

## What is my Favourite Walk-around Lens for Action Photography?



Without hesitation, it is Canon's EF 400 f/4 DO IS USM lens, primarily because of its lightness, its smaller size and its great performance. It's the best handholdable lens available for photographers who spend hours in the field shooting subjects in action, e.g. sport, wildlife, birds in flight, etc. The DO lens is easily recognisable by the distinctive "green" band (instead of the usual "red" band) found on Canon's superior lenses. Build quality is excellent. Construction is dust and weather-resistant. The lens comes packed in a protective and a lockable hard fibreglass case. A neck strap that attaches directly to the lens is also included but I find some of the after-market straps (e.g. *Rapid* or *Op/Tech USA*) more comfortable to use.

### What Does "DO" Stand For?

To make any lens smaller and lighter, the spacing between the elements is shortened and the refractive properties of the front and rear lens groups become more pronounced. This, however, results in increased chromatic aberration [CA]. CA is a type of distortion in which there is a failure of the lens to focus all colours to the same convergence point and shows up as "fringes" of color along boundaries that separate dark and bright parts of the image. To resolve this problem, the Multi-Layer Diffractive Optical [DO] element is located within the lens to cancel out the occurrence of chromatic aberration.

By combining a DO element and a refractive optical element within the same optical system, chromatic aberration (I think of this as 'color smearing' and which adversely affects image quality), can be corrected even more effectively than with a fluorite element; it is suppressed to an absolute minimum. Also, by adjusting the pitch (spacing) of the diffraction grating, the DO element makes possible the same optical characteristics as a ground and polished aspherical surface, which effectively corrects for spherical and other aberrations. If you hold the front element of the 400mm DO lens up to the light and rock it back and forth you can see a ringed diffraction pattern. Also, this diffraction pattern is noticeable in the viewfinder as a *minor* coarsening of the ground glass. Of course it is not in any way visible in the final image. The British magazine *Amateur Photography* reported that the lens is capable of >120 lp/mm at high contrast and >90 lp/mm at low contrast. This ranks the lens among the finest ever tested. In every other measurable parameter the 400mm DO test scores are exemplary, with vignetting at less than 1/4 stop wide open, i.e. at f/4 and essentially gone by f/5.6. Resolution at the centre and edges was found to be essentially the same from wide-open to f/16. These are truly excellent results. Enough techno-babble!

### Ultra Small & Ultra-Light

What constitutes a small and light lens is of course relative. Someone used to shooting with a Canon EF 24-105mm lens will regard the Canon 400 mm f/4 DO lens as being large and heavy. But to someone used to shooting with a Canon 300mm f/2.8 L lens, the Canon 400mm DO lens will feel light (1900 g versus 2550 g). The difference in hand-holdability between the 400mm f/4 DO and the 300mm f/2.8 L lens feels even bigger than the 650g difference in weight indicates. Combining a light and relatively fast lens with IS (Image

Stabilisation) makes handholding even more possible. This is especially appreciated when shooting for extended periods. All wildlife photography takes lots of patience to capture that decisive action shot!

You are not tied to a tripod with this lens, unlike the larger 400mm f/2.8 L or the 500mm f/4 lenses. You cannot hand hold either of the latter lenses with comfort for any period of time; they are just too heavy. The size and ease of handling of the 400mm DO lens must be experienced to be understood and appreciated.

### **IS – Image Stabilisation**

The IS on the 400mm DO enables handheld shots at about 2 f-stops slower than a non-IS 400 mm lens. Remember, IS will not stop subject motion. Both Mode 1 and Mode 2 image stabilisation are available on the 400mm DO. Mode 1 attempts to stop camera/lens motion in all directions. Mode 2 allows panning with a moving subject whilst stabilising camera motion in one axis. As with all IS-equipped lenses, an ON/OFF switch allows the IS function to be disabled. The IS works on this lens. This lens will get you shots that larger and/or heavier telephoto lenses will not allow you to capture. Panning with the lens is a joy. Following wildlife or sports in action is a breeze.

### **Really Fast Focusing**

Using Ring USM (Ultrasonic Motor) electronics, the 400mm DO lens focuses very fast, quietly and accurately. A two-position focus limiter switch allows focusing distances to be limited to a minimum of 2.5m or 8.0m. Limiting the focus distance range improves focus lock times and reduces hunting – great for subject-in-motion photography. I have found the autofocus is very quick to lock on to birds in flight if the limiter switch is set for the longer distance. This is true even with the 1.4X extender fitted to the lens.

### **Sharpness is Excellent**

This lens is sharp at f/4 and when stopped down to F/5.6, is extremely sharp (this is where I do most of my bird photography shooting). I find it as sharp as Canon's legendary 300mm f/2.8 L lens – the gold standard for lens performance. Some users of the Canon 400 mm DO report it is less "contrasty" than some of Canon's other lenses. I have not found this and in any event, it is easily fixed in post processing, if required. Lens flare is not an issue. Placing a 1.4 Extender on the lens does not decrease its performance and I frequently use it on the lens together with a Canon 1DMk4 as my standard rig – it is a beautifully balanced piece of equipment. The "bokeh", or characteristics of the out-of-focus portion of an image, is considered by many (me included) to be of great importance in defining the "signature" or characteristics of a lens. This lens has superb "bokeh", as the Japanese would call it.

### **Comparison with the Canon 100-400mm Lens**



I have used Canon's 100–400 f/4-5.6 for several years especially for whale photography from small boats. But, on many occasions the resolution was not perfect when it should have been. It is a good solid lens and has been around for years. However, a lens that has a changing aperture at different focal lengths will never be as sharp as a fixed focal length lens; the internal optics simply dictates this difference. Also the "push-pull" functioning on the 100-400mm takes getting used to and some photographers avoid it like the plague. With a

1.4X extender fitted to the 100-400mm its sharpness decreases markedly. The 400mm DO is significantly sharper than the 100-400mm lens. The 100-400mm at 400mm on a prosumer camera (e.g. Canon 7D) has always appeared to me to be an “unbalanced” combination. It is not much better on a series 1 camera (e.g. Canon 1DMk4).

### Comparison with the Canon 300mm f/2.8 L Mk I Lens



Canon’s 300mm f/2.8 Mk I lens is unquestionably one of the finest lenses Canon ever made. Its performance is legendary and many professional photographers swear it is the best lens in their kit; it deserves all the accolades it receives. I tested it and considered purchasing it when I acquired the 400mm DO lens. To my mind, the difference in image quality I am getting from the 400 mm DO is negligible and hardly noticeable for the size of prints I produce. The 300mm f/2.8 is heavier than the 400 mm DO lens and almost all bird photographers use either the 1.4 X or the 2X extender with the 300mm to get the reach they require. The 1.4X extender narrows/decreases the lens’ aperture by one stop - the 300mm f/2.8 lens becomes a 420mm f/4 lens. When the extender is fitted to the 300mm lens you are carrying a rig that is nearly *1kg heavier* (830 grams to be exact); for many photographers, this is deemed to be too heavy after even 30 minutes in the field. The 300mm f/2.8 lens is a true competitor for the 400mm DO and in the end it becomes a personal choice between the two.

### Concluding Comments & What Would I Change To?

In summary this lens is fast, lightweight, and rugged, has accurate auto-focus, is an absolute pleasure to use in the field and delivers consistently great, crisp images. The only downside for some photographers will be the rather high price charged by Canon. But, it has no competitors if you are looking for the unique characteristics this lens delivers.

Have a look at some of my bird shots. Practically all of the in-flights shots were captured with this lens fitted with a 1.4X extender on either a Canon 1DMk3 or 1DMk4 camera. Here I am shooting, handheld, at the 35mm equivalent of **728mm focal length** and I can still get really sharp, crisp shots. It is amazing when you stop to think about it.

The recently released Canon 300mm f/2.8 L Mk II lens and the Mk III extenders are receiving excellent reviews. One respected independent reviewer stated this lens “may reach as close to optical perfection as any Canon DSLR lens ever made by Canon; you get one of the best lenses ever made”. Additionally, the same reviewer heaps high praise on the new Mk III extenders. If further independent reviews of this new lens/extender combination report in a similar fashion, I would certainly look at this as an alternative to my 400mm DO. Image quality can only go one way – better. I would then have to make a call on whether I will continue to capture the same number of “keepers” with a rig that is nearly a kilogram heavier.