



March 2001

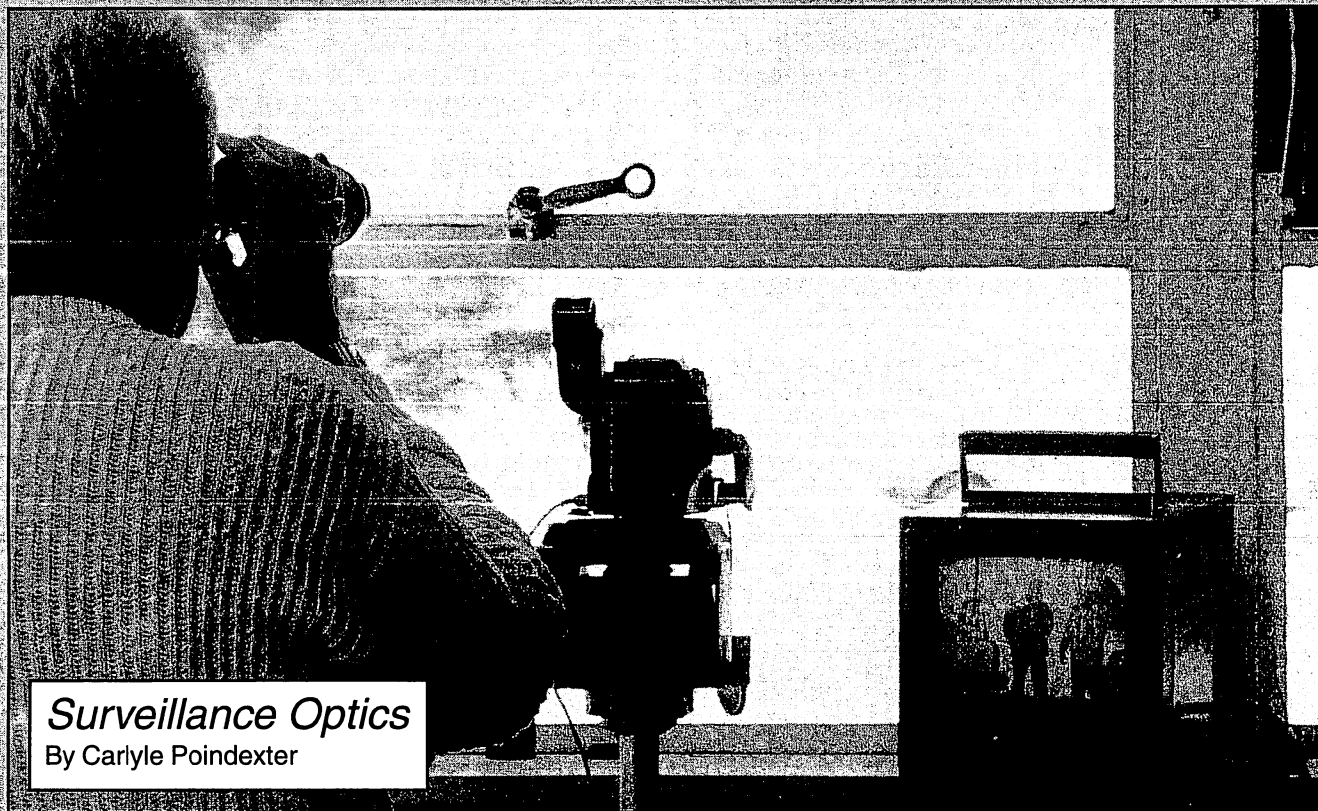
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Media Trends

Focus on Surveillance



Surveillance Optics

By Carlyle Poindexter

The binocular stands as perhaps the single most valuable piece of equipment in the professional surveillants' arsenal. However, some misunderstanding seems to exist among even seasoned investigators as to what constitutes an effective optical device. Given the myriad of manufacturers boasting the benefits of their new and miraculous "space-age" designs, this proves unsurprising.

Careful review of a binocular advertisement, however, usually reveals an emphasis on one particular capability of the binocular. Unfortunately, that one feature often decreases the effectiveness of other important ones. For example, one manufacturer claims to produce a binocular with an amazing magnification of 30 times. What is *not* advertised is that the same unit will suffer an inherent loss of light-gathering capability and destabilization of the image, perhaps serious enough to prohibit handheld use.¹ To avoid this type of disappointment and to choose the correct optical equipment, criminal justice agencies

should examine the basic features of binoculars and some fundamental purchasing considerations.

FEATURES

All prism-based binoculars are similar. Each has four basic features that agencies must consider when choosing a system. These include magnification, light-gathering ability, field of view, and practicality.

Magnification

Magnification refers to the binocular's ability to magnify the image the viewer focuses on. Expressed as a "power," magnification signifies how much closer the image will appear to the viewer, as opposed to observation with the naked eye. For example, viewers using binoculars with 10x (10 power) magnification will see images at one tenth of the true distance from them, or 10 times closer. The first number that appears on the binocular housing represents the power. Therefore, a binocular labeled 10x50

possesses a 10 power magnification. Bearing this magnification principle in mind, it becomes obvious that a higher power binocular allows surveillants to position themselves at a greater distance from the subjects of their investigations. While beneficial to discreet surveillance, this increased capability causes unavoidable decreases in the performance of other features of binoculars.

Greater magnification results in a loss of light-gathering ability, a decreased field of view, and a decline in image stability. To increase the size of the viewed image, additional optics become necessary. In turn, those optics cause a significant loss of the binocular's ability to trap and retain light. Simply put, "more glass eats up more light." The field of view (i.e., the width of the area that the viewer can see) decreases, requiring more effort to center the image. In addition, the image becomes unstable, making it increasingly difficult to focus on fine details, such as motor vehicle registrations and facial characteristics.

Light-gathering Ability

This feature signifies the binocular's ability to gather and efficiently use ambient light (i.e., available environmental light without benefit of light-enhancing devices, such as infra red). The size of the objective lens (the glass optic on the far end of the binocular) determines the amount of light that the binocular can collect. Lens size, expressed in millimeters, represents the second number found on the binocular body. For example, a binocular labeled 10x50 has a 50 millimeter objective lens. The objective lens measurement chosen will depend largely on the surveillant's needs for day or nighttime use. A lens for daylight use requires no more than four times the magnification of the binocular. Any greater lens size may collect an unnecessary level of light. Because the human eye can use only so much light, an excess can cause eye strain over a prolonged surveillance. A binocular with a larger objective lens also tends to

obtrude because of the housing required to contain the additional optics. Larger lenses further increase the likelihood of reflections, which may alert the subject to the surveillant's presence.

The opposite applies to a binocular used under low-light conditions. The housing size and chances of reflection become less important given the cloaking properties of darkness. In addition to the larger objective lens, some binoculars, used predominantly for low-light observations, have a special chemical coating that enhances efficiency by partially preventing collected light from escaping. A low-light level binocular usually possesses a lower magnification as well. Less light is necessary to magnify and transmit the image to the eyepiece. Lower light allows surveillants to position themselves closer to subjects, hence the logic behind a lower magnification power. In short, big lenses equal good light gathering, which, in turn, creates big binoculars.

Field of View

Field of view denotes the width of the focused image as it appears through the eyepiece. Field of view, typically expressed in feet, is based on what an individual can view at 1,000 yards. A wider field of view tends to facilitate quick image acquisition. When choosing binoculars, agencies should select the largest field of view available without

moving to a special "wide view" unit. Although readily available, wide-view binoculars have demonstrated some shortcomings when used in the field. Many lose image quality near the limits of the field of view. Therefore, agencies should scrutinize the image quality before purchasing wide-view units.

Practicality

This feature includes a binocular's durability, size, and suitability for a variety of surveillance needs. Surveillants may subject binoculars to a broad range of environmental conditions. Humidity, temperature fluctuations, and rough handling associated

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with field use can affect the quality of the transmitted image. Misalignment of the optics caused by jarring can degrade a binocular's usefulness quickly. Fortunately, modern well-fabricated units are largely free of the flaws caused by weather. Solid construction and the addition of a rubberized cover on most binoculars have increased their shock resistance and durability, while various nonreflective finishes have enhanced their discreetness.

Size is certainly a practical factor for surveillants, who can find cumbersome binoculars uncomfortable to hold for long periods of time. Fatigue from supporting several pounds of glass makes it difficult to manually hold a stable and focused image. When using binoculars with larger objective lenses, surveillants may need a window mount or tripod, making the unit even more difficult to move or effectively disguise.

Obviously, an optic system of this size would not work for a mobile, e.g., vehicle, bicycle, or foot, surveillance. On the other hand, a compact, handheld binocular may offer a strong magnification, but prove ineffective in any light condition other than broad daylight. What, then, represents an acceptable compromise?

A binocular with a combination of features suitable for a wide range of surveillance needs constitutes the most effective choice for most criminal justice agencies. Such a unit has between 8x and 12x, with an objective lens no smaller than 50 millimeters. This combination represents a "middle ground," offering good magnification without any noticeable light-gathering loss. Image stability appears more than adequate in this range, and the field of view lies between 250 and 350 feet at 1,000 yards.

PURCHASE ADVICE

Before an agency purchases binoculars, it should consider three main issues. First, the agency should try to choose a binocular with individual eyepiece focusing capability. Most people have stronger vision

in one eye; therefore, the individual focus capability takes into account this human vision variation. Out-of-focus viewing through a binocular leads to eye-strain and the inevitable accompanying headaches.

Second, an agency should choose binoculars made by a reputable manufacturer and sold through a reputable dealer. Respected manufacturers will

guarantee their products, while knowledgeable dealers can explain proper focusing and more technical issues, such as binocular alignment and how to recognize optical flaws. Last, an agency must test the binoculars before purchasing them and remember the old adage that "you get what you pay for." Agencies must expect to pay a higher price for quality equipment. The purchase of a well-made binocular will ensure comfortable, clear viewing and quick target acquisition. Small extras, such as

chemical lens coating and durable rubberized finish, can pay big dividends in the field.

CONCLUSION

Criminal justice professionals understand the importance of quality equipment. Often, though, they may overlook the binocular when considering equipment purchases. Agencies and individuals must examine their needs and budgets before deciding how best to use their limited funds for equipment purchases. By looking at the magnification, light-gathering ability, field of view, and practicality of various optic systems, these purchasers can increase their chances of obtaining quality units that fulfill their operational and budgetary requirements. ♦

Endnote

¹ The author based this article on his knowledge gained as a private investigator and by interviewing manufacturers and sellers of binocular equipment.

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