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Underwater Digital Photography Equipment for Evidence Recording

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TECHNICAL REPORT
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Executive Summary

This evaluation was conducted as an adjunct to a longer term project, "Decomposition in the Great Lakes Environment".

In order to document the findings of the project, it was necessary to obtain an underwater digital recording system.

This paper explores the use of such equipment, the testing methods and the results.

Sommaire

L'évaluation a été effectuée comme supplément au projet à long terme « Decomposition in the Great Lakes Environment ».

Afin de pouvoir documenter les constatations du projet, il était nécessaire d'obtenir un système d'enregistrement numérique sous-marin.

Le présent rapport examine l'utilisation d'un tel système, les méthodes d'essai et les résultats.

Underwater Digital Photography Equipment for Evidence Recording

Report and photos by Bill Wiley - Niagara Regional Police Service Diving Supervisor

Project Background

The Niagara Regional Police Service Underwater Search & Recovery Unit (USRU) has been taking part in a nationwide scientific study to assist police agencies worldwide with solving a variety of mysteries related to aquatic death/crime scenes. Forensic Entomologist Dr. Gail Anderson of Simon Fraser University in British Columbia, is assisting with the ongoing study currently managed by Julie Graham of the Canadian Police Research Centre (CPRC).

The purpose of the study being held in Lake Ontario near St. Catharines, is to determine the post mortem interval (PMI) of submerged bodies by identifying:

- stages of decomposition in fresh water at various depths and water temperature,
- scavenging patterns and aquatic organism succession,
- re float patterns of submerged victims based on depths and water temperature.

To document the study findings an underwater digital recording system was required. Little information existed on the feasibility of using digital (still) technology for recording evidence in aquatic death/crime scenes.

Funding provided by the CPRC was used to purchase a (still) digital camera and underwater housing to test whether the equipment is suitable for police work. The camera and housing selected for the test was the Olympus CAMEDIA C-3030 Zoom (\$999 US) combined with Light & Motion Tetra 3030 underwater houses (\$999 US). With exchange, shipping and handling the total cost is approximately \$3,500 Canadian.



Why Digital?

With still photography, the police diver needs a thorough understanding of the types, applications, and limitation of recording methods and the problems encountered under water, particularly that of lighting and limited visibility. He needs to understand the principles of photography, the critical relationship between shutter speed, aperture, film speed and depth of fields. Still photography is more exacting and less forgiving than video and requires some extra effort.

Canadian Police Research Centre Report Underwater Digital Photography Equipment for Evidence Recording Test

Producing high quality evidence photographs using a manually operated 35mm camera can be a daunting task for many. Attempting this under water is difficult, if not impossible, for some. The simplicity and user-friendly nature of a digital camera make it possible for all team members to carry out this crucial police function under water.

Other positive aspects of digital technology:

- Instant images that can be used for publications or quickly inserted into multimedia presentation. Time is not wasted delivering and processing film,
- Images can be electronically mailed to co-workers, neighbouring departments or forensic specialists who may be required to assist with your investigations,
- Images do not require large storage or filing systems when stored electronically.

The first phase of the project was carried out from September 18 to October 5 2000. Ten NRPS police divers conducted daily underwater surveys using a helmet and handheld underwater video camera. Unfortunately, the Tetra 3030 underwater housing was not available due to production delays and did not arrive until December 2000. The forensic study was halted at this point due to an unusually cold winter and ice buildup on Lake Ontario. The deep water digital camera testing is scheduled to resume in mid March 2001. The results of these open water tests will be forwarded to the CPRC upon completion.

Since December 2000, the underwater digital camera quickly proved its worth on a variety of operational and training dives.

Digital Imagery and Law Enforcement



The main advantage of digital cameras is their ability to have a viewable image right away. If you are not happy with the picture taken, simply select the appropriate mode (Playback) and press the erase button.

A new trend for law enforcement agencies across North America is the use of digital point and shoot cameras and digital video for evidence recording, documenting crime scenes and mass casualty identification. Today's digital cameras are easy to use and produce pictures offering high-resolution, high-quality images that last forever (Morrison, Richard D, 1999). Electronic storage is another advantage. Some will argue that digital images cannot be used as evidence because the image can be altered.

Written policy must be in place outlining chain of custody procedures for all image records including digital, as any source could be altered.

A diver presenting digitally recorded evidence is saying, “I was there, I saw it, and it looked like this.” The technology that produced the video (photo) is not of interest. The testimony of the witness carries the weight.

“If there is no serious challenge to the testimony, then there is little reason to question the technology used”

- Scientific Working Group on Imaging Technology

The Olympus C-3030

The Olympus C-3030 is the upgraded version of the previous C-2020 Zoom model. The C-3030 is in the semi-professional category of digital cameras that can be operated in Manual, Semi-automatic or Automatic mode. In addition, the C-3030 has many features, including: 3x optical zoom, optical view finder (for use outside of the housing) LCD viewing screen, video out, serial out, direct printing to Olympus 300 series printers, SmartMedia memory, burst recording mode, self timer, Macro and Panorama mode. Other semi-professional features include matrix (averaging) and spot metering, exposure compensation, white balance control (Auto, Daylight, Overcast, Tungsten light and Fluorescent light), and multiple ISO settings (Auto, 100, 200, and 400). The C-3030 enables the user to use spot metering to isolate a subject and ensure proper exposure.



Rear view of camera with the Smart Media card used for memory storage. With the camera set at high quality, the user will get 20 pictures per card.

The Light & Motion Tetra 3030

The Light and Motion Tetra 3030 is a rugged cast aluminium pressure hull and machined aluminium rear plate that houses the C-3030 digital camera. The rear plate is removed by rotating two self-locking rotary latches and the camera simply slides in or out. A double set of Buna-70 O-rings protects the housing from leaking in depths of up to 300 feet. The Tetra 3030 mechanically controls the camera without the use of electronics. Camera controls are mirrored by the housing allowing for a seamless transition from above water to underwater photography.

Testing

The first tests with the C-3030/Tetra housing were conducted in a murky, poorly lit tank located at Aquatic Sciences Inc. in St. Catharines Ontario. After a quick glance at the operating manual, the writer enclosed the camera in the housing and entered the 10-foot tank.

The writer set the image resolution to high quality then descended to the tank bottom to photograph a colleague performing underwater body bagging drills with a mannequin. With the camera set on Automatic, the quality of the images was impressive. The back of the camera housing provides access to all camera functions, however manipulating them with thick diving gloves takes practice and patience.

Operationally, the camera was used following a home invasion where a suspect attempted to hide inside a concrete dock along the Lower Niagara River in Niagara-on-the-Lake. The suspect, in an attempt to elude police jumped into the fast flowing, freezing waters of the Niagara River in the middle of the night. Miraculously, he managed to find a 10"x 24" opening between the dock pilings and managed to squeeze his body through the opening into a 4'x 4' space. The writer was originally contacted to supervise a diving search of the river bottom where the suspect was presumed to have drowned. As the uniform officers waited for the divers to arrive, the suspect, now hypothermic, shouted out from his cramped hiding place. After almost two hours negotiating with the uniform officers, the suspect surrendered to police and was lifted out of the hole with a lifeline and harness.

A police diver armed with the Tetra 3030 and a small flashlight was lowered down the dock wall and into the hole to search the interior for evidence left by the suspect. The diver inside the pitch black hole took photos of property taken from the home invasion. Remarkably, the photos were clear and later logged as evidence for the upcoming court proceedings.

During a body recovery in sub zero temperatures, the Tetra 3030 proved invaluable for shooting topside evidence photos while snow and drizzle descended on the scene. The only downside while operating the camera in cold temperatures was the reduced burn time due to battery failure. A second set of rechargeable batteries quickly solved that problem.



The image above was taken at the bottom of a murky training tank. The external lighting is from a light mounted on the writers diving helmet.

**Canadian Police Research Centre Report
Underwater Digital Photography Equipment for Evidence Recording Test**

Further testing took place in a clear (indoor) university pool during a dive training session. The writer took a series of long, medium and close-up shots with ambient light only. Once again, the camera was easy to use and provided excellent images for future use in training and promotional multimedia presentations.



The long shot above was taken with the camera set on standard mode with a working range of 31 inches to infinity.



A second medium shot set in standard mode automatically adjusts for poor lighting.



When set to macro mode, the working range from subject to camera is eight to 31 inches. The Program mode setting picks the preferred f-stop and shutter speeds automatically.

Conclusion

Digital still photography is a very useful and commonly used recording method, which produces a permanent, detailed record of an accident, disaster or crime scene. It is a relatively inexpensive method of evidence recording. The photograph(s) taken are admissible and have the same value as the original evidence to the contrary is presented.

The C-3030/T-3030 is definitely a useful tool for law enforcement, not only for recording underwater images, but topside scenes during inclement weather or at hazardous sites (post blast, arsons, etc.) where a rugged, waterproof system is required.

Submitted by Bill Wiley
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