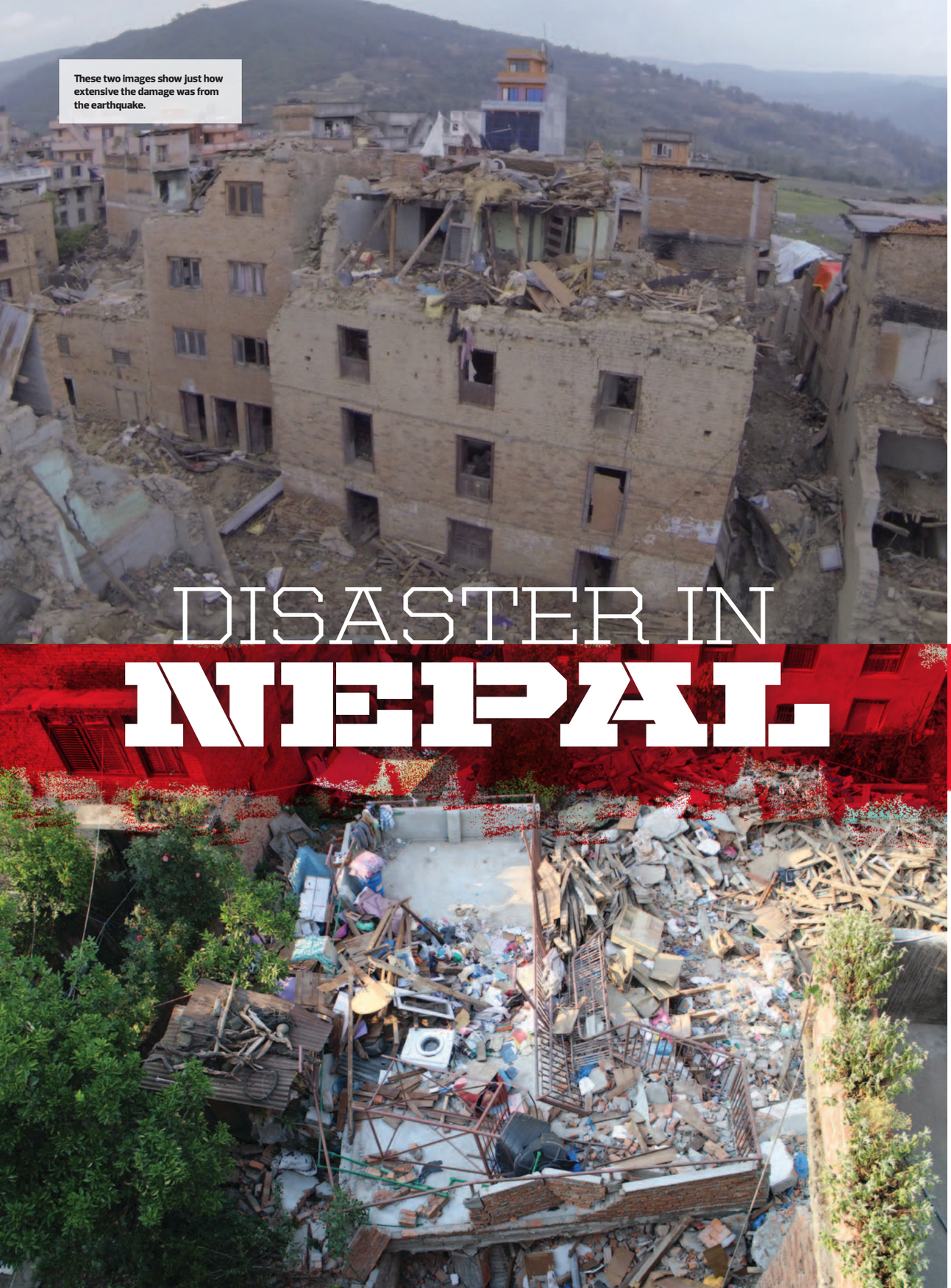


These two images show just how extensive the damage was from the earthquake.

DISASTER IN NEPAL

Once the drone is airborne, all eyes turn to watch the flight.

DRONES AID FIRST RESPONDERS IN THE AFTERMATH OF A DEVASTATING EARTHQUAKE

BY **TEAM *ROTORDRONE***
PHOTOS BY **NAIMUL ISLAM OPU**

EARTHQUAKE! As soon as they hear the news, teams of doctors, humanitarians, and search and rescue crews are on their way to the damaged area to render aid. This is nothing new; it has been going on for decades. But what is new and newsworthy is the new, essential device that they bring to gather information as quickly as possible: rotor drones.

Flying a multitude of drones around a stricken city, like Nepal after April's 7.8 magnitude earthquake, is useless unless there is a coordinated effort to gather information and quickly relay to the officials and emergency workers who need it the most. Patrick Meier has been an advocate of getting that information to a central databank that allows a variety of people easy access, and his organization, Humanitarian UAV Network, put people on the ground in Nepal to gather information from the air with small unmanned aerial vehicles. We recently had a chance to talk with him about the Humanitarian UAV Network and the organization's very important role.

RotorDrone: ***Tell us a little about your organization, what you do, and how drones have helped.***
Patrick Meier: The mission of the Humanitarian UAV Network (UAViators) is to promote the safe, coordinated and effective use of UAVs in a wide range of humanitarian settings. We actively promote a Code of Conduct and provide a coordination service during major disasters to ensure that UAVs are used appropriately, and the resulting imagery shared with humanitarian organizations, government, and local communities. UAVs have helped to shorten the time it takes to assess disaster damage and needs following disasters. They have also been used to support logistics operations, like road-clearance projects and the search for survivors. In fact, there are dozens of ways that UAVs have, and continue, to support humanitarian efforts worldwide, including the use of UAVs to carry payloads like medications, vaccines, and water filters.

RD: ***After the Nepal earthquake you had a number of UAViators visit the disaster area. What was your mission there?***
Patrick: A total of 15 UAV teams voluntarily liaised with

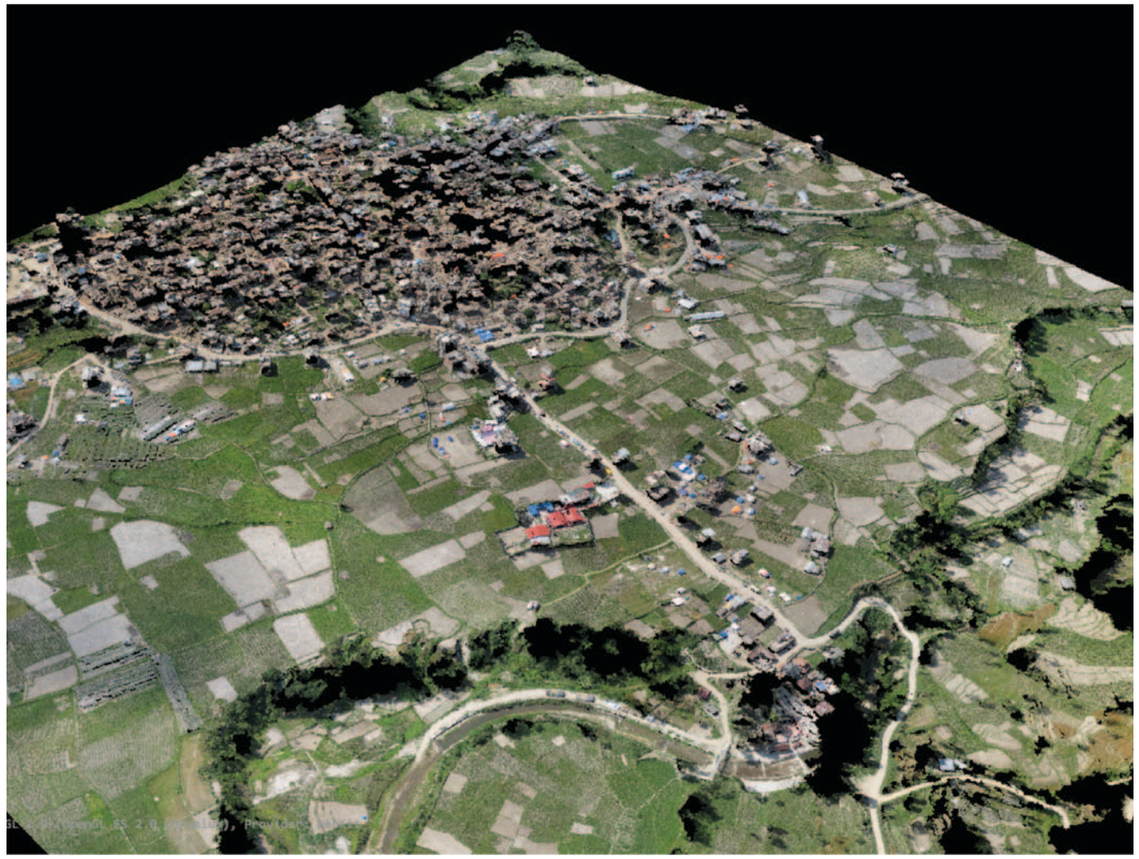


PHOTO BY GLOBAL DIRT

the Humanitarian UAV Network in the immediate aftermath of the earthquake. The Network's mission was to ensure that each team knew about each other (for safety and efficiency reasons) and to actively advocate that all teams respect the Humanitarian UAV Code of Conduct. In addition, UAViators actively encouraged all UAV teams to share their imagery with appropriate responders. Alas, not all UAV teams respected the Code of Conduct and some did not share imagery. This is unfortunate and will certainly not help their reputations moving forward.

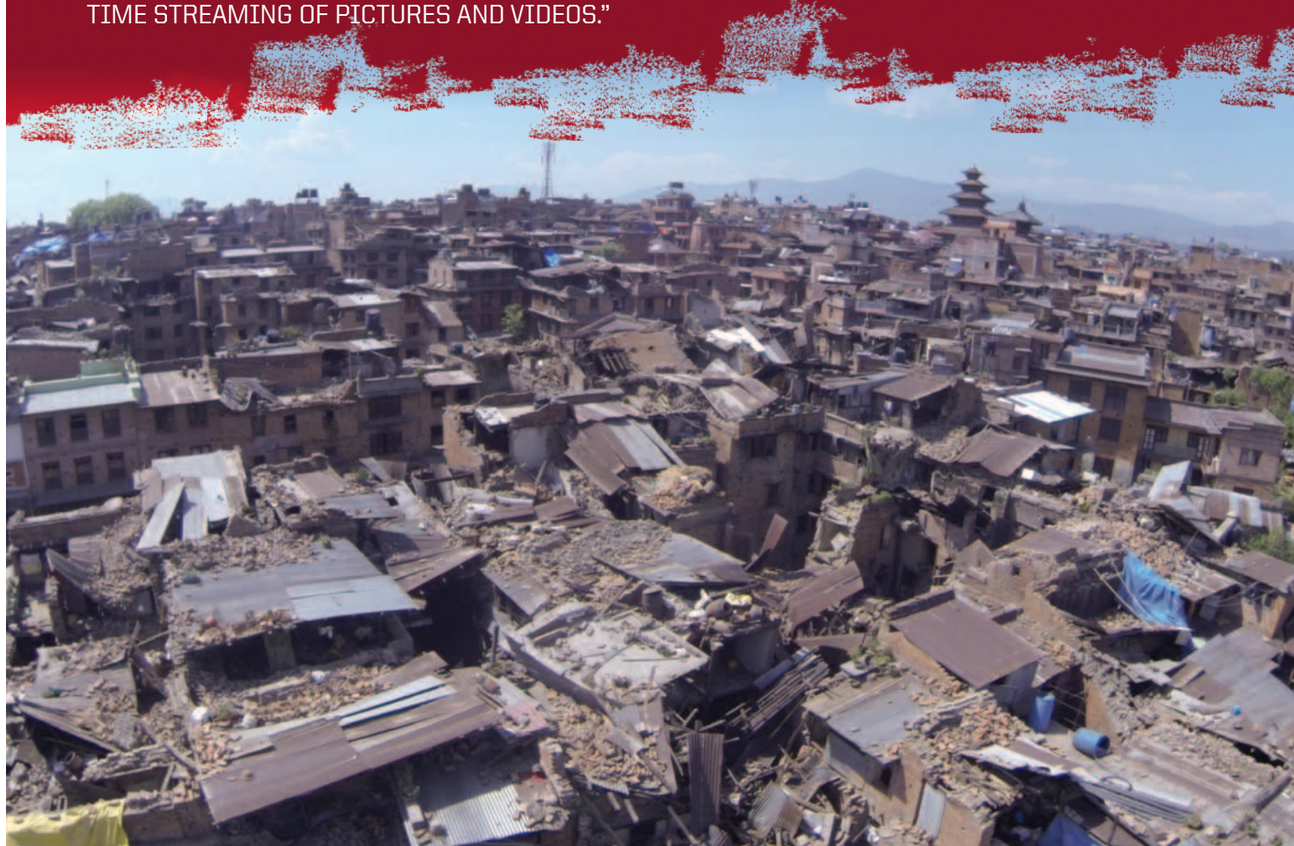
RD: ***How did employing drones help in that disaster?***
Patrick: UAVs were used to search for survivors, recover deceased bodies, assess disaster damage to infrastructure, support road clearance operations, evaluate landslide risks due to the upcoming monsoons, and create high-resolution 3D models of Heritage Sites such as temples.

RD: ***I know that Nepal grounded many drones after the earthquake. Did that affect your mission?***
Patrick: The government of Nepal did not ban UAVs, they simply limited the use of UAVs for humanitarian purposes only. This was in part because disaster tourists and drone journalists were particularly insensitive to local communities vis-a-vis their use of UAVs. In addition, other UAV teams did not even seek to request permission to operate their UAVs, which is a direct violation of the UAV Code of Conduct. The Government's decision to limit the use of drones was perfectly understandable. Unfortunately, this has indeed made it harder for legitimate, professional UAV teams to operate.

RD: ***What new features or technology for drones or programming would you like to see developed that would help your mission?***
Patrick: We need a dedicated smartphone app to safely coordinate flights—something we are working on with several partners. We also need to move entirely to real-time data collection, that is, streaming pictures and videos, and we need methods to clearly analyze this imagery on the fly, particularly 3D models.

RD: ***What do volunteers need to do to get involved with your organization and what qualifications are required?***
Patrick: Volunteers who are pilots join the UAViators Pilot Roster and others join individual UAViators Teams that focus on different aspects of Humanitarian UAV Missions such as policy. The Network is open to all. For more information on the Humanitarian UAV Network, go to our blog at iRevolutions.org and get our book and newsletters at digital-humanitarians.com.

> "WE NEED A DEDICATED SMARTPHONE APP TO SAFELY COORDINATE FLIGHTS—SOMETHING WE ARE WORKING ON WITH SEVERAL PARTNERS. WE ALSO NEED TO MOVE ENTIRELY TO REAL-TIME STREAMING OF PICTURES AND VIDEOS."



Above: 3D-rendered images from a multirotor can help authorities locate problem areas. **Opposite, top:** Here Opu launches his DJI Phantom to inspect damage on the upper part of the building. t **Opposite, bottom:** With many buildings collapsed on each other, the only effective way to evaluate the damage is from the air.

Authorities go over the flight plans with Opu to let him know where they want him to send his quad.

BUILDINGS CAN EXHIBIT TELLTALE SIGNS OF DAMAGE AND PERHAPS IMMINENT COLLAPSE BY SHOWING SMALL CRACKS AND STRESS FRACTURES. BUT SOME OF THESE CAN BE OUT-OF-SIGHT TO THE INSPECTOR ON THE GROUND.

On the Ground

Naimul Islam Opu, the owner of Cygnus Aerial Photography in Dhaka, Bangladesh, was on the ground in Nepal right after the earthquake. He was flying different multirotors with cameras equipped with real-time telemetry, which transmitted the image back to the ground unit. Officials could examine the video and determine if the area was worth the risk of sending rescue workers in to search for survivors. Sometimes the officials would stand over Opu's shoulder and direct where he should send the drone to scout.

Because of the limited resources, it was very difficult and time-consuming for first responders to climb over the rubble and assess the damage. Areas in the center of cities have older buildings and in many instances, many of these buildings collapsed on each other. This made the multirotor a perfect tool to get up over those hills of rubble and see what was on the other side. In this case, the officials would watch and examine the video to see if there was a justifiable reason, such as a survivor or injured person, to send rescue workers over the debris and into damaged buildings.

Having the ability to easily traverse over piles of rubble is one of the advantages of using quads to scout out damaged areas.

Rebuilding efforts

Andy Trench from XactSense, designer of custom UAVs for lidar survey and mapping (using lasers to illuminate a target and calculate distance), provided Naimul with assistance from the U.S. to keep his drones flying after the Nepal earthquake. He notes that after all the rescue efforts were over, drones still had value for rebuilding the damaged cities. For example, after the earthquake in Haiti, inspectors had to assess some 80,000 buildings for structural damage for the rebuilding effort. Buildings can exhibit telltale signs of damage and perhaps imminent collapse by showing small cracks and stress fractures. But some of these can be out-of-sight to the inspector on the ground.

Drones are the perfect tool for examining a large number of buildings or large areas of a city from a close proximity above the structures. This video data can be collected and sent to an inspector, who can comb through it and determine which buildings are salvageable, which warrant immediate demolition and which require closer inspections. Drones can speed up this process and help a city to recover after a natural disaster.

The takeaway

Natural disasters such as earthquakes will continue to happen, but the increased popularity of drones means that these increasingly important tools are readily available during emergencies. Drones are easy to transport, so they can be immediately deployed and, when their operators are coordinated, drones can be used to save lives, assess damage and aid in rebuilding.