

GLO-JO®: An Emerging Technology



By Jerry Knapp and Joe Gonzalez

As your truck turns the corner, you see fire pushing out one window of a single-family house and heavy smoke turning to fire from a second window. It is 0232 hours; the house is in a good neighborhood; two cars and three bicycles are in the driveway, and a kids' playhouse and a street hockey goal are near the garage. Your halligan and flathead ax make quick work of the door. Using your thermal imaging camera (TIC), you lead your team in, up the stairs, and into the bedroom. You see the outline of a child; your partner quickly grabs her, and you exit the building.



Consider the technology you used at this fire: a halligan, a tried and trusted tool, and the TIC, which allowed you to see through the smoke to make the rescue—unimaginable just 10 years ago. You needed both tools to succeed at this call. Imagine if you had neither.

A Mixed Bag

This is the fire service of today—a mix of super technology and trusted tools. How will we get to tomorrow if we don't experiment with new technologies today?

Today we take for granted that interior firefighters have SCBAs and radios. In the 1970s, although we had a few masks on the rig, there was great resistance to using them because of the increased weight, decreased mobility, and decreased visibility. Similarly, radios were large brick-like devices that often were frowned on by “real firefighters.”

We must constantly be willing to try new technologies. Some will fail, but we will never know unless we try. Others will take their place next to the TIC and halligan and become tools we cannot live without. As *Fire Engineering* has reported in recent issues, NIST is experimenting with a variety of new technologies for the fire service funded by million-dollar grants. Often these technologies are years away from field testing and fire department use, but we need to keep experimenting. The goals are improved safety and fewer line-of-duty deaths.

Captain William R. Mora of the San Antonio (TX) Fire Department published a study titled “U.S. Firefighter Disorientation Study, 1979-2001,” in 2003, which he quoted in his evaluation of the GLO-JO® when he said: “In the ongoing effort to prevent structural firefighting fatalities, assistance in the form of affordable and effective technology is now urgently needed. Studies have clearly shown that far too often, traumatic firefighter fatalities in structure fires were directly associated with a loss of visibility within the structure. The loss of vision was understandably also shown to have caused loss of company integrity. In fact, according to the U.S. Firefighter Disorientation Study, 1979-2001, company integrity was lost in 100 percent of 17 national disorientation incidents examined. It is important to note that maintaining company integrity is associated with effective fireground operations and is also widely regarded as the firefighter's safety net. Lose company integrity, and you not only lose the structure, you may also lose firefighters.”

Read the Worcester, Massachusetts, and Charleston, South Carolina, NIOSH reports if you have any doubt. Seeing and being seen during an aggressive interior fire attack or search and rescue can make the difference between life and death. Consider it also from an individual firefighter's perspective. Say you are inside a building. Suddenly, because of the heavy smoke condition, you

cannot see other members of your company. What do you do? You obviously will move to a safer position to find other members or get to a window or door. In a larger structure, such as a warehouse or furniture store, moving may actually take you away from your hoseline or your company members.

If you are visible to your company members, a simple grab for your arm or foot may make the difference between your survival and death. If you are able to hook up with another company member because you can see him or he can see you, you would have a better chance of finding your way to safety. Seeing others and being seen improve your potential for survival and safety.

Crew Visibility



Remaining in contact with your company members is essential to crew integrity, efficiency, and safety. Verbal communication is one way to remain in contact but provides limited results in reduced visibility. Contact with a search rope or hoseline is effective but has its obvious limitations, especially if you lose contact with either. Experiments with personal strobe lights, chemical light sticks, and light-emitting diodes (LEDs) show that they all offer some degree of visibility in smoke, although under closer review, the aforementioned technologies have historically presented critical design limitations, which inevitably prevents optimal visibility of members in smoke.

The TIC is the most recent addition to our tools. It has tremendous benefits when it comes to efficiently locating downed firefighters. Obviously, the TIC is a huge leap forward, but it is not available to every fire department or every firefighter inside. When it is available, it does have its limitations.

All interior firefighters carry a handlight, but it has limited use in medium or heavy smoke conditions. Like high beams on a foggy night, it does a good job at lighting up the smoke directly in front of you. This vital tool has served well for decades, but you must direct it exactly where you want for effective visibility, and it takes away one hand from a firefighter who may need two hands for tasks such as victim removal. Hands-free personal lighting systems exist—a right angle chest flashlight or a helmet-mounted light, for example—and they help to improve immediate work area lighting.

The handlight has been especially useful in combination with retroreflective trim. However, dense smoke conditions will hamper the visible effectiveness of this reflective material. Ideally you will need a high-powered focused light source pointed at the material for it to be visible. In some instances with a moving body, the reflectivity of the material only lasts a few seconds at best.

Optically Tuned Illumination©

After serving at the site of the World Trade Center, Firefighter Joe Gonzalez founded Creative Safety Concepts (CSC Group LLC) to develop and manufacture cost-effective lifesaving technologies that will assist firefighters and emergency responders with being visible among each other during critical incidents where low visibility is a complicating hazard. The company's GLO-JO® products are designed to generate an active illuminated signal via a battery source. The products are designed to generate at least one of three light frequencies or colors of light. The three colors of light that GLO-

JO® technology strategically manufactures are green light, blue light, and aqua light. These light frequencies create what the company calls “optically tuned illumination.”

Optically tuned illumination represents a range of light frequencies that complements the sensitivity of the human eye once it has transitioned into human night vision. More specifically, this range of light is identified between what would be described as blue light and green light. Optically tuned illumination also represents achieving the one light frequency that is peak-sensitive to the eye, once the eye has transitioned into human night vision. Scientifically speaking, once the eye has transitioned to human night vision, 507-nanometer light frequency, or aqua light, is the one color identified for optimal results. Because of the physiology of our eyes, these light frequencies (blue light, green light, and aqua light) are visually received first and therefore transmitted by the optic nerve to be recognized by our brains before any other color.

GLO-JO® technology is designed to tap into the peak sensitivity of the human eye, optimizing one’s ability to be seen and increasing firefighter safety. These are unique patent-pending technologies that can be seen from long distances, in complete darkness, or while operating in various visibility-challenged environments (darkness, smoke, haze, or fog).

GLO-JO® with Retroreflective Trim

GLO-JO® Illuminated Webbing Technology™, in its various forms, is a line of products that can offer a layer of safety while still being cost-effective. Today the most common high-visibility safety technologies used on gear are “fluorescent color” (lime-yellow) and reflectivity, otherwise known as retroreflective trim. For these passive technologies to offer visibility, users need light. Without light, use of the lime-yellow color will never be seen and reflective microprisms will never activate. Other issues with retroreflective trim include common wear and tear, poor maintenance, and situations where white light is unable to effectively pass through smoke to allow it to be seen.

Having an active light source constantly announcing your exact location has proven effective both in field applications and training scenarios. Being able to identify the location of personnel during a critical incident using an active illuminated light source is what CSC Group calls Enhanced Positional Awareness©. How often in real-world situations, either during interior fire attack or search and rescue operations, have you bumped into other firefighters simply because you could not see them? Your sense of touch is your only way to know where your partners are and what they are doing.

The real value of GLO-JO® technology is allowing interior firefighters to see where other firefighters are inside, thus achieving improved task coordination and accountability. This is especially important when conditions deteriorate and you need to know where your company members are so you can all make a rapid tactical withdrawal. The practical benefit of optically tuned illumination is that it offers enhanced positional awareness for everyone on your crew. This optic-sensitive device offers visual communication, enabling you to see others and them to see you 100 percent of the time within practical ranges.

Tests have shown that GLO-JO® technology was visible at about three to four feet, even in an extreme, heavy, dense smoke condition, because of the sensitivity of the eye and one’s ability to easily recognize it. A variety of smoke conditions can exist at a structural fire scene ranging from heavy, dense smoke conditions to waves of less dense smoke. Eventually, as smoke conditions lift, the range of CSC Group’s optically tuned illumination increases. An active illuminated signal offered through GLO-JO® technology has also proven effective in RIT applications for identifying team members, which can increase task coordination, confidence, and air management during search.

GLO-JO® technology is currently being used by many instructors, academies, and fire departments across the country. This technology provides a unique and effective method to maximize safety during training, simply by making instructors visible to other firefighters during the most dangerous interior operations. A student who may encounter a problem in a smoke house training evolution is now able to immediately locate the instructor without guessing and address his or her problem more effectively. This not only helps ensure student safety but can significantly minimize the potential for liability and lawsuits.

GLO-JO® Illuminated Webbing Technology™



The first- and second-generation versions of GLO-JO® Illuminated Webbing Technology began with the GLO-JO® PRO™. This system offers a unique source of neon light, also known as electroluminescent lighting (EL). This design primarily mounts around a helmet as a helmet band. In addition to EL, the helmet band design combines other technologies aimed at enhancing visibility, using fluorescent color, reflectivity, and photoluminescence—all of which enable several redundancies to the active EL light source. The design of this system and its components offers the most heat- and flame-resistant capabilities of the GLO-JO® line of products.

GLO-JO® P.A.L.™



The third-generation version of GLO-JO® Illuminated Webbing Technology is the GLO-JO® P.A.L.™ (Personnel Accountability Locator™). With this product line, LED lighting is used, whereby a sequence of three-millimeter LEDs, spaced approximately every two inches, is housed within a clear tubular housing (luminaire material). This housing disperses the light generated by the LEDs inside it, creating a useful glow that minimizes glare. Currently the GLO-JO® P.A.L. LED system offers a multipurpose visual aid that can help optimize one's ability to be seen either as a helmet band, SCBA bottle band, or arm band. It also offers versatility for customized applications, such as use on bunker gear, equipment bags (RIT/RIC), search lines, hoselines, and the effective targeting of critical locations (doorway, stairwell, victim).

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JOE GONZALEZ is a 19-year veteran of the fire service and a career firefighter with the Orange (NJ) Fire Department. He is a New Jersey state certified fire instructor and a training consultant for M.E.R.I.T. Inc. and Confined Space Services Inc. He is the inventor of GLO-JO® Illuminated Webbing Technology™ and the GLO-JO® Helmet Band™ and is the owner/president of CSC GROUP LLC (Creative Safety Concepts) of Newark, New Jersey.

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