Nikon

- Introduction to Single Lens Reflex Cameras -

Part 10 : How Difficult is Speedlight Photography ?

Modern **speedlights**, also known as strobe(R) and flash, are compact, multi-functional illuminating devices that produce large amounts of light. They are built into many SLR cameras, and are a staple of photography.
Though a photo's appearance will vary radically depending on how a speedlight is used, not many people are familiar with how the device works or the characteristics of light.
In this issue, we'll study the different functions of speedlights and explain their fundamentals

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3. More advanced use of speedlights

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1. Speedlight basics

"Speedlight" is Nikon and some camera maker terminology --- most people are more familiar with the terms Strobe(R), flash and electronic flash.
The first of these common names is a registered trademark of Strobe Research. Flash is self-explanatory vernacular, as is electronic flash.
Nikon dubbed its products speedlights because they deliver high-speed illumination.

Older photographers might think of a flash bulb, which achieved its effect by burning aluminum and zirconium. In other words, it was a physical event in which heat produced the flash.
Today's speedlights are activated electronically. Though the flash bulb can achieve large light output with a small flashing space, it is no longer popular in modern photography.

The speedlight was first used at the New York Expo in 1939, when the Eastman Kodak company demonstrated high-speed shooting. Compared to the modern shape, it was a big device for a small amount of light output.
About 30 years later, a smaller speedlight hit the market, but was unable to wholly replace the conventional flash bulb as the first choice of consumers.
In the mid-1970s, a compact camera with a built-in speedlight was introduced also in Japan(Nippon), the first toll of the flash bulb's death knell and the beginning of a new era in photography.

Modern speedlights are multi-functional with new features. However, the fundamental areas are not as different as people think it is.

1.1. Mechanism of a speedlight

The part of a speedlight that actually does the illuminating is a spark tube housed in a xenon lamp. The results are 1) artificial

light similar to sunlight, 2) the large amount of light and 3) instantaneous response. Let's examine each of these in a little more detail.

1. Artificial light similar to sunlight
The illumination of xenon gas produces a white light that resembles natural sunlight. Because of this, speedlight photography is not only appropriate for outdoor use, but is also able to take "correct-color" pictures without using filters.

2. Large amount of light
The spark in the xenon lamp is caused by electricity that is first compressed in a condenser, then released to an electrode. So, the intensity of the light is directly linked to the capacity of the condenser.
Logically, then, larger speedlights for standard cameras can output more light compared to compact camera speedlights.

3. Instantaneous flash
Flash time — the actual duration of the light emission — depends on the speedlight, and is almost always measured in fractions of a second.
Most automatic speedlights can control light output by adjusting flash time (known as light control). To reduce light output, the release of electricity must cease, resulting in a reduced flash time. But because of simple physics, there's a limit to just what extent flash time can be shortened.

(Photo 0..) In principle, the speedlight should be used at a shutter speed faster than "X"-speed

Camera shake is really not a problem with speedlights. However, light reflection and shadows cannot be confirmed before a photo is taken, so problems with these sometimes appear in the final prints.
With focal plane shutter cameras, shutter speed must be less than the flash sync speed (X speed) in order for the entire frame to be exposed properly. (For details, please see Part 5, section 2.1.)

A little off the topic, but there has been a unique equipment introduced.

For example, the Nikon speedlight **SB-28DX / 28**" can synchronize to high shutter speed like 1 / 250 to 1 / 4,000 sec. by using together with **F5**, **F100**, or **F90** (**N90**) series, and other cameras, and setting it to "FP (Focal Plane)" High-Speed Sync.

With the "FP" High-Speed Sync, many repeated flashes occur when the space between the front and rear shutter curtain move along the frame. It can take a picture as if using an FP-class flash bulb that has long flash time.

For now, it is operated manually, by calculating the GN, the distance to the subject, and the lens aperture. But in the future, it will become more simplified.

1.2 What are Guide Numbers (GN) *?*

The value of a speedlight's light output is known as its guide number. With this value, it is easy to calculate the lens' f-number and obtain appropriate exposure when shooting manually. Generally, the number is indicated when using an ISO 100 film* and the illuminating angle covers the picture angle of a 35mm lens' focal length.

*With an Advanced Photo System™ (IX240) camera, the number is indicated when an ISO 200 film is used.

When film sensitivity is doubled --- from ISO 100 to ISO 200, for instance --- the GN is multiplied by 1.41421356..... (the square root of 2); if it is quadrupled (to ISO 400 in our example), the GN doubles.
Changes in light output and illuminating angle also affect the value. Put simply, GN changes depending on how the speedlight is being used.

Here is the standard GN equation :
GN = Distance to the subject (m) x lens's appropriate f-number

So, a speedlight with a large GN has a larger light output. Most cameras' built-in flashes have GNs of 10 to 18, while the GN of clip-on speedlights attached at the hotshoe runs between 18 and 36. Grip types have GNs of 32 to 56. These figures are based on an ISO 100 at m and an illuminating angle covering 35mm lens.

Today, some flashes have auto-power zoom mechanisms with very high GNs obtained by narrowing the illuminating angle. For example, a clip-on flash might boast a GN of 54 ; but read the fine print and you'll see that this value is with a 105mm lens. With a 35mm lens, the GN falls into the 30s, as one would expect.

In the United States, length is usually measured in inches and feet, not meters and centimeters. One (1) foot is approximately 0.305 m, so the GN of a speedlight sold in America is 3.3 times (ISO 100 at ft.) that of a speedlight based on the metric system. Do not be surprised if you see a GN of 178 — just remember this is at ISO 100 at ft.

Here are a few sample questions to help illustrate the equation. For our purposes, let all film sensitivity be ISO 100.

Q.1.: If the distance to the subject is 4m and the GN is 36, what should the lens aperture be set to, to obtain the appropriate exposure *?*

A.1.: 36 (GN) = 4 (m) = 9. The aperture should be set around f/9.

Q.2.: With a lens whose maximum aperture is f/2, what is the minimum GN needed to obtain correct exposure of an object that's 12m distant ?

A.2.: 2 (f-number) x 12 (m) = 24. Use a speedlight with GN of 24 or higher.

Q.3.: Using a zoom lens with a maximum aperture of f/4 on a camera with a built-in speedlight with a GN of 12, what is the maximum distance at which I can shoot an object and still obtain the correct exposure ?

A.3.: 12 (GN) / 4 (f-number) = 3. Three (3) meters is the maximum distance.

You see, the equation has very practical applications.
However, let's qualify some of the results. The third question, for example, raises an interesting point.
If you're using a conventional SLR camera with a built-in

speedlight, a zoom lens and ISO 100 film, a subject that is more than a few meters away will appear underexposed.
Also remember that the maximum distance will double when you're using ISO 400 film and quadruple when you're using ISO 1,600 film.
When using a camera with a built-in speedlight with a low GN and a zoom lens, remember to compensate with a high-sensitivity film.

REMINDER :
Program mode of some cameras stop down the lens aperture when a high-sensitivity film is loaded.
Using such film does not always guarantee that a speedlight's "reach" will be extended.
If you are going to use the automatic (automatic illuminating) function (to be discussed later), you should confirm its range/reach before taking a photo.
Auto functions are convenient, but they are not always appropriate for every situation.

(Photo 1.)
Check the light-reaching distance before taking the picture.
In this case, the light can reach between 0.8 to 6 meters.

The illuminating part of some speedlights has a Fresnel lens, a lens in which the spark tube is able to shift back and forth in order to change the illuminating angle (zoom function).
For example, when taking telephoto shots, light is emitted in a concentrated area to amply light the subject.
In this situation, there is a large GN. Conversely, in other situations light must be dispersed over a wide area. Here, GN decreases.

Basically, the speedlight should be set to cover the lens's focal length (picture angle). In 1980s, auto-power zoom speedlight, which received the lens's focal length data via the camera body and zoomed the speedlight's illuminating angle, was released.

1.3 Choosing the shooting modes

Modern speedlights have many features. For the photographer, this means the camera and the speedlight does all — or at least

most of — the work.
Because there are so many features out there, it is easy to get confused. In this section, we'll introduce a few of the basic terms used with Nikon speedlights.
This is not intended to be a comprehensive course, though. You should always read your user's manual for detailed information.

1.3.1. Manual mode (M)

In manual mode, a fixed amount of light will be emitted. The amount of light will not vary with subject brightness or camera settings. Output is divided into the following categories: Full power; 1/2 GN light output; 1/4 GN light output; etc.

NOTE :
Charging time is shortened if light output is reduced. This is good for shooting a series of pictures. Use the GN equation or measure conditions with a flash meter.

>1.3.2. Non-TTL Auto Flash mode (A)

(A)
Light from a speedlight that's reflected off the subject is perceived by the speedlight's sensor, which automatically controls light output.
Though this function has largely fallen out of use because of TTL Auto Flash mode (see next section), it can still be useful in certain situations. The f-number indicated on the speedlight should be adjusted to the lens' f-number for correct exposure.

1.3.3. TTL Auto Flash mode

The "TTL" we're talking about stands for "through the lens." What this means is that image brightness appearing on the film surface is measured directly.
In this mode, light from the speedlight reflects off the subject and goes back through the lens, where image brightness on the film surface is measured.
So, light output is actually controlled by the speedlight.
Because light output is measured and controlled when the speedlight flashes, the chances of obtaining the correct exposure are increased.

1.3.4. Balanced Fill-Flash mode

This mode maintains even brightness between the main subject, which is directly influenced by the speedlight, and the

background, which is not. This mode is ideal for daytime sync and night scene portrait photography.

1.3.5. Multi-Sensor Balanced Flash mode

Advanced Balanced Fill-Flash with more sensitive TTL flash control, this function basically takes the guesswork out of using a speedlight.
It culls data from different parts of the frame while it's illuminated by the speedlight, and combines it with distance data that is transmitted from D-type Nikkor lenses to the camera body.
This mode is useful when subjects are standing in front of highly reflective backgrounds.

1.3.6. Program Flash mode

In this mode, the camera automatically sets the aperture, but only if the AF Nikkor lens has been set to its smallest (maximum) aperture.

1.3.7. Monitor Pre-flash mode

This aptly named function emits a pre-flash before the actual flash in order to obtain data for more accurate results. Currently, the Nikon **SB-28DX / 28 / 27** speedlights have this feature.

1.3.8. AF Assist illuminator

If the subject is too bright, the AF function may not be effective. In such cases, the speedlight --- or sometimes the camera body --- emits a thin beam of light toward the subject so the AF function works before the actual picture is taken.
Nikon speedlights emit a pattern that makes setting the focus much easier.

1.3.9. Red -Eye Reduction

We all know what this one does. Eyes appear to be red when light from the speedlight is reflected off the retina. In this mode, the subject will come out with "clear" eyes.

(Photo 2.) The red eye effect.

Also, some person are easier to become "red-eye" depending on the characteristics of that person's eyes.
Since dogs and cats have a curtain-like reflecting wall further beyond the retina, so this effect occurs much easier than human

(unlike humans, they mostly become "green-eye" or "blue-eye").

Built-in speedlights of compact cameras are often culprits in red eye cases, because their lens light axis and speedlight flash are situated close together.
The basic rule for avoiding red eye in any camera is to separate these two elements. Because this is not always possible, this mode is a great boon to photographers.
As bursts of light are emitted prior to the speedlight's actual take, the subject's pupils contract, thus reducing red eye.

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2. Speedlight shooting techniques

Here are some pointers to help minimize mistakes while you're using a speedlight.

2.1. Beware the shadows *?*

The light source of a speedlight is very close to that of a point source. Therefore, a dark shadow drops behind the subject.
When taking a picture by making the camera vertical and using a clip-on speedlight, a big shadow will occur.
Naturally, you don't see these shadows when you're taking the actual photograph, so you might be surprised to find them in the final prints.
The key is to remember that a speedlight emits light from its flashing area and to try to predict where this light might create a shadow in relation to your subject.
There is one speedlight mode, Modeling Flash, that lets you confirm where a shadow might appear.

(Photo 8.a. to 8.c.) Camera position and shadow creation



2.2. Speedlight settings influence outcome

Here's a basic principle of photography : When using a speedlight, shutter speed should be less than flash sync speed (X speed).

But how will a picture change when it's taken at a slower shutter speed *?* By slowing shutter speed, "stationary light" (natural light, light bulbs, florescent lights — any light visible to the human eye) has a bigger impact on the photo.
Therefore, by changing shutter speed, you can alter the amount of stationary light for purposes of exposure.

"Night scene mode" in the Auto Function utilizes this to take more accurate photos. (See section 2.3. of Part 7.) (Photo 9.a.to 9.d.)
Different stationary light portrait taken at varied shutter speeds.

**1/8 sec., f/5.6,
without speedlight**

**1/250 sec., f/5.6,
with speedlight ("A" mode)**

**1/60 sec., f/5.6,
with speedlight ("A" mode)**

**1/15 sec., f/5.6,
with speedlight ("A" mode)**

3. More advanced use of speedlights

Here are a few examples of advanced speedlight techniques.
Modern speedlights are multi-functional, high-performance pieces of equipment that do many tasks automatically.
This said, there is hardly enough space to go into great detail about all their functions.
Always refer to your user's manual or product catalogs for more thorough information.
For now, however, it will be useful for you to get an idea of how certain functions can affect the photos you take.

3.1. Bounce flash shooting

(Photo 10.)
Speedlight with bounce flash

This technique best suited for "neck-swinging" speedlights. If the flashing area is aimed upward or to the side, light will reflect, or bounce, against the ceiling or wall.
This scatters and weakens the light to create softened shadows. Of course, if the surface off which you're bouncing the light is a color other than white, that color will be reflected into the photo.

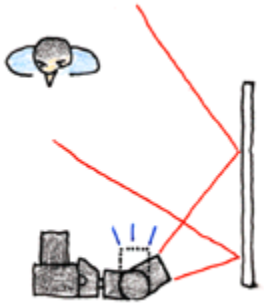
You can use TTL Auto flash or non-TTL Auto flash for automatic shooting. But because reflected light is being used, the amount of light that actually reaches the subject depends on the reflecting surface and its distance from the subject.

In anticipation of the decreased light output, try using a high-sensitivity film or setting the aperture close to its maximum.

(Photo 11.a. to 11.d.) Changes of appearance with bounce flash

Normal shooting

Bounce flash shooting



(Fig. 2.) Bounce flash shooting

3.2. Using speedlights off camera

With an extension cord, the speedlight can be positioned away from the camera in TTL Auto flash mode.
It will take some practice, but it will be well worth the effort when you see the different lighting effects you'll be able to achieve.
Once you feel comfortable with a single off camera speedlight shooting, you might want to try using more than one.

There are many accessories for this type of shooting, so grab a catalog and do some research to see what's out there.

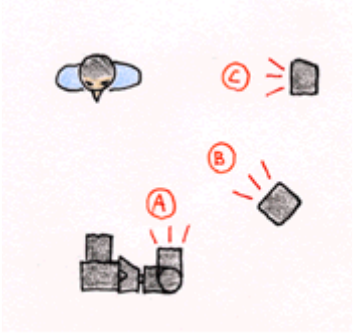
(Photo 12.)
A speedlight separated from the camera with an **SC-17** TTL remote cord

(Photo 13.a .to 13.d.)
Difference of lighting effects by varying speedlight position

(A) Flash positioned above the lens's light axis(A)

(B) Flash positioned at a 45-degree angle

(C) Flash positioned side of the subject



(Fig. 3.) How pictures A, B and C were set up.

3.3. Rear-curtain sync

In normal SLR cameras, the speedlight flashes in sync with the shutter's front curtain, once it's fully opened. This is called front-curtain sync.
By taking a picture of a moving subject in front-curtain sync, however, blur and movement might not complement each other. Rear-curtain sync remedies this by enabling the speedlight to flash just before the rear curtain begins to move.

(Photo 14.a. to 14.b.)
The difference between front-curtain and rear-curtain sync (subject is moving right to left)

Front curtain sync (subject appears to be moving backward)

Rear curtain sync (subject appears to be moving forward)

3.4. Repeating flash

(Photo 15.) Repeating flash

By setting the speedlight to flash repeatedly, it is possible to shoot continuous movement.
Light output, flashing interval and the number of flashes must all be set to the right level, and shutter speed should increase in accordance with such settings.
In effect, this is manual shooting, so exposure should be measured using the guide number (GN).
Also, because the subject's images will be overlapping, try changing the f-number and testing different exposure steps.
Last but not least, such photos should be taken in dark places where stationary light doesn't influence the environment.

Information about speedlights fills volumes.
Though I'd like to spend more time discussing these important devices, it just isn't practical in this forum.

For now, these basics will help you on your way to a better understanding of speedlights and how to use them in your photography.

In the next issue (Part 11.), we'll take a look at colors. Be sure to come back and see what's what *?*

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