The Freestyle 2:

How Handheld 3D Scanners Are Transforming Forensic Data Capture

Content:

Forensic technology
is rapidly evolving in the public safety sector

For a long time, tools like tape measures, total stations, and pen and graph paper were all considered acceptable ways to document a scene. Now, 3D scanning is becoming the gold standard for investigators. 3D data capture technology is accurate, reliable, efficient, and affordable. It allows users to completely freeze crime scenes in time, preserving every little detail.

Like with most public safety concerns, time is always critical during crime scene documentation. Investigators are under pressure to capture evidence as expeditiously as possible in order to release the scene. Objectivity and thoroughness are crucial during this process, so investigators have to make sure they work efficiently while also capturing every detail and measurement.

With manual measurement tools, more responsibility falls onto their shoulders. Leveling the device, using tape measures, trying to manually capture the scene from different angles – all of these processes take up valuable time, making it challenging to capture consistent results and increasing the risk of confirmation bias.

In contrast, 3D data capture tools digitally preserve the entire scene and essentially freeze it in time, so investigators can accelerate on-scene documentation processes while improving the thoroughness and accuracy of the data captured. This helps minimize the risk of human error, allowing them to produce a complete rendering for the jury to see for themselves in the courtroom.

In forensics, confirmation bias refers to the tendency to subconsciously collect or analyze evidence in a way that confirms existing beliefs or previous experiences.

The Freestyle 2: Agile, Photorealistic 3D Scanning

The FARO® Freestyle 2 Handheld Scanner is a simple 3D scanning solution that allows investigators and crash reconstructionists to upgrade the speed and accuracy of their documentation processes. It provides immediate real-time visualizations with photorealistic reality capture capabilities, so users can achieve more accurate documentation while significantly reducing on-scene documentation time. It is compact, portable, and can effectively scan in cramped, hard-to-reach spots – making it easy to capture every detail in intricate crime and crash scenes.

This comprehensive guide

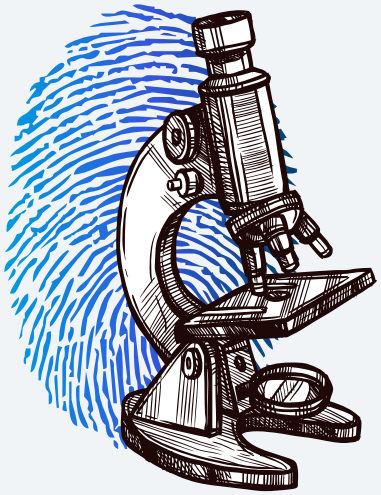
will walk you through everything you need to know about:

- The current landscape of 3D forensic technology
- How handheld 3D data capture solutions can capture notoriously difficult scenes with greater accuracy and speed
- The unique capabilities and benefits of the Freestyle 2
- How to determine the most effective solution for your challenges and applications

The Landscape of 3D Forensic Technology

Forensic science is a field that is constantly evolving.

It has come a long way, from the first autopsy of Julius Caesar back in 44BC to the current landscape of 3D data capture technology. Over the centuries, it has continued to move towards more accurate, holistic documentation.



A GLIMPSE AT THE TOOLS OF YESTERDAY

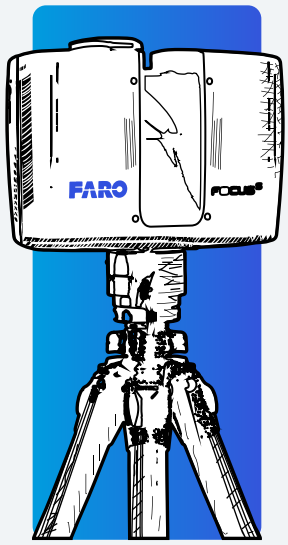
1248 The Chinese book *Hsi Duan Yu* is the first documented application of medical knowledge and entomology to solve crimes. Source.

1859 Photography makes it into courtrooms in the U.S. for the first time, twenty years after the daguerreotype process was invented by Louis-Jacques-Mandé Daguerre. Source.

1953 James Watson and Francis Crick make the groundbreaking discovery of the double helix, the distinct twisted-ladder structure of deoxyribonucleic acid (DNA). Source.

1960s Laser scanning technology is invented in 1960 and is soon used across multiple fields over the following decade. Source.

1988 The first appellate court decides to uphold the admission of DNA evidence. Source.



2010s

More agencies adopt 3D scanning technology as the first successful prosecutions using 3D technology are seen. Agencies begin to see the value in decreased on-scene time and lowered risk for investigators using these tools. Source.

2020s

THE TOOLS OF TODAY

New developments in 3D handheld scanners for forensics introduce new ways to capture objects and surroundings in 3D using mobile reality capture and virtual reality. 3D Capture technology rapidly grows more holistic and soon becomes the new standard for scene documentation. Source.

3D scanning is not the future of forensics. It is the current standard.
Since the invention of 3D scanning, the bar has been raised for comprehensive, accurate data capture, and conventional tools alone can no longer provide the precision that is expected for modern investigations.

3D scanning stands out from other forensic technology with its unique ability to keep scenes "frozen in time" with photorealistic results that allow for safer and faster on-scene documentation, more in-depth analysis, and more impactful, unbiased presentation of evidence in the courtroom.

How does 3D laser scanning measure up against more traditional methods?

3D laser scanners outperform conventional tools when it comes to the efficiency and accuracy of data capture and processing. Total stations and digital wheels are much slower due to the process of entering all the individual data points.

A 3D laser scanner, on the other hand, is capable of capturing up to 2 million data points per second, creating an average time savings of 81% when compared to total stations.[1]

How does 3D scanning work?

3D scanners utilize light-based measurement techniques to capture a full, realistic perspective of the space. Laser scanners collect data with a laser line or point-by-point while structured-light scanners use white or blue light technology to capture the scene with full field scanning.

[1]Clearing and Documenting Injury and Death Crashes: https://insights.faro.com/public-safety-forensics/clearing-documenting-injury-death-crashes

Product Exploration: Introducing the Freestyle 2 Handheld Scanner

Handheld 3D scanners are leading the way in flexibility and accuracy.

All 3D laser scanners produce more accurate, holistic documentation, and handheld models take it to the next level by increasing the flexibility and speed of documentation processes.

This is especially important for more complex crime scenes that can involve documenting confined, hard-to-reach spaces or tiny, intricate details. Without the proper tools, key objects or information may be missed entirely.

Handheld scanners can help put these concerns to rest and are an ideal solution for investigators and crime scene reconstructionists who require more flexibility.

Unlike stationary laser scanners, handheld 3D scanners have compact and lightweight designs that make it much easier to navigate challenging settings. Instead of capturing an overall picture of the scene from one perspective, investigators can move around the entire scene and capture every angle in detail to produce a comprehensive, 360-degree view.

With the ability to produce more realistic, detailed 3D renderings, investigators can significantly reduce on-scene documentation time because there is not as much pressure on them to manually document and assess everything out on scene. Instead, they can create a quick, comprehensive scan on scene – often in less than ten minutes, even for complex scenarios – and then analyze the highly realistic rendering back at the office. This facilitates more comprehensive investigations, reduces expensive overtime, and helps reduce the risk of confirmation bias.

The FARO® Freestyle 2 Handheld Scanner sets a new standard for efficiency and versatility in on-scene documentation and crime reconstruction.

With a **real-time, photorealistic display and unparalleled flexibility,** it ensures data capture for complex crime and crash scenes is easy and straight forward.

As **a portable, self-contained unit**, the Freestyle 2 allows investigators to document scenes more comprehensively, from an overall view of the space to the smallest and intricate details like hair strands or lettering on clothing. Not only does it significantly improve the accuracy and precision of data capture, it also allows investigators to complete on-scene documentation in a fraction of the time it would take with other less precise methods.

The Freestyle 2 offers **easy one-hand operation, guided scanning, and real-time visualization**, so investigators who are familiar with FARO scanners and investigators who are completely new to 3D scanning will be able to quickly learn how to use the equipment and get started with **faster, more versatile data capture.**

For more information about performance specifications, download the full tech sheet.

Features & Benefits

Flexibility

The Freestyle 2 is portable, lightweight, and compact with no bulky computers or cords to get in the way. It is a small, self-contained unit, so investigators can easily maneuver around the scene to scan even the most cramped, hard-to-reach areas, like a narrow hallway or a car engine.

It offers an impressive scanning range for quality data capture from a wide range of distances. The captured 3D Points start at 0.4 m and can be set to a maximum of 10 m.

The computer itself is also small and connects to the scanner with a single cable. It can be attached to a belt or a shoulder strap to keep it secure and out of the way while scanning.

How does the Freestyle 2 perform against other documentation methods?

Documentation Method	Data Points Captured Per Minute
FARO Freestyle 2 Handheld Scanner	13.2 million points per minute[1]
FARO Focus 3D Laser Scanner[2]	60 -120 million points per minute*
Total Station	1-2 points per minute
Digital Wheel	Less than 1 point per minute

[1]Freestyle Tech Sheet: https://insights.faro.com/public-safety-forensics/techsheet-faro-freestyle-2
Acquisition Rate (220,000 points/s X 60 seconds).
[2]https://insights.faro.com/long-range-laser-scanners/techsheet-faro-focus-laser-scanners
*Depends on model and distance scanned

Typical Scanning Time:

Midsize or Full-size Car Scan
5 Minutes

Homicide Victim Scan
3 Minutes

Indoor Room (12 x 12) Scan
6 Minutes

Faster Results

One of the biggest benefits of using a handheld scanner is reducing on-scene documentation time. Faster on-scene documentation protects both officers and data integrity.

At crime scenes, it is common for the body to remain at the scene for hours while the scene is processed and scanned, but medical examiners are often eager to collect the body and leave so they can begin their analysis. With a handheld scanner like the Freestyle 2, investigators can quickly scan the body at the scene, so the medical examiner can take it while they continue the rest of the documentation processes.

Handheld scanners are also invaluable tools for facilitating swifter, more accurate crash scene documentation. Investigators can use a laser scanner to quickly conduct a scan of the vehicles at the crash site and move themselves to safety, then complete a more detailed scan of the vehicles using the Freestyle 2 once they have been moved from the scene. The Freestyle 2 helps capture intricate vehicle crush data that may have not been as visible on site, allowing investigators to analyze key details like the driver's line of sight and find answers about what caused the crash.

Photorealistic Data Capture

The Freestyle 2 captures highly-detailed, colored 3D data with up to 0.5mm accuracy. It can capture the finer details such as hair strands, engine damage, and lettering.

There is also real-time visualization on the display screen, so investigators can easily monitor exactly which details the scan is capturing.

User Friendly Design

The Freestyle 2 is easy to learn and easy to use, especially for investigators that are already familiar with stationary laser scanners and FARO SCENE software. It requires minimal training to get started – **as little as 10 minutes** for investigators who have used other 3D scanners before.

Even if a team has not used any kind of 3D laser technology before, laser scanners are generally much more straightforward and user friendly than older solutions like total stations. There is less set up required and handheld scanners do not need to be manually leveled.

With the Freestyle 2, investigators can see the scan forming in **real-time** as they make their way around the scene, making it easy to adjust as needed to capture the entire space. **Haptic feedback** will cause the scanner to vibrate and alert the user if they are too close to the object. There is also a bar that appears on the side of the display screen to show the quality of the scan, so users can see if they may need to slow down or adjust their technique to create a more accurate scan.

More Efficient Data Processing: Using FARO® SCENE Software with the Freestyle 2

FARO SCENE Software is an intuitive, efficient software designed to process and manage data from all Focus and third-party laser scanners, including the Freestyle 2.

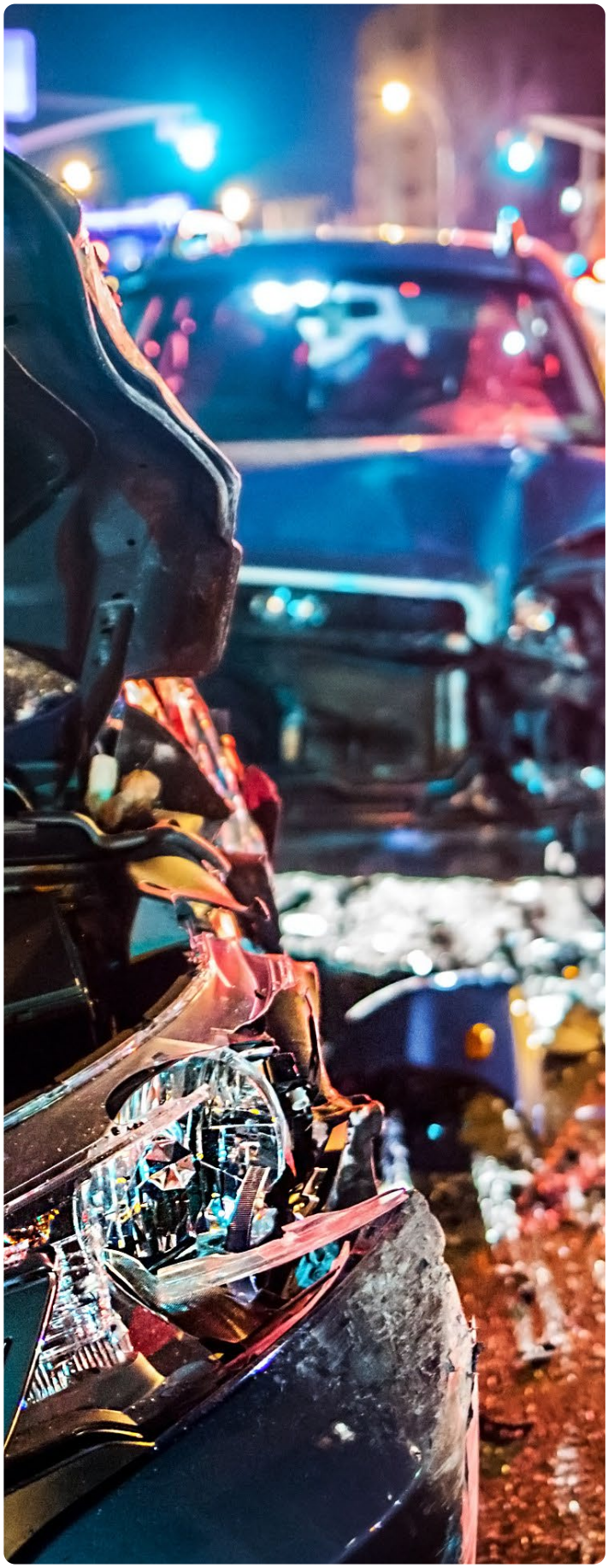
With SCENE, investigators can immediately begin evaluating and processing the data by completing simple measurements, creating vivid 3D visualizations, and exporting the data to various point cloud or CAD formats.

The most recent version of SCENE Software is backwards compatible with all FARO scanners. Teams that already have other FARO Focus scanners will be able to seamlessly add the Freestyle 2 to their data capture toolbox, and for teams who start out with the Freestyle 2 and decide to expand their toolbox with another FARO scanner, it won't require purchasing or syncing up with new and expensive software.

How does FARO SCENE Software simplify data capture and processing?

Explore Scan Data in 2D, 3D and Virtual Reality (VR)	Straightforward Data Registration
Efficient Data Processing	Intuitive Interface and Data Organization
More Data Sharing Capabilities	Plug-Ins and Apps for Extended Functionality

For more detailed information on FARO SCENE software, visit https://knowledge.faro.com/Software/FARO_SCENE/SCENE



3D handheld scanners form part of the critical toolset for faster, more comprehensive on-scene documentation.

Every crash or crime scene has its own challenges. The size, conditions, and severity will always vary, so it is crucial to have a versatile toolbox that enables investigators to navigate different challenges and scenarios.

For example, the Freestyle 2 is perfect for capturing small, confined scenes, like in a narrow hallway or a bathroom, while laser scanners are ideal for documenting larger indoor and outdoor areas.

Drones and map images can also be used to create a more comprehensive overview of extensive outdoor scenes, such as the scene at the Las Vegas shooting in 2017. They can establish spatial context and capture the extent of the scene from above, so investigators can then go in with stationary and handheld 3D scanners to capture the view from the ground and document the finer details up close.

Freestyle 2 Applications

The Freestyle 2 can improve data capture for many different applications, especially complex crash and crime scenes.

Crash Scenes

Crushed vehicles are notoriously difficult to document. Using the Freestyle 2, investigators can quickly capture vehicle details that could provide critical information about the crash. Details as minute as the seat position in relation to pedal positions at the moment of impact can be captured. If there are bikes involved in a crash, the scanner can capture every feature, down to the wheel spokes, fasteners, and sprockets.

Crime Scenes

Crime scenes, especially homicides, also pose a great challenge to investigators with their complexity. Hard-to-reach areas, like small bathrooms or entryways, can pose a real challenge to documentation with less mobile scanners.

Just like with crash scenes, the Freestyle 2 is able to document the intricate details. This helps medical examiners during autopsy injury documentation as well. Instead of using yardsticks, sketches, or other small units of measure to document wounds, examiners can save time by scanning the entire body. The Freestyle 2 can also effectively scan clandestine graves and digitally document the layers to create a view of the body in the grave and the surrounding evidence.

In the Courtroom

This “frozen in time” type of data capture is much more impactful in the courtroom. It’s not uncommon for several years to pass between the crime and when it is tried in court, but with 3D data reconstruction, the jury can virtually experience the crime scene for themselves as if they had been there on the day it happened. They can show angles and perspectives of the scene that never would have been accessible otherwise, which conveys the gravity of the crime better than traditional 2D photos ever could.

What Sets the Freestyle 2 Apart from Other Solutions?

The Freestyle 2 is one of the most comprehensive handheld scanners on the market. Whereas some options excel at a single feature, the Freestyle 2 is designed to be versatile and highly effective across all areas.

A More Realistic Perspective

Unlike some other models, the Freestyle 2 uses two infrared cameras to create a stereo pair of images that work similarly to human eyes, which improves accuracy and perspective.

A Wider Scanning Range

It offers a significantly stronger scanning range than most other handheld scanners. Instead of narrowing itself as a close-range or far-range scanner, it provides the flexibility to do both.

Scanning Range
Not only a matter of Standoff and Depth

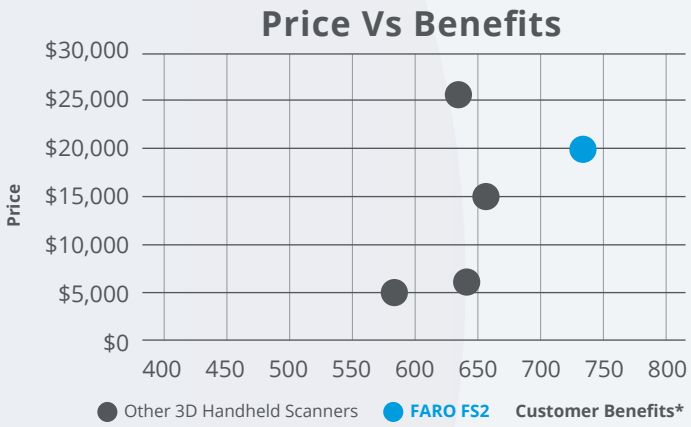
Competitor 1

Competitor 2

FARO Freestyle 2 / **4m - 10m**

A Cost Effective Solution

The Freestyle 2 is ideal for teams with a wide range of budgets, from departments that are already using other scanners in their investigations to teams who are new to the 3D scanning world and looking to expand their toolset. Using a more efficient scanner helps decrease expensive overtime out on the scene.



*Analysis of 3D handheld scanners on the market used by public safety and forensic professionals. Customer benefits rated based on features such as tracking capabilities, accuracy, ease-of-use, ability to scan in sunlight, ability to merge data with 3D scanners data, IP rating and more.

Better Mobility and Flexibility

It also stands out in terms of mobility. Lightweight and durable, it is designed for one-hand operation that allows investigators to easily maneuver around even the most complicated, cumbersome scenes to obtain thorough and accurate data capture.

The Freestyle 2 in Action

Investigators and reconstructionists who have already tried out the Freestyle 2 for themselves have found it fast, accurate, and easy to learn and use.

Bobby Jones

Lieutenant Gabe Mullinax

Bobby Jones and his team at Bobby Jones Accident Reconstruction implemented the Freestyle 2 to complement their FARO® Focus Laser Scanner. Jones was impressed by how fast he was able to complete a scan that normally would have been more extensive.

"In my opinion, it's a must-have supplement to the FARO Focus^{S}, which we were already using. I think it also works great as a stand-alone unit, but I like having both because the Focus allows me to capture the wider view of the scene from a single spot while the portable nature of the Freestyle 2 makes it easy to move around the scene and capture all the details.

The Freestyle 2 also allows us to scan much faster. You can scan an entire vehicle in roughly five minutes. In contrast, it typically requires an hour to capture a whole car using the current Focus scanner."

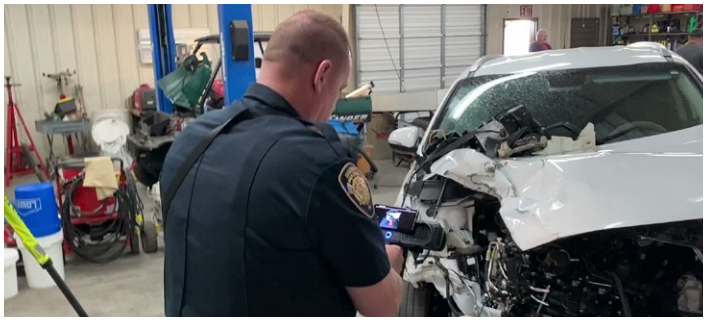
"I would say it's fast, accurate, lightweight, easy to operate, and a major 'game-changer' for both crash and crime scenes."

Lieutenant Gabe Mullinax is the head of the Forensic Services Unit at the Knox County Sheriff's Office in Knoxville, Tennessee. He has worked in homicide, forensic mapping, and crash reconstruction for over 18 years.

"I was a first time user so I didn't know what to expect but was easily able to see exactly what I needed to do as far as spending more time in a certain position or if I was going too slowly. And if you get too close to what you're scanning, it vibrates and lets you know, 'Hey, back off just a little bit.' So as far as ease, it is very cop friendly.

One of the things I found amazing and user friendly was the real-time visualization feature. The fact that you can see exactly what you're doing in real-time.

And the PC itself is not in your way. It's on your side, so it's something that law enforcement is comfortable with because most of our gear is stabilized somehow around our waist. And the device itself is very lightweight."



Is the Freestyle 2 right for your team?

If you're still feeling unsure, the checklist below can help you decide whether the Freestyle 2 is the best fit for your documentation processes.

Give yourself a point for each line that applies to you and add up your score at the end to find out your result.

- [ ] Do you have to document intricate on-scene details, such as wounds, line of sight, or vehicle damage?
- [ ] Do you ever have to capture data from scenes in cramped, cluttered, or hard-to-reach locations?
- [ ] Is it common for you to feel under pressure to move quickly to release scenes – while also taking thorough and precise measurements?
- [ ] Are you or other members of your team regularly working overtime because of lengthy on-scene documentation processes?
- [ ] Do you often have to switch between different tools to achieve exact measurements of smaller objects?
- [ ] Do you find it difficult to move around the scene and document at the same time?

If you checked two or more of these boxes, your team could benefit from the Freestyle 2. You need a solution that will provide better efficiency and accuracy for your on-scene documentation processes, and your current tools aren't meeting the mark.

Accelerate the speed and accuracy of your on-scene documentation with the Freestyle 2

BONUS: Tips for Securing Funding for a 3D Scanner

Grants: There are many state and federal grants available for law enforcement agencies looking to expand their technology toolbox. https://www.policegrantshelp.com/faro-grant-assistance is a great place to start.

Foundation Funding: Local foundations are often overlooked, but they can be a great resource for funding. The best way to get started is by contacting a foundation representative to learn more about their funding opportunities and application process.

United States Department of Agriculture (USDA) Assistance: The USDA runs a Community Facilities Program, which enables public safety departments to receive financial assistance for new equipment like a handheld 3D scanner.

Funding opportunities are available for public safety teams. Learn more.

FARO

Local offices in over 25 countries around the world. Go to www.faro.com to learn more.

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