***Written testimony of former FEMA Deputy Administrator Joseph Nimmich for a joint House Armed Services, Subcommittee on Strategic Forces; and, House Homeland Security, Subcommittee on Emergency Preparedness, Response and Communications hearing titled* "Threats to Space Assets and Implications for Homeland Security."**

Good afternoon, Chairman Rogers, Chairman Donavon, Ranking Members Cooper and Payne, and members of the subcommittees. My name is Joseph Nimmich and I am the former Deputy Administrator of the U.S. Department of Homeland Security's (DHS) Federal Emergency Management Agency (FEMA). Thank you for the opportunity to testify today about the critical role of satellite technology in preparing for, responding to, recovering from, and mitigating disasters.

The use of satellites and satellite-derived data is mission critical for emergency management operations. Emergency managers require extensive, timely, and accurate information to make critical life-saving and life-sustaining decisions. Their decision-making information comes from a multitude of sources, with satellites being one of the most critical. Satellites, both national and commercial, inform almost every aspect of emergency management, allowing responders to act faster and smarter to preserve the safety and security of the American public.

U.S. Government's Satellite Capability

Emergency managers work closely with the National Oceanic and Atmospheric Administration, or NOAA, when preparing for potential storms. NOAA operates the Nation's system of environmental satellites, including "geostationary operational environmental satellites", or "GOES," for short-range monitoring and warnings; as well as "polar-orbiting environmental satellites", or "POES," for long-term forecasting. Local, state, and Federal emergency managers all rely heavily on NOAA's satellite data.

NOAA's satellites track weather events, including tropical systems, tornadoes, flash floods, winter storms, dust storms, volcanic eruptions, and forest fires. NOAA also monitors space weather events, such as geomagnetic storms, which can disturb Earth's magnetic field and communications networks. The ability to monitor this second category of storms is critical in reducing damage to public infrastructure systems, including power grids, telecommunications, aviation, and GPS.

The National Weather Service depends on weather satellites to monitor and collect information about evolving weather systems to help forecasters predict future weather events with increasing accuracy. Emergency managers require these short- and long-term forecasts to carry out their mission. Advance knowledge of incoming storm systems allows the government to preposition assets in a safe location or provide assistance to mitigate the impacts of river flooding and storm surge.

Satellite Data for Before, During, and After an Event

In addition to satellite-supported weather forecasts, emergency managers utilize satellite-based sensors for critical information regarding the atmosphere, earth's surface, and our built environment. This information is utilized by decision-makers at all levels to enact timely decisions both in the immediate as well as the long term.

Pre-Disaster Mitigation

One of the most significant ways communities can prepare in advance of a storm is through pre-disaster mitigation efforts. These efforts can include basic preparations such sandbags and hurricane shutters, but the most effective forms involve community investments in long-term projects, such as: constructing safe rooms in areas prone to tornadoes; building homes and infrastructure outside of flood-prone areas; and enforcing stricter building codes in areas at risk of earthquakes to ensure structures are built to withstand aftershocks. Smart mitigation is informed by risk, and determining accurate risk requires an understanding of the changing environment over time.

FEMA monitors urban and infrastructure changes over time through a robust archive of historical and current satellite images. These images provide a baseline for investments in mitigation efforts that protect our nation's critical infrastructure. FEMA's flood mapping relies heavily on satellite-derived elevation data for advanced flood modeling, flood zone designation, flood insurance updates, and flood map production.

Satellites also enable smarter prepositioning, which in dire circumstances, can be the difference between life and death. Satellites inform more efficient routing of Urban Search and Rescue teams, supply convoys, and the proper positioning of supply distribution points. As an example, during Hurricane Matthew, risk maps helped FEMA leadership predict the extent and location of damages well in advance of the storm's landfall. This advance knowledge allowed FEMA to preposition assets, build accurate staffing models, and more precisely allocate limited resources to where they were most needed. The ability to pre-position resources is critical to a prompt emergency response.

Emergency managers and city planners also utilize satellite date in developing and maintaining critical evacuation routes in high-impacted communities. In instances of hurricanes or flash flooding, models such as HURREVAC incorporate real-time satellite information to allow local and state officials to order timely evacuations. Early warnings of pending tornados by satellite-supported models provide effected individuals the minutes needed to relocate to safe rooms and interior shelters.

Response and Recovery

The best response to a disaster starts well before the disaster actually occurs. Early and accurate predictive information supported by satellite data allow emergency managers to move people, responders, and commodities in advance of the storm, saving lives in the face of disasters.

Satellite data preserves one of most valuable resources in emergency management: time. Time, and more specifically, advance warning is often the difference between life and death. Local emergency managers can order evacuations based on solid predictions supported extensively by satellite data. While evacuations are synonymous with hurricanes, new satellite technology is also improving predictive capabilities to support flash flooding evacuations and tornado events. Evacuation planning for manmade catastrophic events is ongoing.

Satellite technology also improves response time. In the immediate hours after a storm, satellite imagery provides the foundation for the whole community's common operating picture. Information from meteorological, atmospheric, and imaging satellites contribute to situational awareness of unfolding or impending impacts, allowing for more timely evacuation and deployment decisions. This imagery can assist decision-making by identifying the extent and impacts of flood inundation; locating and analyzing debris fields; and assessing patterns of damage within disaster areas to identify areas of greatest need. Satellite imagery also helps in detecting and assessing road, bridge, airport, and port damages, and in characterizing impacts to critical infrastructure, public buildings, and dwellings.

Satellite imagery can quickly confirm areas of worst impact and need, and help focus the timely delivery of aid to survivors. During Hurricane Sandy, rental assistance was expedited to over 44,000 applicants whose home were identified as inaccessible through remote sensing and geospatial analysis. Imagery-derived damage assessments speed approval of Presidential declaration decisions and deployment of national assets. All of this helps us to more quickly and efficiently locate and serve survivors in the hours and days after a storm.

Satellites are also critical to local, state, and federal recovery mission. Satellite imagery and geospatial analysis has enabled FEMA to accelerate house-by-house damage assessments and expedite millions of dollars of rental assistance to disaster survivors. This capability reduces costs to the taxpayer, as damage assessments can be derived from satellite imagery at a fraction of the cost of ground inspections, in some cases up to 90% less costly. A single satellite image can cover hundreds, even thousands of square miles and provide cheaper and timelier data than deployed teams, especially in remote areas.

Finally, satellites provide critical communications and coordination for response operations. Data and voice communications are the nervous system of any effective response. During disasters, commercial communications are often severely overloaded. In fact, many of you may recall the 2011 Virginia earthquake that was felt here in Washington, D.C. As you may remember, within minutes, it was impossible to make commercial calls or send text messages as the system exceeded capacity. In spite of the overtaxed lines, satellite communications ensured emergency responders were able to continue to communicate and maintain connectivity at all times. Much like that day, emergency managers across the country rely on this national communications capability during the most severe events.

Satellite Technology in Action

Before I conclude, I'd like to discuss the role of satellites in the last major response I supported as FEMA Deputy Administrator, the response to Hurricane Matthew.

Information on the potential severity of Hurricane Matthew began coming in weeks before landfall. On September 28, NOAA began monitoring a tropical storm off the African coast, and original predications indicated it could eventually impact the Southeastern United States.

In the eleven days leading up to landfall, NOAA's satellite data allowed the emergency management community start to plan for eventualities. As the storm progressed, iterative models from NOAA satellites indicated predicting a 90-degree change of course, resulting in significant impacts to the Florida coastline. This information allowed FEMA to engage Florida early on, determining the potential impact and resources necessary to address potential impacts.

As Matthew roared across Haiti, preparations in Florida were well underway. The President declared an Emergency Disaster Declaration, which allowed the Federal Government to provide emergency funding and resources in support of the State. Commodities such as generators, food, water and personnel were made available, and the Governor ordered evacuations of highly susceptible coastal populations.

As Matthew approached Florida, real-time satellite data improved projections and determined the hurricane would not make landfall, but instead stay just offshore. This change in projection refocused our efforts, and the response focus moved to Georgia and South Carolina. Both Governors requested, and the President granted, Emergency Disaster Declarations and with the stroke of a pen, Federal focus rapidly moved to these states. The states ordered evacuations of at-risk coastal areas and awaited the storms arrival. Utilizing satellite communications and GPS capabilities, FEMA moved commodities no longer needed in Florida to Georgia, South Carolina and North Carolina. The rapid changing environment was met with a rapidly adaptive response, all enabled by the use of national and commercial satellites.

On October 8, Hurricane Matthew came barreling into Georgia overnight, making landfall near McClellanville, S.C, about 35 miles northeast of Charleston, and worked its way up the coast. The storm weakened throughout the day and it became clear that the most significant impacts would be inland flooding. North and South Carolina, having been inundated by rain just a week prior, knew the stream and rivers couldn't absorb the near 15-20 inches of rain Hurricane Matthew would create. While it seemed as though the worst had passed, we knew significant flooding was imminent.

Using information from RiskMAP, State and Federal Emergency Managers were able to project those areas most likely to be severely flooded. Since we were already aware of the shift in weather patterns, resources originally planned for Florida were already on their way to North Carolina. Commodities were provided to support shelters for those forced out of their homes. Generators were available to support critical infrastructure. And most importantly personnel were in place ahead of the flooding, to preserve life and property. Urban Search and Rescue teams with fast water capabilities were in the right place at the right time, thanks to reliable satellite information and effective coordination and communication. Soon after the hurricane passed, federal disaster declarations were swiftly approved based on imagery-derived damage assessments, allowing survivors to begin the road to recovery. The use of satellite technology provided the data necessary to expedite the timely delivery of aid to survivors.

CONCLUSION

I will conclude with this: I cannot leave this discussion with readers thinking that without satellites there would be no response to disasters. Every level of emergency management prepares for emergency response where there is limited access to information including satellite information. But to be very clear responses to emergencies with degraded satellite information will be less timely, less capable, and far less efficient. satellites are the bedrock of efficient emergency response. They support every aspect of Emergency Managers' efforts to prepare for, mitigate against, respond to, and recover from disasters confronting our nation. It is critical that the federal government continue to invest in these capabilities if we are to support the American people in their times of greatest need.

Thank you for the opportunity to testify today. I look forward to any questions the subcommittees may have.