you can Canon

The dawn of EOS

When photographers choose the EOS 5D or EOS-1D Mark II N cameras, they choose far more than just a camera. They choose what many professional photographers believe to be the finest camera system available.

Where it began

The EOS story begins in 1933 when Seiki Kogaku Kenkyujo, the predecessor of Canon Inc., was founded in Azabu-Roppongi, Tokyo. The trial production of the first Japanese 35mm focal plane shutter - the Kwanon - commenced in 1935. From the very start, Canon established a reputation for innovation. The first Canon single-lens reflex (SLR) camera - the Canonflex R – appeared in 1959, and was followed by many more SLR models. In the mid-1980s, the flagship models were the F-1N and T90, supported by a large range of FD lenses.

EOS arrives

In March 1987, the EOS 650 camera was launched. In part, the first EOS built on features from earlier models, especially the T90. But the most innovative feature was the lens mount. In a move that other manufacturers would later attempt to copy, Canon replaced the mechanical links and levers between the camera and the lens in favour of a fully electronic configuration. Eight gold-plated electric contacts transferred data at high speed between the two components.

At the time, this was a major gamble on the part of Canon. Would photographers be willing to get rid of not only their camera, but also all their FD lenses to upgrade to EOS? The answer caught even the most optimistic Canon investors by surprise. EOS cameras and their EF range of lenses triggered an immediate sales avalanche for their manufacturer. One reason for this was the auto focus system.

The birth of auto focus

Canon had been experimenting with auto focusing (AF) lenses for SLR cameras for some years. As early as May 1981, it introduced the FD 35-70mm f4 AF lens, bringing auto focusing to every FD camera. But the lens was bulky, and the auto focus action was relatively slow. Then in April 1985, Canon introduced the T80 camera. This used the FD lens mount and FD lenses, but also accepted three AF lenses exclusive to the camera. The system worked well, but the limited range of AF lenses held it back.

Mechanical limits

Canon realised that trying to build an AF system into the existing mechanical lens mount placed too many restrictions on their designers. The era of the FD lens mount, with its near cult following and sixteen years of service, was about to draw to a close.

Ultrasonic motors

The arrival of EOS also introduced Canon's renowned EF lens range. The first EF lenses used an arc form drive (AFD) to turn the focusing mechanism of the lens. An AFD is an electric motor that uses multiple gears to transmit movement from the rotor. The motor was shaped into an arc so that it could be fitted inside the barrel of the lens. One of the early innovations seen in the range was the ultrasonic motor (USM). Canon pioneered USM to do the job faster, more quietly and with far greater accuracy.

There are two main parts to a USM motor – a stator and a rotor. The stator has a number of piezoelectric elements bonded to it. These vibrate against the rotor at ultra-sonic frequencies (hence the name) when an electric current passes through them, causing the rotor to turn. Think of it a little like a coin laid flat on top of a washing machine. When the machine reaches its spin cycle, the vibrations make the coin slide across the surface.

In some EF lenses, the USM is in the shape of a ring which fits around the inside surface of the lens barrel. This allows motor size to be matched perfectly to the size and weight of the focusing elements. Canon has gone on to develop the Micro USM and Micro USM II. These motors work on the same principle as the ring USM, but the stator and rotor are stacked together in a tiny cylinder. Without lens diameter restrictions, these motors can be incorporated into a wide variety of lenses, including ultra compact zoom lenses.

Evaluative metering

The EOS 650 introduced a metering method that has been used in every subsequent EOS model. Before EOS, the most popular metering method was Centre-weighted average. The reading was from the whole 35mm frame, but with more notice being taken of the area in the centre. This works well for landscapes, as the centre-weighted metering is not unduly influenced by the bright sky at the top of the image. But there are many subjects where a simple reading is not successful.

Evaluative metering divides the frame into a series of zones (from 3 to 35, depending on the model). A reading is taken from each zone and information

passed to the built-in microcomputer for analysis. If, for example, the camera sees that some of the outer zones give a higher brightness reading than the central zone, it assumes that the subject is back lit, or has a white background, and the appropriate exposure compensation is applied. Similarly, a bright central zone but very dark outer zones will suggest a spot lit subject or a very dark background.

Advanced Integrated Multipoint control

The EOS 10 camera, launched in March 1990, improved the auto focus system by introducing multiple focusing points. There are just three focusing points in the EOS 10. By comparison, the EOS 5D has 9 focusing points, while the EOS-1D Mark II N has 45.

With the focusing points set to automatic, the camera takes readings from each point. It then focuses the lens for the point that indicates the shortest distance between the camera and the subject, on the assumption that this will be your main area of interest. The system overcomes the need to use a focus lock function to deal with off-centre subjects.

Of course, if the subject is off-centre, an exposure system that bases readings on the centre of the frame is likely to give inaccurate results. To deal with this problem, Canon developed 'Advanced Integrated Multipoint' control (AIM). If an off-centre focusing point is selected, the metering pattern shifts as well, so the area of the subject in focus is also used for exposure analysis.

Image Stabilizer

One of the major causes of poor pictures is blurring caused by camera shake. As a general rule of hand-held photography, the shutter speed needs to be at least as fast as the reciprocal of a lens effective focal length to avoid the effect of camera shake. So if the camera is fitted with a 28mm lens, a shutter speed of at least 1/30 second is required, but if a 200mm lens is fitted, a speed of 1/250 second or faster will be necessary.

It is not always possible or desirable to use fast speeds, especially in low light, or with telephoto lenses. Canon solves the problem with a range of Image Stabilizer (IS) lenses, which compensate for camera movement with the use of a special shifting lens element.

An IS lens contains two gyros which detect the direction and degree of unwanted movement. One senses vertical movement (pitch); the other detects horizontal movement (yaw). These sensors also measure the frequency of the movement; i.e. how many times per second the camera is being shaken up and down or from side

to side. Once the microcomputer onboard the lens has all this data, it works out how much and how fast the floating lens element needs to move to keep the image steady on the film or digital sensor.

Perhaps the most impressive feature of image stabilization is that it copes not only with shake caused by hand-holding the camera (generally around three to five movements per second) but also vibrations from a car engine or even a helicopter (up to 20,000 vibrations per second).

Having the IS technology in the lens rather than attempting to correct vibrations in-camera means that the benefits of the stable image are visible to the photographer when taking the shot, not just in the resulting image. This makes an enormous difference to photographer comfort.

A system camera

One of the principles behind EOS is that it is a 'system' rather than an individual product. New camera technologies can be developed that will integrate with existing lenses, flashes and other accessories, while new lens and accessory technologies can be developed which will work with existing camera bodies.

The eyes of EOS

New and updated EF lenses are introduced regularly. There are over 60 lenses in the current range, with focal lengths from 14mm to 600mm. Specialist models include three tilt-and-shift lenses, macro lenses with up to 5x magnification, extenders and a converter. Renowned L-series EF lenses represent the pinnacle of groundbreaking image performance, outstanding operability, robustness and resistance to weather and ageing, making them particularly suitable for professional photographers.

Comprehensive camera range

From the beginner's EOS 3000V right through to the professional EOS 1 series, Canon has a comprehensive range of film SLR cameras to choose from.

It is in the field of digital photography, however, where Canon has a remarkable advantage. With resolution, speed and image quality advantages, EOS digital cameras are now specified by all major wire agencies across Europe (including AFP, Getty and Reuters). The digital line-up now includes:

- EOS 350D Digital – 8.0 Megapixel APS-C size sensor, 3.0 fps. Combining ease of use with many of the same compelling technologies found in Canon’s professional series EOS cameras.

- 8.2 Megapixel 5 frame per second EOS 20D. – the first semi-professional camera to deliver all the performance, speed and flexibility of high-end film SLR cameras.

- The 12.8 Megapixel EOS 5D – creating an entirely new digital SLR category: a camera with a full frame sensor in a compact, lightweight body.

- 8.2 Megapixels and 8.5 frame per second EOS-1D Mark II N – set to take over from the EOS-1D Mark II as the undisputed camera of choice for modern sports photography and reportage.

- Full frame 16.7 Megapixel EOS-1Ds Mark II – described by critics as rivalling medium format for quality. Ideal for commercial fashion, studio and portraiture work.