

Capturing your Flight on Video

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Like many of you, my first exposure to watching home-made in-flight videos was on youtube, where a quick search can yield seemingly endless clips depicting virtually every kind of flying there is...from stunning VFR vistas to really cool, ice-water-in-your-veins IFR approaches. Another favorite of mine was www.shortfield.com, where backwoods pilots share first-hand footage of short and rough-field landings at remote airstrips across the country. After spending an embarrassing number of hours watching other people's experiences online, I decided that my own flights might be worth capturing on film. Since then, I've found that re-living your flight to be a really enjoyable experience, coming very close in satisfaction to the flight itself!

When I began to research the range of recording options out there were no shortage of set-ups: Modify your smartphone or use a dedicated camera, 730, 960, or 1080 resolution, neutral density filters, propeller blur, sound recording options – and these days, you can literally cobble something reasonable together for less than \$100. And while price should be a real consideration - this is an add-on hobby, and most of us are not looking to get nominated for any Oscars – in many respects, you will get what you pay for. So here's my take on how to turn a bit of scrounging and a little elbow grease (home builders have an abundance of that, right?), into a video recording system that has given me great results (with money left over for actual flying!).

Anyone who has followed the digital camcorder field will know that 2 years ago, the two most popular digital recorders for 'sports' activities were Contour (Figure 1) and GoPro Hero (Figure 2).



Figure 1. Contour HD video camera

Not that long ago, NFlightcam was selling a version of the Contour that was touted as a flight-specific video camera, and had most of the most important features built in : good quality HD, microphone input, blue tooth remote on/off, and a 'special' feature that all but eliminated the annoying 'propeller blur'. At that time, this last feature is what really set it apart from the GoPro Hero. At \$500 retail, it was also more expensive than the GoPro Hero.

Things have changed recently: Nflightcam has abandoned their support for the Contour line and developed an aftermarket product for the Hero3 series cameras, the most recent of the GoPro offerings. Moreover, new equipment has come down in price significantly. So let me give you two options: the "New off the shelf" Hero3 option, and the "Used-do-it-yourself" Hero2 option.

Option #1: New Off-the-Shelf:

The new GoPro Hero3 ‘White Edition’ runs you \$200 (Figure 2), and the NFlightcam filter/microphone kit (Figure 3) costs another \$100, bringing you to \$300.



Figure 2. Hero3 ‘white edition’.

This is a reasonably-priced option, and though you still need to invest in a suction mount and memory cards, this package does give you the essentials:

1. Eliminates propeller blur. If you use a standard GoPro Hero camera (or any digital videocamera for that matter), the propeller will look like a large fluttering disk that most will agree, is very distracting, and diminishes the quality of the footage. Part of the \$100 NFlightcam gimmick is actually a neutral density filter that sits over the Hero3’s lens (Figure 3).



Figure 3. NFlightCam’s filter and microphone adapter

Without going into the technicalities, the filter limits the light that enters the camera, thereby ‘tricking’ the circuitry in the Hero3 into slowing its shutter speed. In so doing, the rotating prop becomes almost invisible, just as it is to the human eye. At light levels seen aloft in small aircraft cockpits, the filter is essentially imperceptible.

2. Easy mounting options. The GoPro Hero series of cameras were designed for high-intensity sport activities, so the flexibility of the mounting options is unsurpassed. GoPro has a nice array of durable cases, case-backs, mounts and fixtures to accommodate any airplane interior. A suction cup mount is particularly useful for high-wing Cessnas, as the windscreen goes way up to the wing line, providing lots of clearance from the panel, and a relatively unobstructed view out. On low wing aircraft, other mounting options will need to be employed. I’ve seen some attach the camera to the ceiling panel with a GoPro stick-on slide mount (included in most GoPro Hero packages). Others use a window-to-window spring-loaded shower-curtain-type bar, that allows the camera to be positioned right behind the pilot (or co-pilot), or even between the two.

3. Wifi connectivity for remote on/off and viewing. The really new development here is that all Hero3 camera packages now come standard with wifi connectivity, which allows you to use either one their proprietary remote control units (\$79), or a smartphone app (free), to turn the camera on or off. Basic GoPro Hero cameras do not have a an LCD built-in to save weight and battery life (though you can get it as an add-on feature), so being able to remotely see what the camera sees with your smartphone is particularly useful, especially when installing in hard-to-reach locations on

your aircraft (I should note here that it is apparently against FAA regulations to install such devices on the exterior of certified GA aircraft). Besides that, the wifi features promote in-flight safety, allowing you to focus on flying rather than craning your neck to see if your camera is rolling or not.

4. Microphone jack. A good part of the fun in playing back your home movies is listening to the radio chatter that occurred during the flight, especially yours. Without a microphone jack, you'll be forced to use the existing microphone on the Hero3, and that amounts to annoying engine noise (unless you're lucky enough to be flying a G7). With a \$20 mic that you slip under your headset ear cup, (or a splicing cable included in the NFlightCam kit) you get really nice, intelligible, high-tech audio at a truly low-tech price. More on the audio options later, but in short you can't go wrong with the Hero3 (or Hero2) series of cameras.

5. Convenient mp4 video format capture: Hero cameras record in mp4 format, so there is no conversion needed from/to MVI or AVI to reduce the size of the clip before playing on your favorite device or sharing via email (within reason).

Here are a few more details to consider before you rush out and buy this set-up. First, the NFlightCam filter fits on the gopro Hero3 camera itself, and precludes the use of the great GoPro cases. You can get an adapter for the 1/4" tripod mount to allow use of the go-pro mounts but frankly, it's an unsophisticated solution. Second, the NFlightCam included adapter cable only has a mini USB microphone plug, so you can only use it with the Hero3. If you can live with these shortcomings, a new Hero3 is a quick and easy entry platform.

Option #2: Used Do-it-yourself

This is certainly not the only way to modify the Hero series of cameras, but if you follow want video and audio like this ([link](#)). GoPro Hero2 cameras with Wifi backpacks will run you about \$200 on eBay, but they usually come with a LOT of other really useful accessories you'd need to actually capture video right out of the box. For example, I paid \$320 for mine in early 2013, but it came with the dedicated GoPro remote control unit (\$79), 3 Hero2 cases (\$40 each), 2 additional batteries (\$20 each), 2 32GB memory cards (\$30 each), and a host of mounting options the previous owner had collected (\$50 conservative estimate). All that extra stuff would have cost me at least another \$300 not to mention the time and effort needed to research and select these accessories. But if you watch eBay for a few days, you'll see that \$200 is about all you'll need to spend to get a decent Hero2 with a wifi backpack. I stress the wifi capability because it allows you to remotely turn the camera on and off, just like the newer GoPro Hero3 series. And the Hero2 has a standard 3.5 mm external microphone jack, compatible with dozens of microphone options. Now the only thing left to tackle is that propeller blur, and thanks to the internet, someone taught me how to do that too.

Based on this video on youtube ([youtube video](#)) I bought a 25 mm to 58 mm step-up ring filter adapter (\$9.98 + free shipping) and a 58mm ND16 neutral density lens filter (\$6.59 + free shipping) on eBay. Here's how I attached the step-up ring adapter to the Hero2 case. First, file off the small flange on the inside of the filter adapter, as seen in Figure 4.



Figure 4. Filter adapter, before and after filing off the flange, and transferring screw holes.

Once done, undo the black lens ring on the original Hero2 case, and remove the protective lens (Figure 5).



Figure 5. Unscrewing the lens retainer from the case

Now take that black retaining ring, and use it as a template to transfer/drill 3 of the 6 holes into the adapter (Figure 6).



Figure 6. Lens retainer as drill template

You are free to transfer all 6 screws holes (as I did), but only 3 are necessary to get the job done (Figure 7).

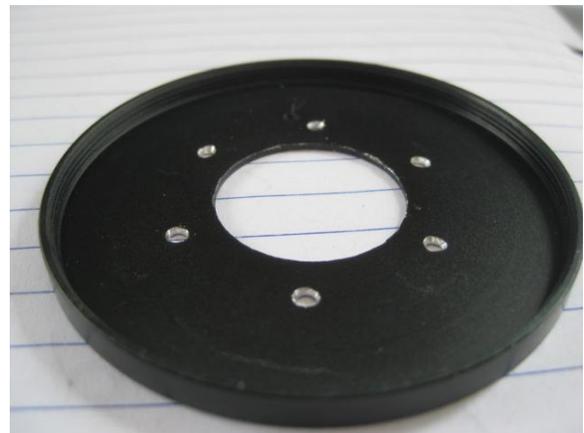


Figure 7. Screw holes transferred to adapter

To attach the adapter to the camera case, you'll need to clip the length of the 3 screws (to about half) so these don't protrude through the acrylic and into the camera when installed in the case (Figure 8).

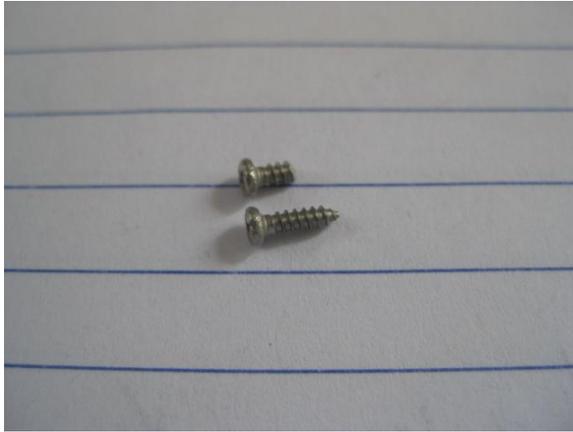


Figure 8. Shortened screws

Before you actually attach the filter adapter to the case, you'll need to remove some material off the front of the case to make things fit right. First, file away some material at the button switch on the case exterior, otherwise it will prevent you from correctly centering the 58 mm adapter over the camera lens (Figure 9).

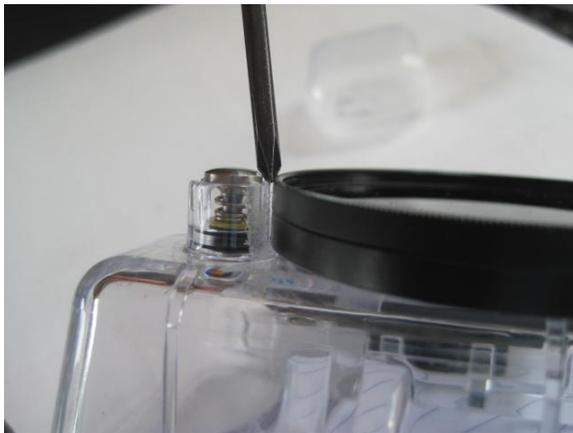


Figure 9. Exterior trimming of the push-button to clear the filter adapter.

Also, you'll need to file or sand the attachment area shown in Figure 10 flat with a file. This is to get the adapter as close to the actual camera as possible. Trust me, this step matters because you don't want the edges of your filter to show up in camera the field of view (a.k.a. vignetting). Finally, you'll need to drill a half-inch hole where the microphone input jack is, so you can

plug in the microphone when the camera is in the case (also Figure 10).



Figure 10. Adapter attachment area sanded flat with mic opening drilled (bottom left).

Once you have trimmed all surfaces as above, you're ready to attach the filter adapter to the case with the aforementioned shortened screws (Figure 11).



Figure 11. Filter adapter installed

I only used three screws to hold the adapter in place. Once the adapter is screwed in place, screw on the 58mm neutral density filter, and voila: you have a flexible and inexpensive 'flying' case for your Hero2 camera! It goes without saying that all these modifications are no longer 'airtight', so I would stick to interior video capture with this set-up.



Figure 12 Final product with hole drilled for external microphone

The whole thing doesn't take more than an hour, and that should bring the total expense to well under \$250, even if you include the \$20 Audio-Technica ATR-3350 Lavalier Omnidirectional Condenser Microphone that I use to capture the audio. Tape the mic in place inside the earcup and marvel at the quality radio communications you will record along with your flight video. The audio is even better if you're sporting an ANR headset, though you'll have to find the right location for the wire to cross the ear-cup foam, lest you break the 'seal' around your ear and get unwanted background noise in flight. If you go with the new Hero3 option, you can buy the Aircraft spruce recording adapter cable below (part # 11-11567) (Figure 13), which plugs directly into your aircraft's intercom system. At \$58, it's kind of pricey for what it is, but does include a bit of on-board circuitry to bring the intercom transmissions down to appropriate levels for sound recording. It's important to note that this cable is also designed specifically for the Hero3 series, because it only accepts only a mini USB microphone plug (not the standard 3.5 mm plug you see on the Hero2).



Figure 13 Aircraft Spruce adapter cable

Whether you choose the Hero3 or Hero2, capturing the audio and video on the same device also precludes the need for secondary recording equipment and editing, which keeps either setup nice and simple, which is really what you want with an inflight system. And if you've kept the in-flight footage relatively 'focused' (e.g. short landing and takeoff sequences), you can simply transfer it to your computer at home with a standard mini-USB cord, attach the whole video to an email, and share it with friends right after the flight. And if that wasn't enough, a further bonus is that you can change the neutral density filter to suit your lighting needs. I found that an ND 16 worked well in most conditions in the C172 I fly, but with the camera set back in the cockpit in a low-wing aircraft, an ND 12 or 8 may be more appropriate. The 58 mm industry standard adapter allows you quickly and inexpensively customize your video recording experience. You can even put on a polarizer for that professional 'deep-blue-sky effect'.

So there it is: \$250-300 (and some careful scrounging for GoPro Hero2 deals) gets you really nice in flight video capability that allows you share your lofty experiences with others. Once you start looking you'll find there are a

number of other options to modify the new Hero3 cases as well, and Enjoy!

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