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The Next Generation of Security

ADVANCED OPTICAL SYSTEMS MAKES TOUCHLESS FINGERPRINT IDENTIFICATION A REALITY

What do you get when you cross facial structure, eyeballs, voice and fingerprints with body odor?

The answer is a new science focused on personal identification verification (PIV) techniques called biometric identification. Fans of the popular TV show *CSI* have heard of it, but there is just one problem: none of the components except fingerprinting is actually ready for prime time.

Face recognition software failed in the Boston Bomber case, and voice recognition software failed to produce conclusive results in the Zimmerman-Martin case. While touted as standard practice on *CSI*, iris and retinal recognition is still cumbersome, requiring the user not to blink while a laser scans one of the most sensitive parts of the anatomy.

But a Huntsville firm has started to change all that. Advanced Optical Systems, Inc. (AOS), a noted innovator in electro-optical

By Kimberly Ballard

systems for the military, has made serious advances in touchless fingerprinting (TFP) technology. Sister company IDair, also located in Huntsville, has expanded TFP technology from super-secure government and military applications into practical uses for the commercial marketplace.

The rewards of innovation can go beyond the financial. This past April, AOS won a Gold Edison Award for its AIRprint non-contact fingerprint technology. The Edison Universe, named after inventor Thomas A. Edison, recognized AIRprint in the Safety/Security division for Innovative Services. Adding luster to this award, AOS also won a Silver Edison for its Hermes proximity, location and ranging system for pilotless helicopters.

AOS founder and CEO Dr. Richard Hartman says AOS has spent more than 15 years researching recognition technology for DoD, Marshall Space Flight Center (MSFC) and NASA applications.

"We have worked with the Air Force, the Army and Navy to provide them with hardware and software systems primarily for unmanned aerial vehicles, to help them find targets, detect things on maps, and to let them know where they are," says Hartman. "Several years ago, we provided an experimental recognition system on the USS Enterprise, and our systems have been installed on five different pilotless helicopters and on one manned helicopter."

Prior to its entrance into the military, AOS used recognition technology to help dock satellites in space and in other space-related applications where robotics are used on unmanned missions. AOS software, hardware and sensors currently sit on the tail end of the Hubble Space Telescope, awaiting use in the next robotic servicing mission to be conducted by the Shuttle replacement.

In April 2013, AOS was awarded a Gold Edison Award for its AIRprint non-contact fingerprint technology, as well as a Silver Edison for a system utilized by helicopters. *(Submitted)*

"AIRprint is the underlying technology for a whole family of AOS/IDair products," explains Dr. Keith Farr, AOS president. "All of it involves using smart cameras, infrared cameras, or some apparatus that captures a picture of, or makes sense of, what is going on at any given time."

Many businesses and government entities currently use fingerprint recognition devices at their secure facilities. AIRprint's touchless technology and ability to read prints at a distance make it more advanced than current devices.

AOS/IDair officers believe AIRprint has applications in law enforcement, in hospitals and pharmacies, at government installations, as well as in restaurants and business establishments where varying levels of security are necessary.

Dynetics, for instance, uses fingerprint technology to allow employees access to space labs at its new facility in Huntsville.

"In today's world, security is everything," says Farr. "From secure entry access to password protection for our electronic devices, communications, even electronic banking, bill paying, and purchases; all these things require a more secure environment."

TOUCHLESS ONEprint

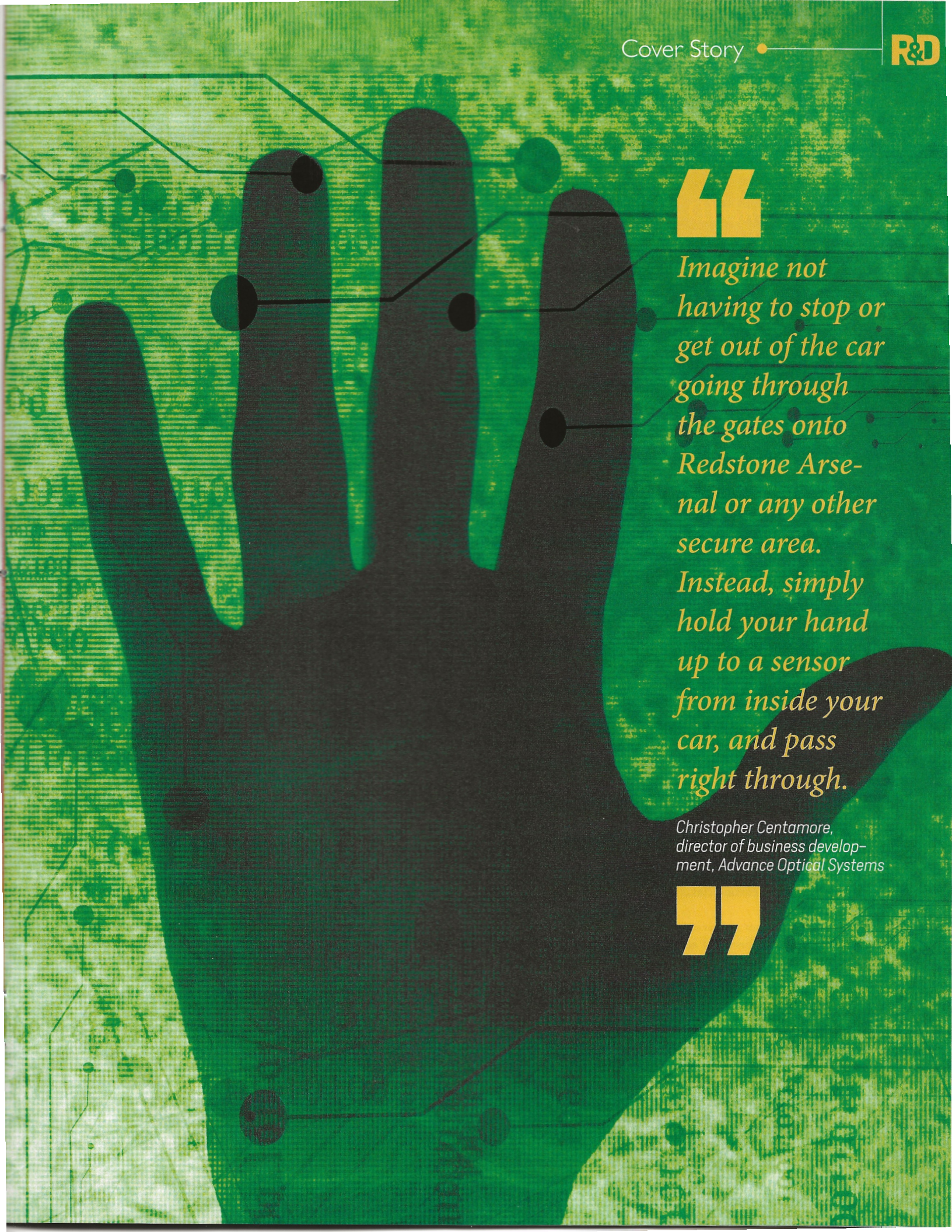
Two years ago, Dr. Joel Burcham, a 12-year AOS veteran and now president of IDair, looked at AOS technology and asked: If a UAV equipped with our recognition system could identify a tank from the air, could it not recognize a person's fingerprint from a much closer proximity?

"There are three main themes to the AIRprint technology," explains Burcham. "See, Understand, and Act. To 'see' refers to the collection of data on cameras. The key point is not just to take a picture of it, but also to 'understand' what you are taking a picture of. We have developed software that accurately converts the picture of a fingerprint into an actual fingerprint."

Why is the touchless aspect so important?

"The food service industry is a likely candidate for our Touchless ONEprint because they are sensitive to germs in an environment that is anything but dirt and grease-free," says Burcham. "The managers of many fast-food restaurants use a touch-based over-ride key device that requires pressing your finger onto a pad. Not only are they transferring germs, but also the sensor easily gets dirty, and when you are in a busy, multitasking environment, people tend to smack the device harder than necessary, several dozen times a day. A commercial device requires durability, and these existing devices aren't up to the task and are failing after a few months."

Left: Keith Farr, president of AOS, demonstrates the fingerprint scanner using AOS technology at the office's entrance. Right: The AOS facial recognition and full body scanning technology is being fine-tuned. *(Sarah Cole / scole@al.com)*



> *Imagine not having to stop or get out of the car going through the gates onto Redstone Arsenal or any other secure area. Instead, simply hold your hand up to a sensor from inside your car, and pass right through.*
>
> *Christopher Centamore, director of business development, Advance Optical Systems*

InnerID eliminates the need to type in passcodes and passwords when using a cell phone to do a variety of tasks, from unlocking the phone to authorizing banking transactions.

AOS AIRprint technology can be utilized in a variety of settings. *(Submitted)*

The touchless ONEprint never gets dirty, requires no physical contact, and essentially never fails, he says.

One of IDair's first commercial clients was a 24-hour gym.

"They wanted a sensor at their entrance that would recognize members and admit them. With AIRprint, all they do is hold their finger under the scanner and if their fingerprint is on file as a member, they are allowed access," says Burcham.

Other commercial applications involve child protection services. Recently, some insurance companies offered free pictures and fingerprinting of children as a precaution against their being lost or kidnapped. Fingerprints taken by parents, however, were usually inferior and often un-useable; quality fingerprints need to be taken professionally.

"The first few hours are critical to a police investigation of a child kidnapping or disappearance," says Burcham. "With AIRprint technology, you can get quality prints and have them available to the police within minutes, not three to four hours later after the investigators dust the house for the child's prints."

Agile AIRprint

Currently being tested for use within the military and government where security is imperative, an AOS-developed TFP device called Agile AIRprint reads fingerprints from a distance of up to 2 meters – what the military calls "standoff distance." The Agile not only takes the fingerprint, but also finds the whole hand and records the prints on all fingers.

"Imagine not having to stop or get out of the car going through the gates onto Redstone Arsenal or any other secure area. Instead, simply hold your hand up to a sensor from inside your car, and pass right through," says Christopher Centamore, AOS director of business development. "Think of the problems we could solve for the Transportation Security Administration (TSA)."

He adds that Agile meets government requirements for reliability and the ability to work over long standoff distances.

"Any super-secure government entity requires a higher threshold for testing and product development than the private sector," explains Farr. "The DoD needs to know whether Agile or ONEprint is the right technology for their application. If the testing says it is, then they want to know whether that technology can do all the things they need it to do. If the testing says okay to that, they want to see how it works in the field in an actual application.

"Right now, we are a couple of steps along with a couple of government customers."

Farr says product manager Keith Savas has improved on the aesthetics of the original Agile model, changing it from a rather dull and lackluster mechanical box to something that looks and acts like a friendly robot.

"It comes down to this," says Farr. "ONEprint is proven to work for a 24-hour gym, but for a nuclear facility to adopt Agile, it must be tested to the required level of certification. Our TFP technology is so new that an entity such as the FBI doesn't yet have a process to certify non-contact fingerprint scanners."

InnerID for Smart Phones

AOS and IDair are working on a variety of smart phone applications known as InnerID. They believe it is a game-changer in PIV, eliminating the need to type in passcodes and passwords when using a cell phone to do a variety of tasks. InnerID lets the user replace the locking mechanism on a phone by scanning his fingerprint, and using that along with Bluetooth to unlock the home or car doors; to authorize banking or financial transactions; and in the future, to even use fingerprints instead of passwords at places like Amazon and Paypal.

"Right now, our biggest challenge is discrediting the claims made by CSI," Burcham laughs, "But touchless fingerprint technology is right here, right now."