

## **JIFX After Action Report (AAR)**

### **Instructions**

Please submit the following form with as much detail as possible.

Please maintain format of text.

Please insert any relevant graphics or images with captions.

Please submit completed **WORD DOCUMENT and any datasets or images** to [jifx@nps.edu](mailto:jifx@nps.edu)

**JIFX Experiment Number (X-00):**

E-01

**Experiment Title:**

21<sup>st</sup> Century SOS

**Organization:**

Southwest Synergistic Solutions, LLC

**Experiment Lead/Point of Contact:**

Juan Cienfuegos

**Quantitative Results (please be as descriptive and detailed as possible):**

One of the areas this experiment proposed to explore was how much more effective drones can be during search and rescue operations if a color coded post disaster survivor visual signaling system is established.

It was hoped that drones could be used during this experiment, but unfortunately no nighttime flights were authorized. For this round of experimentation high ground was used instead. More specifically the roof of the “Hotel” found at the CACTF. It had the highest view point.

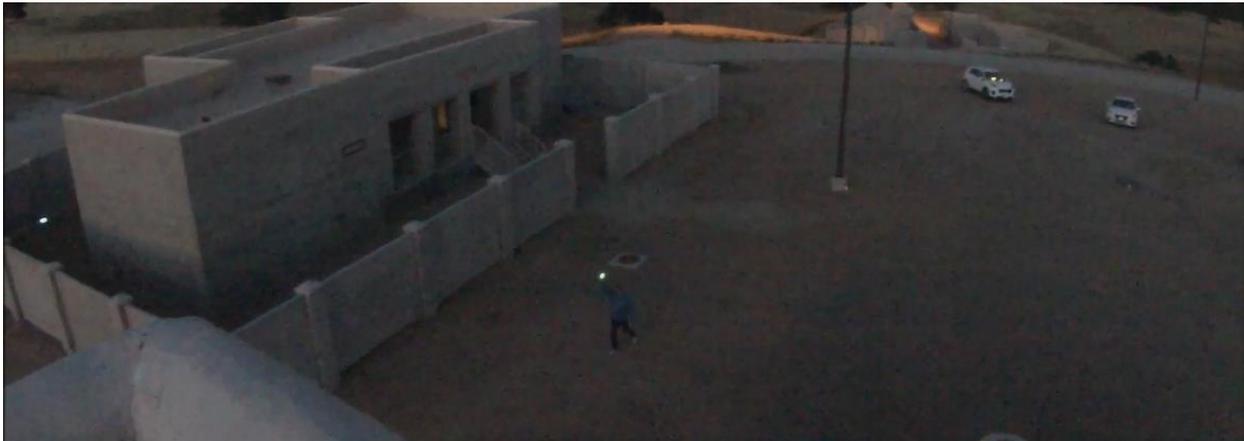
Several laptops and cellular phones downloaded either, the “Disaster ID” app, an outdated color code is used in it, and the “Visual 911+” app that includes the latest proposed visual signaling color code. The post disaster code follows, red = children, green = special needs (handicapped), blue = adults, yellow = service animals/pets, and white is a catch all color. Flashing screens = “I’m here in need of medical assistance”, constant screens = “I’m here but OK”. White is included as a catch all color for those caught without an app or the ability to change the color of their screen, to use everyday flashlights or keychain lights, in order to still participate in the system, and at minimum convey their location and condition.

Due to limited resources and time available for nighttime experiments, the proposed multiple rounds in the day time and night time conditions were not conducted. The rounds were to time, the time it took for a drone to locate multiple survivors, was not conducted. In one round the survivors would use t-shirts, towels, hands, anything they could use, and in the other they would use their cellphones screens, laptop screens, and flashlights to signal their location, condition, and group makeup. Then the time differences would be compared.

Instead, this experiment focused on the participants’ personal visual impressions and opinion, as well as camera sensor data looking in IR, EO, and fused wavelengths. CMU was used a technology before the human eye did.

After reviewing images and video, the visual signals coming as far as the village, at the furthest distance from the Hotel, were viewable. If NPS personnel know the distance from the Hotel roof

to the village/condo complex at the bottom of the hill, we can know the approximate maximum distance the signal could be observed. Following is a picture showing the signaling in the system.



There are six signals. Can you find them?

All the illuminated targets were viewable. It was more difficult to see the illuminate screens located in lighted rooms. Confirming the distances to the different buildings would aid in quantifying distances and possibly gather data as to color distinction at the different distances from the video and images taken.

By asking the experimenters from CMU we could also determine the distance from there sensor to the target they located before the human detected it, and verify that the signal they picked up was from the cellular or laptop screen. It would be interesting to know if CMU could distinguish the color.

For better quantitative results a set number of people signaling must be tracked, their distances and signaling color must be known. Times should also be taken where in trial 1, no screens are used and in a trial 2, screens are.

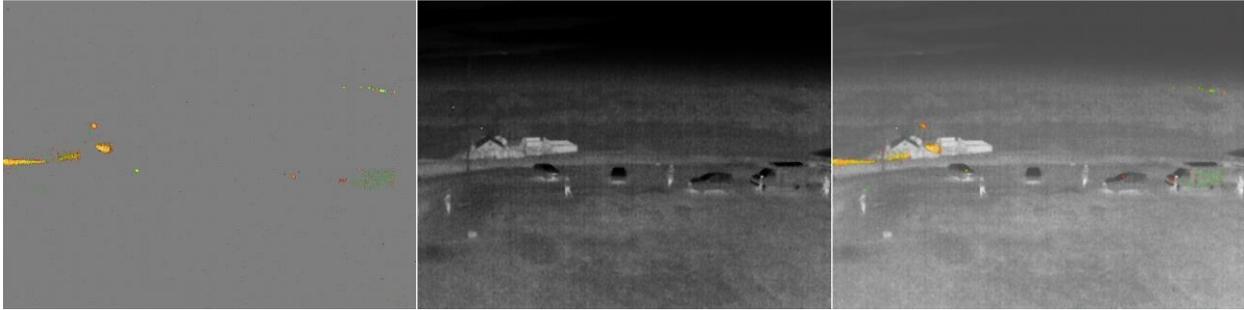
**Qualitative Results (please be as descriptive and detailed as possible):**

It was obvious that the visual signals could be seen with the naked eye from various distances and angles. High definition cameras with good zooming systems should do even better.

Following is some of the feedback I have received to date:

Feedback from one of the Teledyne team members:

“The layout below is as follows: left=visible(EO), center=IR, right=Fused.



As you may have overheard us discuss, we had an unfortunate mishap where because of the cold weather, the camera was not responding well. In this case, it caused the EO channel to have very poor response. However, it was successful in capturing the cellphone/table lights (along with tons of noise and saturation under the light posts). What this set of images shows is that the color lights are extremely effective in identifying people based on the state of their light. It also shows that the IR is indispensable for night operations as it helps provide situational awareness. As you remember from when you were up on the roof with us, it was hard to see people and especially whether they were standing, sitting, etc. The fused image on the left, which combines the EO and IR, exemplifies the benefits of fusion as it provides a “full situational awareness”. I believe the person on the far left is you holding the light up in the air as you were swinging your arm (I could see this in real time!). Unfortunately I am now noticing that when I compressed the image for email, the second person from the left appears to not have a light but in fact they are and it is blue. You can also see the green and red flashing lights through the windshields of the first and third vehicle from the left.

More to come once I’ve had a chance to go through the data.

You can use my address below my signature. Thanks!

Cheers,  
Mario XXXXX, Ph.D.  
Principal Scientist  
Information Sciences...”

### **Observations & Comments:**

After zooming into the image provided by Teledyne it is obvious the camera not only observes there is a survivor there, but with the addition of a color coded signal being transmitted by the survivor they know the two survivors on the left are special needs (blind, deaf, mute, wheelchair limited, etc.),” and the survivor on the right is a child. This is valuable information for any responder for the following reasons:

- Children are less likely to take notice of the threats to their surroundings.
- Children may have difficulty self-evacuating.
- Children may have difficulty following evacuation commands.
- Children may be unfamiliar and afraid of the sights and sounds following a disaster.

Children may be unable to communicate effectively to aid rescuers or require additional equipment necessary for evacuation.

Having this information prior to attempting a rescue allows the rescuer to focus on the needs of that particular survivor and increases the likelihood of a safe and life-saving rescue.

#### Special Needs:

By incorporating a specific color-code for handicapped people, rescuers can be better prepared to respond and assist the specific needs of special needs-survivor.

Knowing survivors special needs can also ensure the number of handicapped on scene that needs specific evacuation equipment, medical support devices, or medicine when they are extracted will most likely be available.

#### Adults:

Adults are more knowledgeable about their surroundings and threats to their safety, capable of following evacuation commands, familiar with rescue operation equipment and gear, capable of self-evacuation (provided the adult is not injured) and capable of communicating vital information on other survivors, locations and threats.

#### Service animals and pets:

By identifying the location of a pet/service animal whose owner has taken the time to attach a yellow dog tag to them, that animal will have the capability of potentially leading responder to their owners.

It important to note that very young children or pets will not be carrying cellphones, but this does not preclude them from participating in the 21<sup>st</sup> Century SOS. Pet owners could buy yellow collar lights and use them for daily walks or other activities and when a disaster strikes they are already equipped. Same for very young children, parents could provide a small red light and attach it to their back backs and instruct them from an early age that if they are ever in a disaster to turn on the red light to help responders know they are there so they can come help them.

When I spoke with Anna from NAVAIR, she asked why this app is not on every phone. I explained that I had been trying, but that it was a challenge to get a color coded system officially recognized. For example "SOS", "This distress signal was first adopted by the German government in radio regulations effective April 1, 1905, and became the worldwide standard under the second International Radiotelegraphic Convention, which was signed on November 3, 1906, and became effective on July 1, 1908. SOS remained the maritime radio distress signal until 1999, when it was replaced by the Global Maritime Distress and Safety System.[1] SOS is still recognized as a visual distress signal.[2]." Information taken from Wikipedia. So the question is. Who or what organization in 2017 has the authority to officially establish a 21<sup>st</sup> Century SOS. 1905 was over 100 years ago.

Over the years, several personal attempts have been made to get the Federal Government interested in going one step beyond simply alerting our population of an impending disaster like a

hurricane, and giving our population a standardized system to communicate with responders after the disaster has struck. With the ever increase use of drones for search and rescue, and the fact that over 90% of the population owns a cellular phone, smartphone, Ipad, laptop, smart watch, etc..., the system is practical because the majority of the population is already equipped with a signaling device that is not dependent on external power or network availability. The topic itself is ranked in 1<sup>st</sup> place at the Department of Homeland Security's, National conversation website regarding the responder of the future. Here is a link, <https://scitech.ideascale.com/a/ideas/top/campaign-filter/byids/campaigns/60591> . Even with the above, no one at DHS has contacted me. I have also contacted people at FEMA and have spoken with FEMA personnel in charge of the IPAWS (Integrated Public Alert & Warning System) program and have basically been ignored. No one seems to know where to go.

Additional efforts others, and myself have tried to get a 21<sup>st</sup> Century SOS officially recognized follow:

- Introduced bills to the Texas House of Representatives and Senate in 2012, 2014, and 2016. Following is a copy of the 2017 Texas House HB1598:

Why a law? Legislation is needed to give official recognition/uniformity to the system so that it helps mitigate future search and rescue outcomes. It would be difficult if East Texas adopted one color code and West Texas another and when they came together to respond to an emergency they interpret the signal differently.

To paraphrase an article titled, "How Elected Officials Can Prepare for, Respond to Emergencies", elected officials set the tone and direction in the community for prevention, mitigation, preparedness, response and recovery activities. They do so by providing policy, mission, direction and authority.

Therefore, it is important that elected officials understand what their role is prior to a disaster. They should take pre-emptive measures to mitigate or lesson the effects of disasters on their communities. Sadly many communities do not address mitigation until they are in the recovery phase of a disaster. However, it has been proven that mitigation saves money. It is documented how every \$1 spent on mitigation saves society an average of \$4.

- A search and rescue subject matter expert (Eddy Weiss) and others have started grass roots effort. For example Sarasota county, Florida. Following is part of a letter received which discusses how the Visual 911+ app is being utilized:

“Hi Eddy,

Happy conferencing.

I will like to thank you with my greatest appreciation for your staying with us during the week of 4/10/17 and for your presentations.

Attendees are still speaking about your sessions. My supervisor wants you back here simply on the strength of reading the evaluations written about your presentations. Your real-life experience, evident superlative insight and relevant lessons learned are inspiring.

Furthermore, your ability to bring to our awareness, cutting edge companies who are creating innovative and critically needed supplies and equipment in the realms of Emergency Management, EMS, Fire and Rescue is sorely needed and welcomed.

Please thank them for giving us the opportunity to see the showcase of their products.

On that note, here are what we are doing and what we need:

**What we are doing** (Keep in mind that no purchase is final until it is approved by leadership and finance)

1. Medical Reserve Corps of Sarasota County (MRC-Sarasota) will be rolling out the **Visual 911 +** in the following ways:

- a. As one of our foundational and critical Apps to the community through our CDC and NACCHO grant funded All-Hazards Survival and Active Bystander Training Program (AHS/ABT)
- b. As one of our foundational and critical Apps to the Healthcare Coalition (HCC), Community Organizations Active In Disaster (COAD), CERTs and Home Owners Association, MRC national boards and conversations, and various other groups that we partner with for disaster preparedness, response and recovery. I will also be sharing it with Pinellas County Citizen Corps and the State Emergency Management office and other relevant state-wide groups.
- c. Within MRC-Sarasota we will also be using this app for our weekly and monthly communication checks-Think radio checks with the cell phone.

## About CXXXX XXX

CXXXX is internationally known as a dynamic, “Forget the box”, results-driven expert in the areas of Disaster Preparedness, CDC National Strategic Stockpile/Medical Countermeasures (SNS/MCM), Access and Functional Needs Disaster Planning, Volunteer Cadre program development and maintenance, and developing robust survival capabilities through strategic and dynamic partnerships among government, non-government, businesses, communities and Faith-based entities. Having earned the prestigious and highest honor of “President’s Award” for her graduate studies in Emergency Management, held multiple national and state positions including Vice Chair of the National Association of County and City Health Officials’ (NACCHO) Public Health Emergency Management Workgroup, earned numerous certifications through FEMA, the National Emergency Response & Rescue Training Center (NERRIC) and through her work with the National Terrorism Preparedness Institute and being a Master Trainer, Carol can speak authoritatively on a wide variety of disaster, survival, strategic planning and operations development topics. Leveraging over 30 years of field experience in disaster response, transportation and port security, soft target hardening, hospital and medical facility preparedness, development and mentoring of leaders, Active Shooter/Hostile Event survival training, Anti-Terrorism, Emergency Medical Services, and technical consulting to federal, state and local governments within the U.S. and internationally, Carol brings a unique blend of candid, interactive and high energy presentation to her programs.

Carol has been a trail breaker throughout her career; including, years spent in diverse and challenging leadership roles as a Technical Consultant for Southern Command (SOUTHCOM) Caribbean and South American projects, being a sitting member of a Carnegie Board, developing ground-breaking and internationally acclaimed programs with FEMA Higher Education Project, National Oceanic and Atmospheric Administration (NOAA), National Fish and Wild Life and the National Science Foundation. This diversity has given Carol a 360 degrees viewpoint of many critical issues. Invited often as a speaker and to conduct workshops at technical, government and private industry conferences, Carol brings this clarity when she shares real-life examples from the canvas of her experiences managing volcanic eruptions, hurricanes, mass evacuations, massive wild fires, and major events like the World

Cup, Iron Man, Olympic qualifications, annual U.S. Presidential visits and carnival. Carol XXX spins her stories against an international tapestry and paint them in local colors; leaving the audience with practical strategies, actionable steps and innovative solutions to seemingly-impossible challenges. Carol leaves her audiences galvanized into action.

Carol currently wears many hats for the Florida Department of Health including being the Vice Chair of the Southwest Disaster Healthcare Coalition and State Program Coordinator for Community-Based Disaster Coalitions. Carol solves challenges and build relational bridges through Management of county-level SNS/MCM and Access and Functional Needs and Directorship of the county Medical Reserve Corps. Carol is the recipient of many competitive grants including three CDC grants and two NACCHO Challenge Awards which keeps her immersed in ground-truthing data, current research and strategic programmatic changes focused on the above mentioned areas. Carol maintains her national Certified Healthcare Emergency Professional (CHEP) certification along with those related to her EMS/Rescue and trainer roles.”

- The same subject matter expert, “Eddy Weiss” utilized the Visual 911+ app during Hurricane Matthew and it resulted in at minimum two reported rescues.

In closing, I believe more experimentation should be done on the 21<sup>st</sup> Century SOS. Gathering additional evidence based data to prove its effectiveness will go a long way in getting a post disaster survivor visual signaling system officially adopted. The effectiveness of the different colors at different distances, the effectiveness of waving the illuminated displays, observing the displays from different angles, and knowing the distances, is data that can be gathered in future JIFX’s.

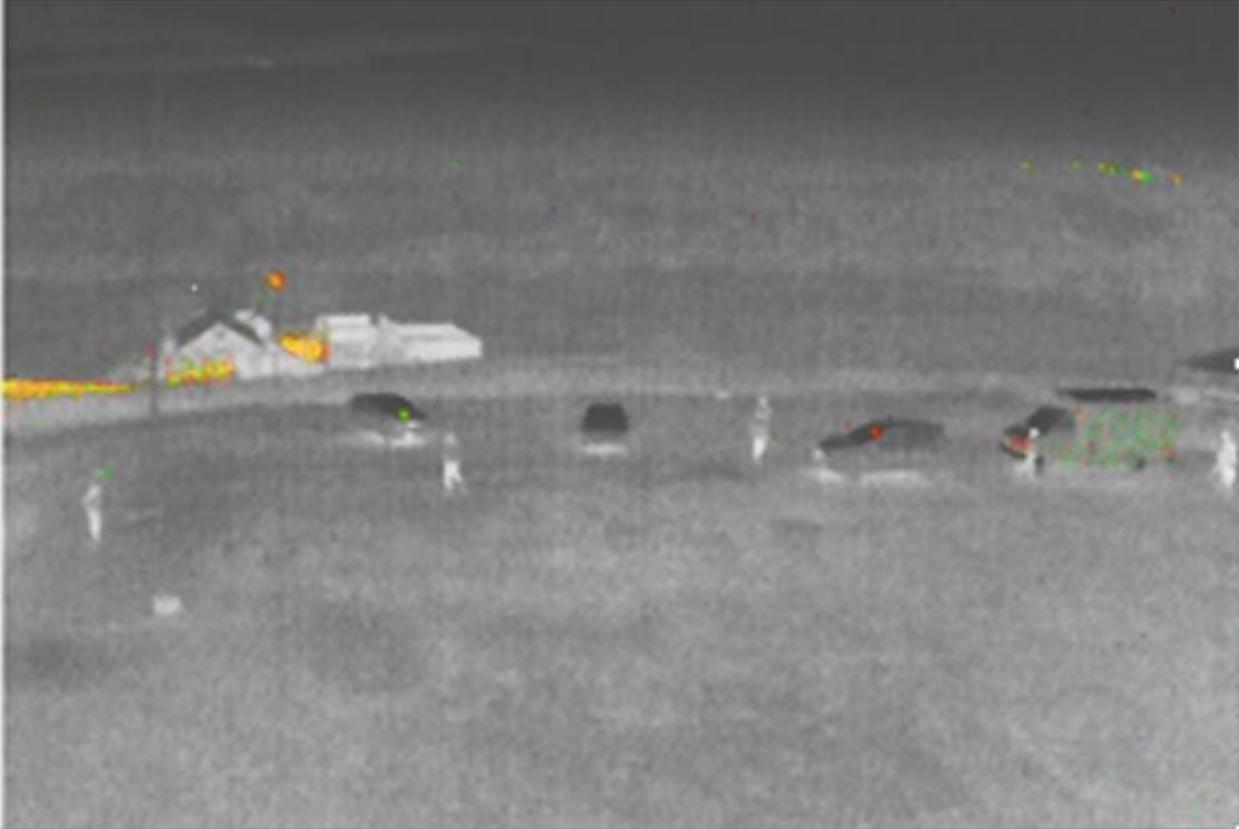
Here is a link to video of compiled video footage gathered by several GoPro cameras during JIFX 17-3. The video starts at the beginning of the exercise, mentions some of the methodology, and ends at the wrap up. Notice how dark the last minute or so of the video is (during the wrap up and when the set up lighting was turned off). I do not notice much difference of the signaling visibility when the set up lighting was on.

<https://www.youtube.com/watch?v=uit-t-DP8hM>

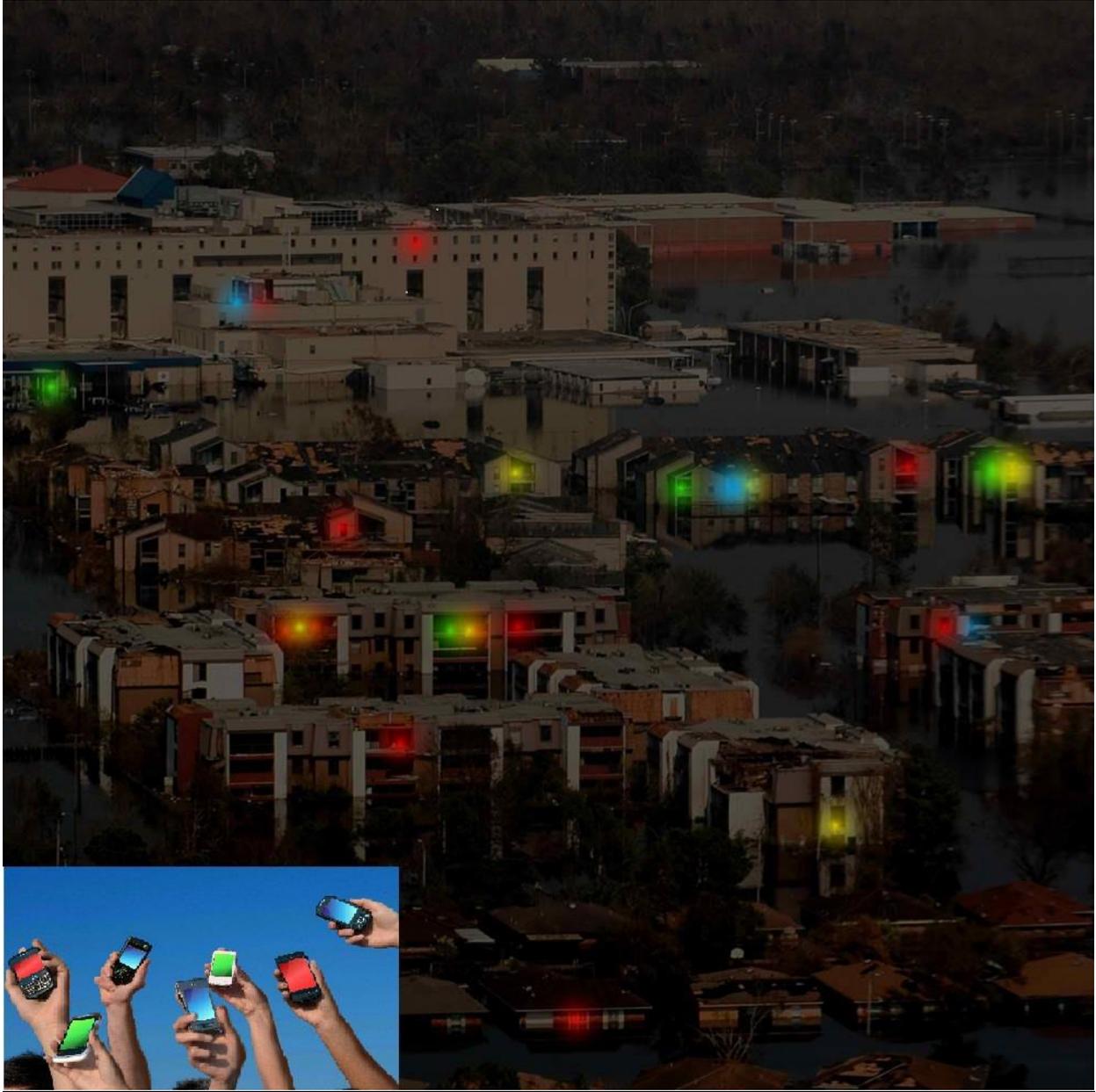
**Photo/Graphics (please keep the file size to a minimum):**



**Image taken by Teledyne: left=visible(EO), center=IR, right=Fused.**



**Enlarged fused image showing survivors and the visible colors coming from screens.**



**Image convey the concept. Imagine the image without the visual signals.**