

Aerospace Technology for Disaster Relief

Marin Kobilarov, PhD

Catastrophic events like the Asian tsunami of 2004, which killed nearly 300,000 people; the Haiti earthquake of 2010, which killed over 200,000; and most recently the earthquake in Nepal have demonstrated the urgent need for rapid response and a high level of preparedness during natural disasters. New aerospace technology including nanosatellites and unmanned aerial vehicles (drones) can provide a highly adaptable mechanism for on-demand communication, situational awareness, and even direct intervention as first responders, which can help to save thousands.

Nanosatellites are a new class of low-cost modular space assets with the potential to quickly reconfigure and provide telecommunication and high-resolution imaging. For instance, Planet Labs completed a launch sequence of a swarm of 28 Earth-imaging CubeSats in March 2015, whereas companies including OneWeb, ComDev, and SpaceX envision even larger constellations. While satellites provide a global view and coordination, small low-cost drones can deliver first-aid kits and vital medicine and can track people or deploy sensors that can be attached to their bodies for tracking and monitoring of vital signs. Larger autonomous helicopters could then be optimally deployed to rescue the most severely injured and to deploy self-contained disaster relief packages.¹ To achieve such capabilities, it is necessary to develop navigation systems for robust operations in extreme weather and natural terrains, a technology that could be viable several years from now.

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Message From Nepal

Vincenzo Bollettino, PhD

On April 25th at 11:56 AM, Nepal was hit with a 7.8 magnitude earthquake centered in the Gorkha region. Nearly 8000 people lost their lives and thousands more were injured. The Nepalese government, military, and local citizens responded immediately to rescue survivors and treat the wounded. Local organizations like Kathmandu Living Labs mobilized thousands of volunteers around the world to crowdsource information that was used to inform the Nepalese military (in reports issued every 2 hours) about actions needed on the ground.

The international community responded as well, with the United Nations, international nongovernmental organizations, and foreign militaries all deployed to Nepal. Unfortunately, they faced many logistical challenges. Some of these challenges were a product of Nepal's geography.

Many of the destroyed towns were in hard-to-reach places in the mountains, with roads cut off by landslides. Some of the challenges were man-made. The KTM airport was too small to handle the volume of flights. Landing permits were difficult to get and it took too long to get humanitarian relief items through customs in the early days of the response.

Regrettably, although not uncommon, this was a disaster experts knew was coming, but too little was done to actually prepare for. We were fortunate this time that the epicenter was not closer to Kathmandu. Countless thousands more would have died if it had been. Preparedness is key. It is ultimately less expensive and saves more lives than does response. The government of Nepal must build back better.

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Report From Nepal

Eduardo Dolhun, MD

Over the last 5 years, I have participated in 4 of the worst global disasters: Haiti (earthquake), Pakistan (floods), Philippines (Typhoon), and now Nepal (see video in **supplementary material**). I guess I could be considered a veteran of sorts.

Arriving within the first few days of a disaster is important: people can still be saved, relatively easily at that. But getting there early means that you arrive in chaos: the infrastructure of the city or region you land in is usually wiped out, meaning no electricity, water, buildings, roads, etc. Interestingly, I have found that the very first broken element to be restored is communication. Within hours of a disaster, it seems that all resources focus on getting the communication up and running. This was so in every disaster I have been a part of, including, and astoundingly so, the relatively rural parts of Nepal.

Over a decade ago the United Nations developed the Cluster system to address the often ad hoc response to emergency situations around the globe. Clusters are organized into 9 thematic areas: nutrition, health, water/sanitation, emergency shelter, camp coordination/management, protection, early recovery, logistics, and emergency telecommunications.

Due to the early coordination and repair of the telecommunications infrastructure, dozens of international organizations were able to more successfully coordinate and direct resources, achieving greater coverage and avoiding redundancy.

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Supplementary material

To view supplementary material for this article, please visit <http://dx.doi.org/10.1017/S1935789315000749>



Top left – Nepal, May 2015. Courtesy of Eduardo Dolhun, MD, Drip Drop Clinic, San Francisco



Top right – Nepal, May 2015. Courtesy of Vincenzo Bollettino, PhD, Harvard School of Public Health, Harvard Humanitarian Initiative



Bottom left – DMPHP Journal thanks Michal Czapski (Poland) and Thomas Folliard (UK), who developed the image.



Bottom right – DMPHP Journal thanks the Space for Health Team, Space Studies Program 2014, International Space University.