroPoint at this mark and ensure it is left in place to record at least two hours of data.

For your first flight, we'll use the data from this AeroPoint to calculate an estimated point (accurate within 50cm). For subsequent flights, we'll treat that coordinate as a "known mark."

Global accuracy:
500mm/500mm/500mm

Consistency:
20mm/20mm/50mm (the best available—dependant on using same known mark each time)

Internal accuracy:
10mm or less (precise internal reconstruction)

d | Using your own RINEX corrections

You might have access to a dual frequency L1/L2 RTK rover, or your site may have an RTK base station receiver. Provide us with RINEX formatted GNSS observations for the period of your survey and we can use these as the reference point.

Note: The RINEX file must have an accurate location for the base in the header, as this is the location that the AeroPoints will be measured against.

Global accuracy:
20mm/20mm/50mm (the best available)

Consistency:
20mm/20mm/50mm (the best available)

Internal accuracy:
10mm or less (precise internal reconstruction)

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APPENDIX II: CONFIGURE YOUR SMARTPHONE HOTSPOT TO ACT AS PROPELLER WIFI NETWORK

Using an Android device

The procedure for setting up a WiFi hotspot is different for each Android device.

Refer to instructions from your specific device manufacturer (or Google it!).

Using an iOS device

Change your device name
From Settings, navigate to General > About > Name. Change the name of your device to "propeller."

Change your Personal Hotspot password
From Settings, navigate to Personal Hotspot. Change WiFi password to "propeller" and toggle Personal Hotspot to On (green).

Important: Keep your iOS device open on the Personal Hotspot screen to maintain connection and monitor data upload.

Above: Changing your device name on iOS.

Above: Opening your hotspot settings on iOS.

APPENDIX III: MOBILE APP

Connecting AeroPoints 2.0 to the AeroPoints App

1. Turn on your AeroPoints.
2. Make sure Bluetooth on your mobile device is enabled.
3. Open the AeroPoints App.
4. The AeroPoints App will automatically begin scanning for nearby AeroPoints for three minutes.

a. **If there are AeroPoints missing from the list, wait for the scan to finish, and then, tap the Search Again button found on the right side, at the top of the AeroPoint list.**

Download the Mobile App here ▸

Turn on the camera on your mobile device. Hold the camera up to the QR Code. Tap on the link displayed, to go to our AeroPoints App guide.

AeroPoint 2.0 Diagnostics with the AeroPoints App

Available AeroPoints will display in three modes;
   a. **Recording:** The AeroPoint is capturing data.
   b. **Searching:** The AeroPoint is trying to connect to a network.
   c. **Uploading:** The AeroPoint is currently uploading files.

To see more details (such as status, mode, or battery) for each of the AeroPoints, tap on the AeroPoint you're interested in.

Configuring Wi-Fi Credentials for your AeroPoints 2.0

To configure a custom WiFi network for your AeroPoints, tap the WiFi icon found in the top **right hand** corner of the screen.

1. Manually enter the desired network name and password, then click Configure which will update all the visible AeroPoints.
   a. **Successfully configured AeroPoints will have a green check mark next to them.**
2. Selecting **Done** » will return you to the homepage.

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AeroPoints User Manual

SUPPORT

Need help?

Visit **help.propelleraero.com** for how-to articles,
tutorial videos, and more.

Email **hardwaresupport@propelleraero.com**
to get in touch with our hardware support team.

.▪propeller

Propeller Aero
Sydney, AU | Denver, USA

Talk to us:
hello@propelleraero.com
propelleraero.com