

# Blackbird User Manual



It is recommended that you also view the Blackbird instructional DVD

### Warranty

The Blackbird is covered by a full warranty for a period of one year for all defects in materials or workmanship. Warranty returns will be repaired or replaced at the discretion of CMR. The warranty does not include accidental damage from severe handling such as impacts, improper use or weather exposure. Call 919-876-6020 or email [sales@camotionllc.com](mailto:sales@camotionllc.com) for warranty return authorization. Shipping charges will be paid by CMR at the lowest cost shipping method.

### Registration

If you did not purchase your Blackbird directly from Camera Motion Research please take a few minutes to go to our website [www.camotionllc.com](http://www.camotionllc.com), then My Account and then click on the link at the bottom of the page to register your Blackbird purchase.

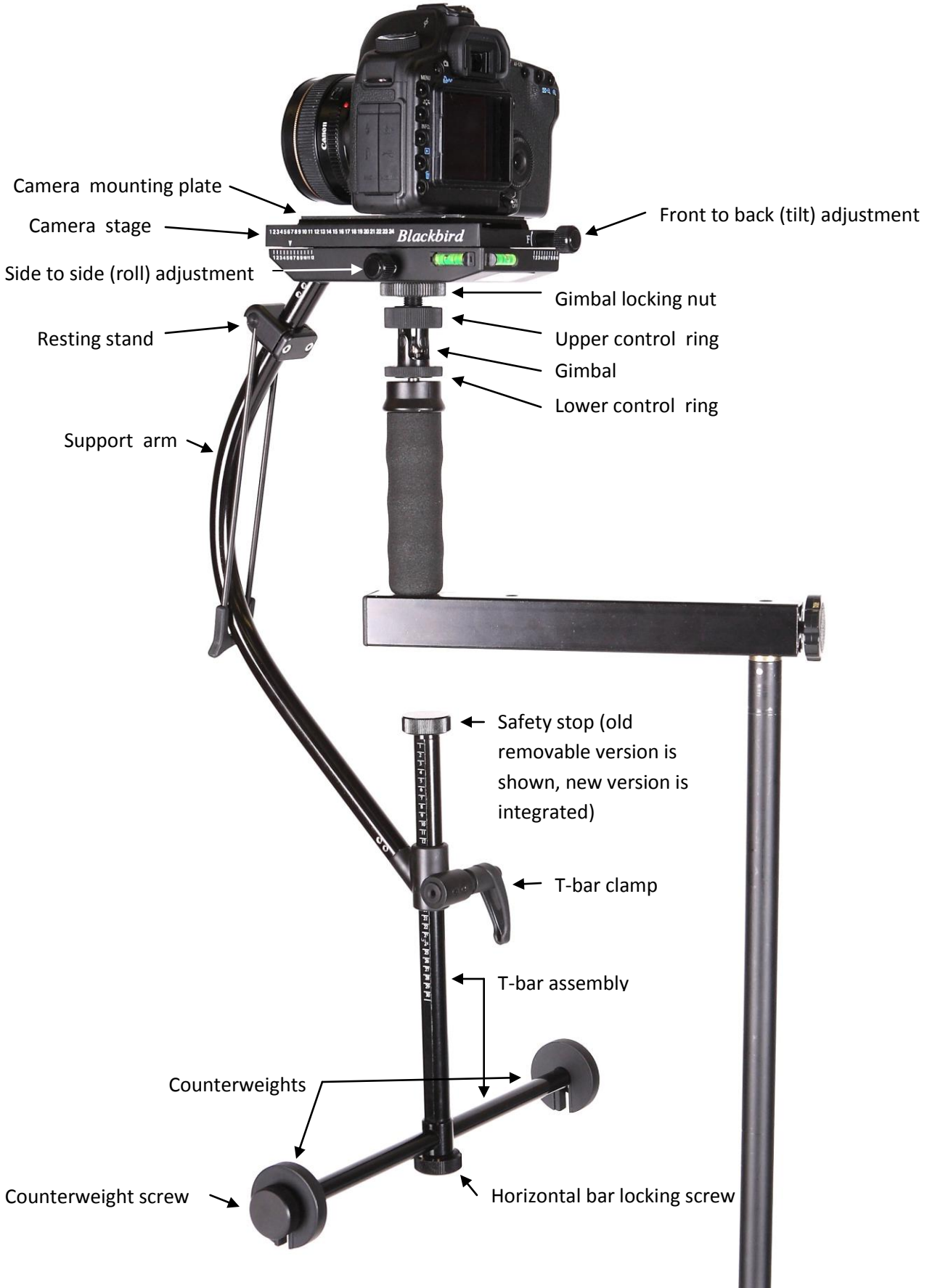
([https://www.camotionllc.com/serialno\\_registration.php](https://www.camotionllc.com/serialno_registration.php))

This will allow us to contact you with product improvement information.

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### Blackbird Part Names



## Blackbird Full Kit Components



[1] Chassis

[2] T-bar assembly

[3] Camera mounting plate

[4] Counterweights

[5] Gimbal extender

[6] Horizontal bar 11 in.

[7] Spare screws and locating pin

[8] Universal docking Bracket \*

[9] Table clamp\*

[10] Tripod adaptor\*

[11] User Manual

[12] Horizontal bar 15 in.

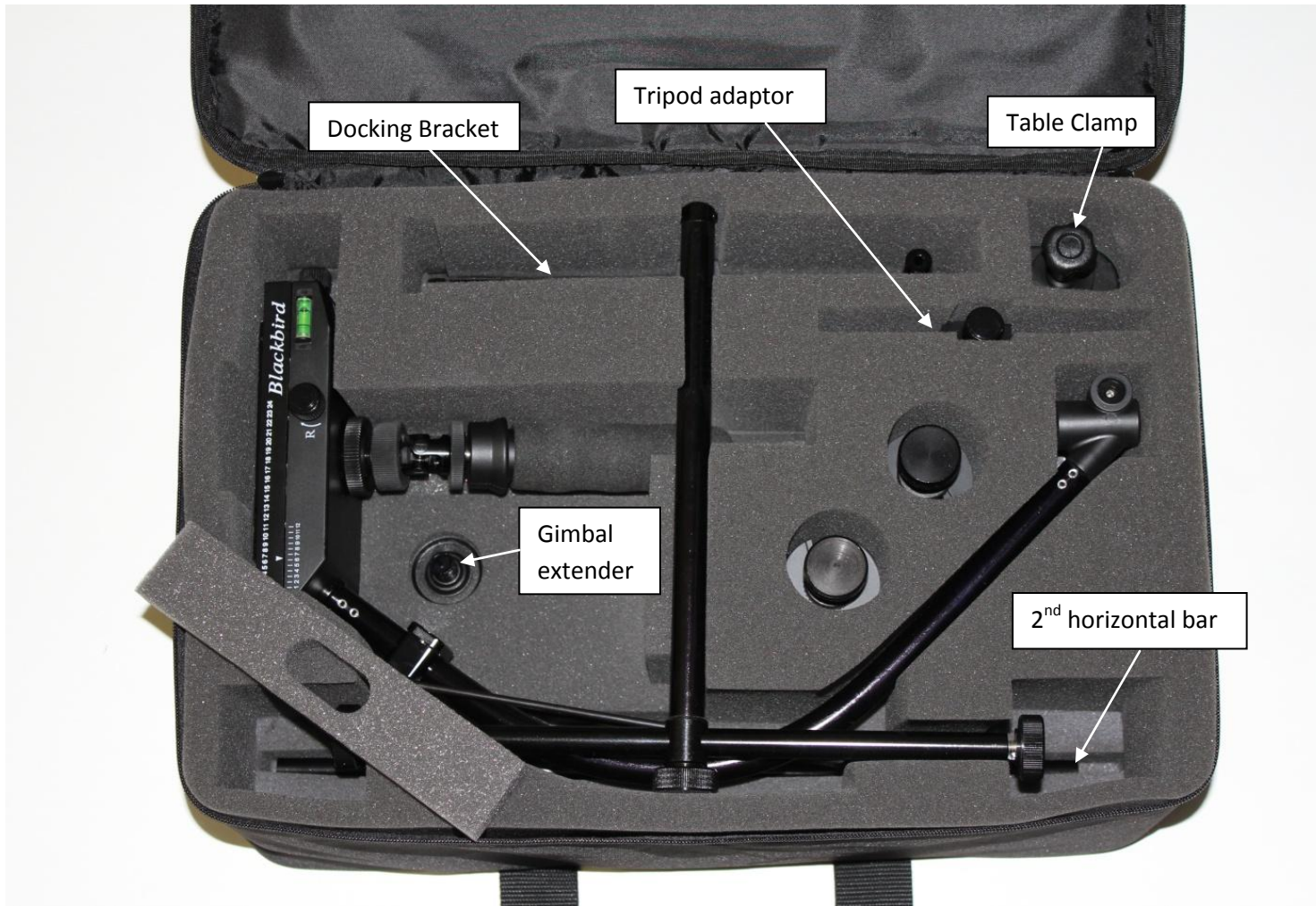
[13] Instructional DVD

[14] Resting stand\*

[15] Case\*

**\*These accessories not included with Blackbird Basic**

### Packing Blackbird Parts in the Case



## Part I. Getting to know the Blackbird Parts

### A. Attaching the T-bar to the Blackbird support arm

The Blackbird is packed in its case with the T-bar removed from the support arm. To assemble the Blackbird you insert the vertical section of the T-bar assembly into the support arm.



To attach the T-bar to the support arm simply push it into the support arm Y.



To remove the vertical tube press on the two spring loaded locking tabs while pushing the T-bar down into the support arm Y.



Tighten the T-bar clamp by turning it clockwise to secure the T-bar. You can change the end position of the T-bar clamp (without loosening it) at any time by pressing on the button and pulling it out and then rotating it to the desired position.

**Note:** Because of its engineered design the T-bar clamp requires very little force to lock the T-bar securely. If you see small clamp marks on the vertical bar it is because you are using too much clamping force.

The rotational position of the horizontal bar does not affect the stabilizer performance. Normally you would have it side to side relative to the camera so that you can hold the Blackbird closer to your body without bumping into it. But you can also position it front to back parallel to the camera.

## B. Mounting the Camera

Remove the camera mounting plate from the stage by loosening the clamping screw on the stage. Attach the mounting plate to your camera with the  $\frac{1}{4}$  -20 screw. Drop the camera and mounting plate into the top of the Blackbird stage and tighten the clamping screw. By loosening the mounting plate camera screw the camera can be moved front to back. The safety pin on the top of the Blackbird stage prevents the mounting plate from sliding off the stage even when the clamping screw is a little loose.

**Always check that the clamping screw is tight and camera is securely clamped before using the Blackbird.**





## Which Mounting Hole to Use?



Place the 1/4-20 camera screw in the hole that you think will locate the center of gravity of the camera directly over the gimbal. Or just start with the #2 hole in the middle of the camera mounting plate and check balance. The locating pin screws into the appropriate hole.

If during balancing you cannot get the camera level by adjusting the front to back and side to side knobs then move the mounting screw appropriately. For example, if camera leans to your left, then move the screw to one of the holes on the right (#3 or #6).

Note: DSLR cameras do not have a hole for the locating pin in the camera mounting plate. The locating pin on the camera mounting plate can be removed by unscrewing it (store it in the spare parts bag).

## C. Adding or removing counterbalance weights on the horizontal bar

Equal amounts of counterbalance weights should always be used on each end of the horizontal section of the T-bar. To add or remove weights simply loosen the locking nuts on each end of the horizontal bar to make space for the weights. The first weight is keyed on a tab on the horizontal bar and additional weights nest together. After adding weights retighten the weight nuts.

Each large weight weighs 0.2 lb and each small weight weighs 0.1 lb. So you can combine weights (equally on each side) from 0 to 0.9 lb in 0.1 lb steps (example, 2 large plus 1 small = 0.5 lb).

## D. Procedure to change horizontal bar

The 15 inch horizontal bar provides noticeably more pan axis moment of inertia than the 11 inch bar. Smaller cameras weighing less than about 3 lbs will benefit the most from using it.



Remove the counterweight screws that are on the present bar you are using and set them aside. Remove the horizontal bar screw and set it aside. Slide out the horizontal bar. Insert the new bar and line up the tapped hole through the bottom of the T-joint. Screw the horizontal bar screw back in to secure the bar. Re-insert the counterweight screws on the new bar.

### E. Adjusting the gimbal position

**Question:** Why would you want to adjust the gimbal position? **Answer:** Adjusting the gimbal position gives you an additional adjustment for vertical balance in addition to adding or removing counterweights or changing the height of the T-bar. See part III, A Vertical Balancing

The gimbal stem screws into the bottom of the camera stage and is locked in place by the gimbal locking nut. To adjust the gimbal position loosen the locking nut and screw the gimbal up or down. You will have to screw down the locking nut if you want to raise the gimbal up. Always tighten the gimbal locking nut securely after adjusting the gimbal position.

**Note that you can screw the gimbal down too far and not have enough thread engagement with the camera stage base.** To prevent this there is a visual cue on the gimbal stem that is a thread cutout. It is OK to have the thread cutout just slightly visible as shown below. If you go further and start to see the threads again you have dropped the gimbal too far and don't have recommended thread engagement in the base (should have at least 3 full threads engaged).



The maximum extension for the gimbal stem is shown at left. When you just begin to see the shiny thread cutout it means **DON'T GO ANY LOWER.**

## F. Attaching the gimbal extender

For cameras less than about 2 lb. you will need to use the gimbal extender which drops the gimbal down to allow correct vertical balance.

To install the gimbal extender, first remove the gimbal and handle by loosening the locking nut and then unscrewing it (counter-clockwise) completely out. Then insert the gimbal extender and lock it into position with its own locking nut. Finally re-insert the gimbal and handle into the bottom of the gimbal extender and tighten its locking nut. Just like the gimbal the extender has a thread cutout to indicate when you shouldn't have it out any further



The maximum extension for the gimbal extender is shown at left. When you just begin to see the shiny thread cutout it means **DON'T GO ANY LOWER.**

## G. SmoothTouch friction adjuster

The roll and tilt axes friction adjuster is located below the gimbal center block. When turned clockwise it increases friction in the tilt and roll directions. Turn it counterclockwise to reduce friction. (note: if the knob turned counter-clockwise too far out it will touch the gimbal lower yoke and the gimbal will not rotate freely)



Observe the freely swinging handle to see the amount of friction being added. To do this support the Blackbird with one hand under the camera stage and lift the gimbal to about a 45 degree angle and release it. With no friction it should pendulum about 4 to 6 times before coming to rest. As you adjust more friction and drop the handle you will see it come to rest after fewer and fewer pendulum swings. With a very high friction adjustment the handle will just overshoot vertical and stop.

## Part II. Accessories (Not included with Blackbird Basic)

### A. Resting Stand

The resting stand is clamped to the support arm with two screws and pressure plate and is easily attached or removed from the Blackbird with the supplied allen wrench. It should be positioned on the support arm approximately 1.5 inches below the camera stage. When properly positioned it just rests against the support arm while in the folded down position and the rubber foot should be centered at shown in the picture below.



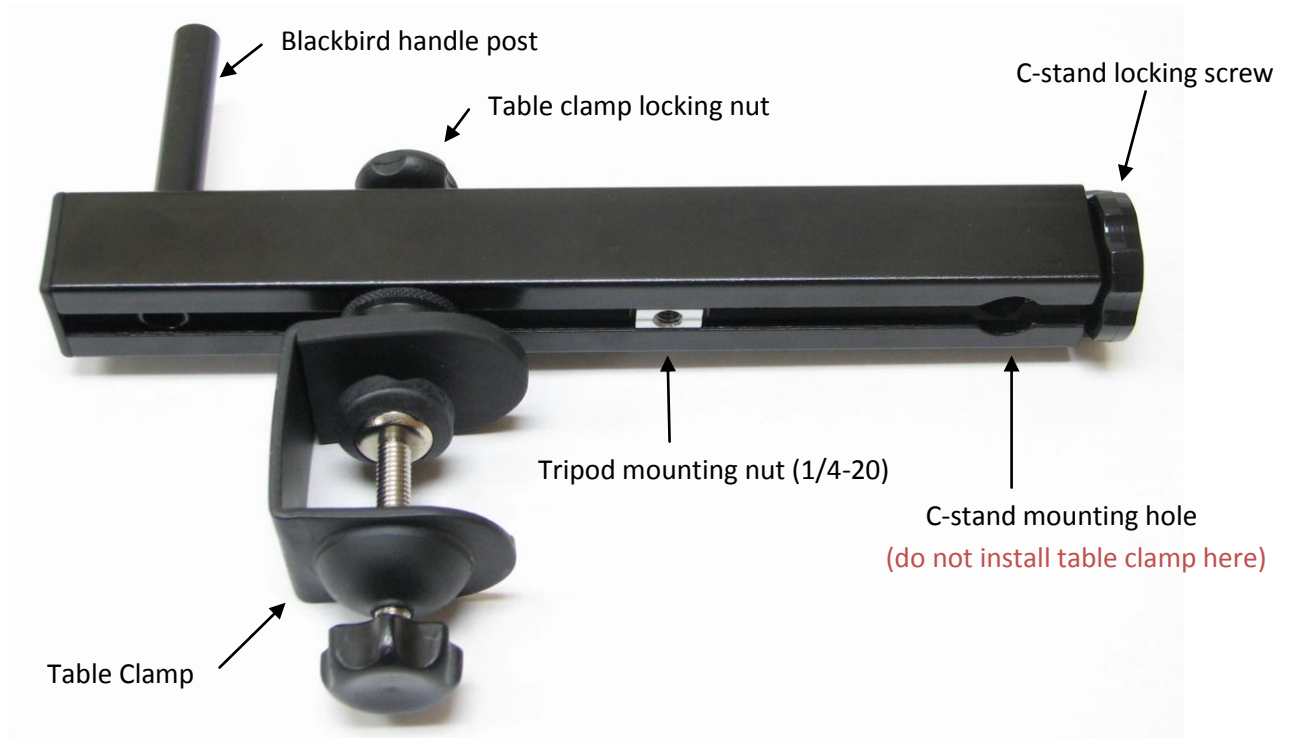
The resting stand should be folded down for normal flying and flipped up to set down the Blackbird.

The resting stand can only be used when the horizontal bar is positioned side to side as shown below. For maximum resting stability you can set the rig down and loosen the T-bar clamp slightly while rotating the Blackbird slightly to get perfect 3 point support.



### B. Universal Docking Bracket

The universal docking bracket allows you to conveniently dock or balance your camera and Blackbird on a C-stand, tripod or table edge. The Blackbird handle drops into the post on the docking bracket as shown below.



**Caution:** The docking bracket is designed with high strength components that are suitable for any possible loads from the Blackbird and camera. But users must verify that C-stands or tripods or tables can support the high loads and torques.

### C. Tripod Adaptor

The tripod adaptor allows for quick transfer of your camera between the Blackbird and a tripod. The adaptor is mounted to the tripod (standard 1/4-20 connection) and has a mounting surface and clamping screw similar to the top stage of the Blackbird.



## Part III. Blackbird Balancing Basics

The balancing instructions below may seem complicated at first look. But balancing a camera on the Blackbird can be relatively easy if you understand the basic concepts, and after you get some practice you should be able to balance any camera in 15 minutes or less. Once you know the correct counterweights to use for a specific camera you should be able to remove the Blackbird from its case, install your camera and balance it within 5 minutes or less. The Blackbird was specifically engineered to make balancing quick and stable.

There are two balancing adjustments that you will be making, which are vertical balancing and horizontal plane balancing.

### A. Vertical Balancing (Drop Time)

The purpose of vertical balancing is to achieve a condition where the stabilizer is just a little bottom heavy. Getting this right will minimize the pendulum motion of the stabilizer when you walk around with it<sup>1</sup>. The amount of bottom heaviness is described by measuring the “drop time” of the rig as shown on the next page.

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<sup>1</sup> Adding some gimbal friction with the Smoothtouch control will also help reduce undesirable pendulum motion



When you hold the stabilizer in the horizontal position think of it as a simple mechanical balance where the gimbal is the fulcrum or pivot point of the balance (like a see-saw). If the rig is bottom heavy then when you release the T-bar the counterweights will drop down. Count the seconds from release until it just swings through vertical and that is the drop time.



Drop time ▲ is recommended to be about 1.5 to 2.5 seconds.



Note that to get a good drop test the stabilizer should be at least roughly in balance horizontally. If the Blackbird wants to rotate on its pan axis when you release it, or if it leans to one side instead of dropping all the way down this is a sign of horizontal balance being off. So with the rig in any bottom heavy condition first do a horizontal balance (see horizontal balance below) before checking drop time.

Vertical balancing to get the right drop time can be accomplished by a combination of three adjustments which are:

- Using different amounts of counterweights on the horizontal bar
- Adjusting the position of the T-bar up and down
- Adjusting the position of the gimbal up and down

## Procedure to get rough vertical balance

1. Set the T-bar position to about 8 on the scale. (just a starting point with room for adjustment)
2. Refer to Table 1 below and put the suggested counterweight combination for your camera weight on each side of the horizontal bar.
3. Hold the Blackbird in the horizontal position and note whether the counterweights tend to drop or go up.
4. If the counterweights don't drop then you must add more counterweights until they do to get the bottom heavy condition.
5. Release the counterweight bar from the horizontal position and count the time it takes for the counterweights to fall from the horizontal position (9 o'clock) to the bottom position (6 o'clock). This time is called the DROP TIME.
6. If the drop time is less than 1 second (very bottom heavy) then you should remove some counterweights.
7. Once you get a drop time between about 1 and 3 seconds you must make a horizontal balance before making the final drop time adjustment.

**Table 1. Suggested Counterweight combinations**

Camera Weight lbs	Gimbal extender	Weights (each side)
1	Yes	1 small or none
2	Yes	1 small
3	optional	1 large
4	No	1 large, 1 small
5	No	2 large
6	No	3 large
7	No	3 large, 1 small
8	No	4 large, 1 small

## B. Horizontal Plane Balancing

Horizontal plane balancing means adjusting the Blackbird so that the camera is level in the tilt and roll directions, in other words it sets the framing of your shots when you just let the stabilizer float.

Fortunately horizontal plane balancing is easy, and it is an adjustment that you may do frequently when shooting. And most often when shooting you will want to adjust the horizontal balance so that the camera is level with the horizon in both the roll and tilt directions. But leveling the camera parallel to the earth plane also positions the camera so that its center of gravity is located directly over the gimbal. This will also help with adjusting the drop time and gives the best dynamic balance for fast pans.

You can adjust horizontal balance to get the desired camera leveling by a combination of three adjustments which are:

- Use the camera stage adjustment controls to move the stage front to back and side to side (tilt and roll adjustment)

- Slide the camera mounting plate forward or back (get tilt adjustment into range)
- Use a different hole on the camera mounting plate (get tilt or roll adjustment into range)

### Procedure to adjust horizontal balance

The top of the Blackbird is a precision x-y stage with control knobs to move the camera forward or back for the tilt angle adjustment and side to side for the roll angle adjustment.

The tilt angle adjustment knob is at the rear of the stage. Turning the knob clockwise moves the stage away from your hand. Note that in addition to adjusting the stage front to back you can get considerably more front to back adjustment by sliding the camera mounting plate forward or back as shown below. A safety pin on the blackbird stage prevents the camera mounting plate from sliding off the stage even if the clamp is a little loose.



You can also get additional adjustment back by using one of the rear holes (#4, #5, or #6) on the camera mounting plate.

The roll angle adjustment knob is on the side of the stage and it also moves the stage away from your hand when you turn it clockwise. If the camera is leaning to the left then you turn the roll knob clockwise to level the camera.

Also, if after using all of the roll angle adjustment on the stage the camera is still tilting to one side or the other, you can use one of the off-center mounting holes on the camera mounting plate. For example, if camera leans to your left, then move the screw to one of the holes on the right (#3 or #6).

### **C. Final vertical balance drop time adjustment**

Now that you have the horizontal balance adjusted you can go back and do the final vertical balance. For most people a drop time of 1.5 to 2.5 seconds works best. If the drop time is too fast then you can raise up the T-bar to get a slower drop time, or if the drop time is too slow then you should lower the T-bar.

You can get an additional drop time adjustment by raising or lowering the gimbal because this has the effect of moving the pivot point. Moving the gimbal up will decrease drop time, and moving it down will increase drop time<sup>2</sup>.

### **D. Gimbal Friction effect on drop time and horizontal balance**

The Blackbird feature that allows you to add friction to the tilt and roll gimbal axes can help you get noticeably better shots. It accomplishes this by damping gimbal motion while still maintaining reasonable gimbal isolation of hand movements.

You will find that adding even a large amount of gimbal friction has a small effect on the drop time (with the normal 90 degree drop). But it can make adjusting horizontal balance much less sensitive. In other words for small angles off vertical in either the tilt or roll axes (say a few degrees up to 10 degrees) there can be significant damping. So with high gimbal friction you may want to shake the handle gently while setting the horizontal balance.

### **E. General guidelines and strategies for vertical balancing and setting up the Blackbird**

1. For best performance try to balance the rig so that the T-bar is nearly fully extended. It is a mistake to think that if you add some counterweights and move the T-bar up to maintain vertical balance that you will have a more stable rig. If you do that you will have a heavier rig that has LESS moment of inertia in the tilt and roll axes (only the pan axis will benefit from the added weights).
2. If you want to take low shots and want to get the camera as close to the ground as possible, or you want to minimize the chance of bumping into the weight bar, then you should balance the rig with the T-bar raised up appropriately.
3. If you want the lightest weight rig then adjust the gimbal high (close to the camera stage), but always try to get the T-bar nearly fully extended.
4. For cameras weighing less than about 2 lbs. you usually must use the gimbal extender to get vertical balance.

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<sup>2</sup> When dropping the gimbal down please note limit on how far down it can be to maintain enough thread engagement.

5. If you have a camera weighing more than about 2 lbs but less than about 3.5 lbs you can increase the pan and tilt moments of inertia by dropping the gimbal down as much as possible and/or using the gimbal extender. This will force adding more counterbalance weight. This is effective in increasing moments of inertia by adding a small amount of weight that can usually be tolerated for these medium weight camera rigs. But again it is only effective if the T-bar is nearly fully extended.
6. Remember, moving the gimbal up or moving the combination of gimbal extender and gimbal up will make the rig **more** bottom heavy. Moving the gimbal down will make the rig **less** bottom heavy.

## Part IV. A Quick Guide To Operating The Blackbird

Handheld gimbaled inertial stabilizers can be frustrating tools for beginners, and some patience is required as you start using your Blackbird. You should watch the Blackbird Instructional Video, but here are some basic concepts to get you started.

### Operation Requires Both Hands

While it is possible and sometimes necessary to operate the Blackbird with just one hand for short periods, most of the time you will be using both hands to fly the Blackbird. You will use one hand to support the Blackbird from the handle and the other hand to finely control pan, tilt and roll. The picture below shows the right hand supporting the Blackbird and the thumb and index finger of the left hand making very light contact with the upper control ring. Of course you could reverse the role of each hand, and it's not a bad idea to practice both ways if you are so inclined.



The skill in operating a handheld stabilizer is a form of eye-hand coordination. Watching the view screen on your camera, you gently apply correction with your control fingers. If the horizon rolls, you have to correct for it. If you move forward quickly, the camera will tend to pitch down unless you correct for it. If shooting outside when it's windy you just have to do your best to keep the horizon level and to control pan.

As you practice and get experience it will become a little more automatic to anticipate the kind of control you will have to apply to minimize camera pitching (tilting) or roll as you move with the camera.

But it will always take concentration if you want to get the best results.

Moving slower than you might want will require less control to get good shots, and often movement is just too fast anyway.

### Delicate Touch With Your Control Fingers

If you squeeze the control ring too tightly, you will probably be over-controlling and introducing movement that you don't want. The only time you need to tightly grip the control ring is when you are tilting the camera (but for long tilt shots you should trim horizontal balance for the correct tilt angle and let the stabilizer do the work). For shots with no tilt you might try just making small tapping corrections with your control hand thumb and index finger rather than keeping them in constant contact with the control ring.

## **Walking with your Blackbird**

You can get great shots going up and down stairs, but please use a spotter (an assistant to catch you if you fall, should always be below you whether going up or down), or be very, very careful! The same is true for walking backwards.

Keep your knees bent a little by dropping an inch or two, to avoid the slight vertical bobbing that results from normal walking.

Use your support arm as a buffer or kind of spring to cushion your body movements similar to what you do while walking carrying a nearly full open cup of coffee without spilling any.

Practice walking short straight distances with no camera roll, the seasick motion that our brains find so annoying when watching video. Then practice moving forward from standstill (slowly) and stopping (slowly) from moving to get minimal tilting in each case. Finally, practice side tracking shots with the camera pointed to one side as you move forward.

Practice locked-off shots where you are not moving at all, just holding the stabilizer very steady for at least 5 full seconds. These are important shots in a lot of situations.

Practice keeping the boom height (height of camera off the ground) constant for better looking shots, unless you actually need to boom for the shot you want.

## **Some Final Tips to Remember**

- Set the drop time to about 2 seconds
- Use the 15 in. horizontal bar to increase pan stability
- Use gimbal friction, more in the beginning, or to reduce effect of wind or for more aggressive moves.
- Shoot with as wide (short focal length) a lens as possible.
- The heavier your rig is, the easier it will be to control (and you get the added benefit of strengthening your arm muscles without paying a gym fee).

For Blackbird technical support please email [sales@camotionllc.com](mailto:sales@camotionllc.com) or phone 919-876-6020