

# NATURAL DISASTERS - SATELLITES TO THE RESCUE

Satellites Play a Critical Role in Saving Lives and Providing Critical Services Before and After a Natural Disaster



Prepared By:



Updated July 2024

For more information regarding this report, please visit the SIA Emergency Response and Disaster Relief Webpage [HERE](#)

Further reference materials:

[SIA Public Safety Policy Webpage, click HERE](#)

[SIA First Responders Guide for Satellite Communications, click HERE](#)

# WHEN NATURAL DISASTERS STRIKE

**Due to Recent Leaps in Innovation, Satellites are Providing More Data to Forecasters, Emergency Planners and Responders than Ever Before. Satellites are Playing an Increasingly Critical Role in Saving Lives and Providing Services Before, During and After Weather Related Disasters Such as Hurricanes or Wildfires**



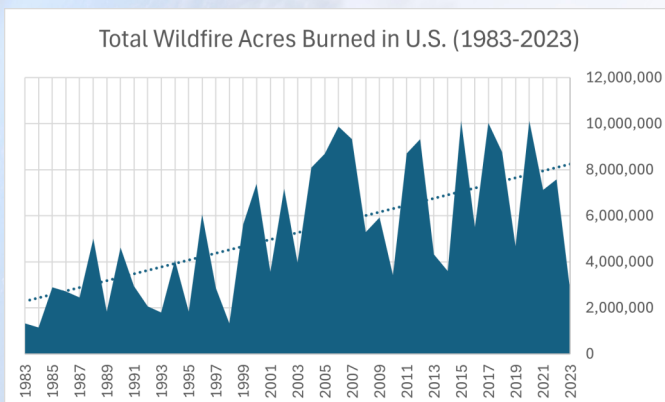
(Above) Since Hurricane Katrina, 28 U.S. States plus 2 U.S. Territories and millions of Americans have been severely impacted by Atlantic hurricanes and tropical cyclones.

Since 2005, 41 Atlantic hurricanes have hit the U.S., causing more than 2,100 casualties and damage estimated in the hundreds of billions of dollars.

In Sept 2022, hurricanes destroyed much of Fort Myers Beach and severely damaged Daytona Beach Shores. Two years earlier, a record-breaking 30 named cyclones and 12 storms made landfall in the continental U.S.

The 2024 Atlantic Hurricane Season began on Jun 1st and ends in Nov.

**Satellites to the Rescue — For 60 years, satellites have been helping save lives by supporting improved hurricane, tropical storm and other severe weather forecasting, preparation, search, rescue and recovery services as well as everyday utilities that become critically vital to citizens when a disaster strikes.**



(Above) Over the past 4 decades, the annual number of acres burned in the U.S. due to wildfires has trended upwards, with the 10 largest acreages burned all occurring since 2004. Source: National Interagency Fire Center

Since 1983, the National Interagency Fire Center has documented an average of approximately 70,000 U.S. wildfires per year.

On Aug. 8, 2023, gale force winds collided with extremely dry terrain on the western coast of Maui in Hawaii. Collapsed power lines helped ignite what would become the deadliest wildfire in more than a century, killing 100 people and destroying much of the town of Lahaina.

**Eyes in Space — Remote sensing satellites are becoming an increasingly important tool for boots on the ground when it comes to fighting wildfires. Thanks to lower costs and an increased number of commercial “eyes in the sky”, the growing number of innovative Earth observation spacecraft are providing real-time data that give fire-fighters information that helps predict a fire’s behaviour and its consequences.**

**Satellites provide critical atmospheric and ground data, significantly improving detection and observation of wildfire disasters that can directly affect public safety, protection of property, and America’s economic prosperity.**

## ADVANCED WEATHER FORECASTING SATELLITES

As weather predictions are vital to saving lives, the National Oceanic and Atmospheric Administration (NOAA) Geostationary Operational Environmental Satellites (GOES) with advanced imaging allows meteorologists and emergency responders to more quickly and accurately predict when and where hurricanes will strike. Overall, the Lockheed Martin built GOES-R series satellites are providing forecasters with sharper, more defined images of severe storms, hurricanes, wildfires and other weather hazards. During the record-breaking 2020 Atlantic hurricane season, GOES-16 and 17 images were critical in forecasting severe weather as it approached the U.S. Atlantic and Gulf coasts.

In an effort to further improve forecasting, NOAA also purchases satellite GPS-radio occultation data as part of its Commercial Data Purchase program. (see section below for more details regarding radio occultation.)

One of three companies that provide NOAA with data is Spire Global. Spire's atmospheric temperature, humidity and pressure data is crucial as it helps officials plan evacuations in areas predicted to be impacted by severe weather.



(left) GOES-R series satellites provide life-saving images to forecasters and emergency officials like this image (right) taken of Hurricane Idalia in August, 2023. The newest satellite GOES-U, built by Lockheed Martin, was successfully launched on June 25, 2024. This final next-gen R-series weather satellite will be renamed GOES-19 once it reaches GEO orbit over the western hemisphere. Photo Credits: Images courtesy of NASA and NOAA



Spire Global satellites provide commercial and government customers with radio occultation data for atmospheric temperature, pressure and humidity that can be vital for forecasting severe weather. Photo credit: Spire Global

## WHAT IS RADIO OCCULTATION?

Radio occultation (RO) is a measurement that creates a detailed profile of conditions that extend from the Earth's surface into the ionosphere. Low-Earth-orbit RO satellites including those from Spire, can provide detailed pressure, temperature, water vapor and electron density data, providing a thorough picture of atmospheric conditions. RO improves the accuracy of weather and space weather forecasts. Measuring the moisture in and around tropical cyclones is important as it is a key ingredient for their development and intensification.

## ENVIRONMENTAL SATELLITES ENABLE IMPROVED STORM FORECASTING PLUS CLIMATE AND WILDFIRE MONITORING

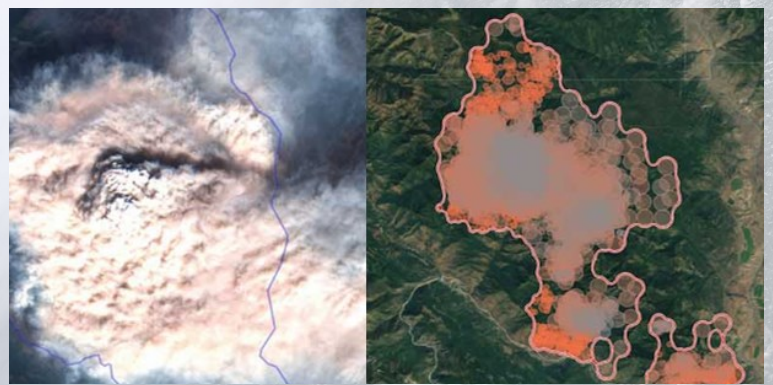
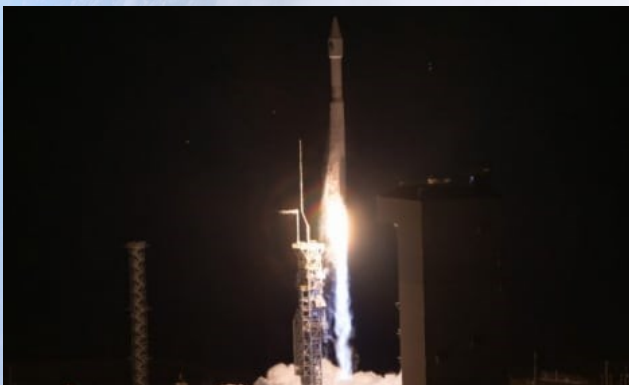
NOAA-21, an environmental satellite built by Northrop Grumman, carries several instruments for advanced Earth observation data collection. This data is critical for scientists and researchers to make weather forecasts and monitor climate change to make time-sensitive decisions on emergency preparedness for events such as hurricanes as well as assessments for long-term phenomena like droughts.

The Northrop Grumman-manufactured Advanced Technology Microwave Sounder (ATMS) measures microwave radiation from the Earth's atmosphere and surface during the day and night regardless of cloud cover. The global temperature and moisture profiles ATMS generates allow meteorologists globally to create more accurate weather forecasting models that help communities with natural disaster and emergency preparedness efforts.

The satellite's Visible Infrared Imaging Radiometer Suite (VIIRS) is a scanning device which collects imagery and radiometric measurements of the land, atmosphere, and oceans in several visible and infra-red bands. The VIIRS Thermal Hotspots and Fire Activity layer is an active fire detection product which automatically downloads near real time data and imagery site, every 15 minutes.

Satellites have been used to monitor wildfires for decades, but today's satellites are also capable of generating infrared imaging data which enables firefighters to see through a forest canopy or track a fire through thick smoke, providing data that conventional visual sensors cannot.

Satellite infrared images can also provide detail about the extent of the damage post-wildfire. Such images of the devastation left from the 2023 wildfire in Maui showed recovery teams that the fires had burned a vast area of land, including forests, residential areas, and businesses.



In late 2022, the Northrop Grumman-built NOAA-21 satellite was launched from the Vandenberg Space Force Base in California. The satellite carries Advanced Technology Microwave Sounder (ATMS), which measures microwave radiation from the Earth's atmosphere and surface during the day and night regardless of cloud cover, and a Visible Infrared Imaging Radiometer Suite (VIIRS) instrument, which the U.S. and Canada use to monitor wildfires. (Photo credit: NOAA/United Launch Alliance)

Select Spire satellites also carry infrared imaging and extreme heat sensing payloads which can also see through thick smoke and provide real-time monitoring and early detection systems allowing authorities to shorten wildfire response time. (Photo credit: Spire Global)

## BEFORE AND AFTER IMAGERY AND DETAILED GROUND IMAGES

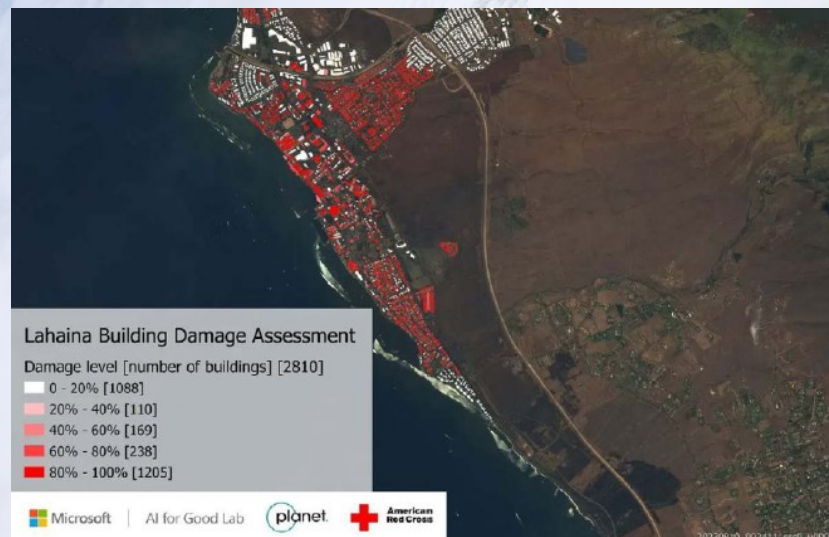
Comparison “before and after” imaging from satellite companies assists responders and recovery teams in locating areas of flooding/fire damage, shelters/resources, search and rescues, evaluating damage to critical infrastructure, searching for roads, and prioritizing response and recovery.

Satellite imaging can also provide detailed changes on the ground at all stages of disaster response and recovery.



Commercial satellite imaging companies such as Planet, can provide emergency responders and recovery agencies with high resolution before and after images. Such images taken from space before and after a hurricane or other disasters (such as a 2020 dam breach pictured above) (Photo credit: Planet)

(right) After a catastrophic wildfire hit Lahaina, Maui in the summer of 2023, Microsoft engineers used Earth imaging data from Planet to train an AI model to rapidly estimate the number and extent of buildings damaged, helping first responders and aid organizations prioritize assistance and support relief efforts in partnership with the American Red Cross. (Photo credit: Image courtesy of Forbes)



## GLOBAL POSITIONING SYSTEM (GPS) SATELLITES

Operated by the U.S. Space Force, GPS satellites built by Lockheed Martin and Boeing provide position, navigation, and timing data for GPS terminals and mobile phones before, during and after a disaster. This data enables critical precision location of disaster victims, relief team workers, and emergency responders and their equipment. Products such as Globalstar’s SPOT Satellite Messenger are also used to provide GPS position information during an emergency.

GPS satellites also support the continuity of communications networks, electrical power grids and financial networks and ATM services by providing precise timing data that is critical for synchronization and operational efficiency.

Hundreds of millions of Americans and over 5 billion persons worldwide depend on the Position, Navigation and Timing (PNT) signals from GPS. The next-generation constellation of GPS satellites is currently being launched. Six GPS III satellites are now in Earth orbit and the seventh next-gen satellite is now being prepared for launch, expected in late 2024 or early 2025.

## SATELLITE COMMUNICATIONS (SATCOM)

Satellite Communications (SATCOM) Networks are highly survivable and robust compared to terrestrial communications infrastructure which may be damaged or destroyed in a hurricane. SATCOM equipment can also be pre-deployed to centralized "safe" locations within a region and in some cases, these systems can be pre-installed to enable operation before, during, and after a disaster. From federal, state and municipal public agencies including FEMA and NGO recovery organizations to everyday consumers, satellites provide robust services and business continuity when other networks are damaged, overloaded or unavailable. Satellite Communications also provides a load sharing or surge capacity solution and enable the creation of instant communications infrastructure. For a list of specific response initiatives by satellite companies in the wake of recent hurricanes and wildfires, please see the appendix at the end of this report.

## SATELLITE CONNECTIVITY AND BROADBAND



Photo Credit: Jackson Lamar Cubic/GATR

In 2020, after Hurricane Laura made land-fall as a Category 4 storm on the U.S. Gulf Coast, Intelsat and its customer Cubic provided critical internet connectivity (pictured left) to first responders and residents in Lake Charles, LA.

In 2022 and 2023, GEO and NGSO satellites provided crucial internet connectivity and other services post Hurricane Ian in Florida and following the devastating wildfire in Maui, Hawaii.



Satellites provide vital debit and credit card authorizations at gas stations and retail stores during storm preparations and after a hurricane has impacted an area.

In Puerto Rico and the USVI, EchoStar's Hughes Network Systems partnered with FirstResponse1 to establish emergency connectivity. Hughes VSAT connectivity has been a constant presence, supporting FEMA efforts in the aftermath of weather and seismic events that continue to plague the region. Satellite data services from Intelsat, EchoStar-Hughes, Viasat and others provide essential lifesaving connectivity and data services to response and recovery agencies, hospitals and others when terrestrial services are damaged.

Retailers process purchases using satellite data services before and after a hurricane. Companies such as EchoStar Hughes and Telesat provide reliable business continuity services for point of sale (POS) credit/debit card authorizations and inventory management.

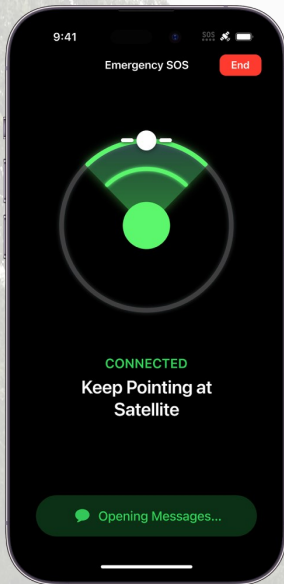
## SATELLITE PHONES

Natural disasters may damage terrestrial mobile networks and disrupt their services or make them unavailable. Because satellites fly far above the surface of the Earth, they are unaffected by hurricanes and wildfires.

Satellite phones from companies such as Globalstar, Iridium, Ligado and Viasat can provide vital communications service to first responders and recovery teams. They can also be used by survivors if they are cut off from the world and wish to reach out to family and loved ones.



(Above) After Hurricane Maria struck Puerto Rico, a Coast Guard Tactical Law Enforcement Team South crewmember provides a satellite phone to a local resident so she could call her son in Alaska who she hadn't been able to contact. Photo Credit: U.S. Coast Guard photo by Petty Officer 3rd Class Eric D. Woodall



**SATELLITES TO THE RESCUE:** In 2023, with cellular service damaged and unavailable, Apple's Emergency SOS Service via Satellite was used by a family trapped by the Maui Wildfire. First responders were able to locate and rescue the family after they texted their position to a family member. Source credits: Apple and MacWorld.

## SATELLITE DIRECT-TO-DEVICE SERVICES

One of the most recent and innovative developments in the satellite industry is Direct-to-Device (D2D) services. D2D service allows cellular smartphone users to communicate using satellite networks—even when cellular or Wi-Fi terrestrial coverage is unavailable. Depending on the type of D2D service, select smartphone users would be able to text or use voice and connectivity services, even when operating far outside the coverage area of terrestrial mobile services.

Such a service would also be invaluable for smartphone users such as first responders or those in an affected area where a natural disaster, such as a hurricane or wildfire, has either damaged or destroyed terrestrial mobile infrastructure.

Apple's Emergency SOS via Satellite service is already available in the U.S. and select other countries for its iPhone 14 and higher models, allowing users to text SOS message using satellite service when cellular or Wi-Fi coverage is unavailable. This service proved to be lifesaving for a family trapped by the Maui Wildfire in 2023. (left)

D2D texting is expected shortly from Apple and Starlink and several other D2D companies have either announced the U.S. launch of their services such as Skylo or are in the midst of testing in the U.S. market (AST SpaceMobile, Lynk, Omnispace).

## SATELLITE BROADCAST SERVICES

Satellites from companies such as Eutelsat, Intelsat, SES, Telesat and Viasat support television news trucks and emergency responders to provide valuable onsite rescue and recovery information and services.

SiriusXM works with the Integrated Public Alert and Warning System (IPAWS) management office to distribute receivers in impacted regions.

DIRECTV provides satellite subscribers access to national news, weather and (to the extent they are unaffected) their local broadcast channels during a natural disaster and has also activated temporary channels during a disaster event.



Satellite News Trucks pictured above were deployed following Hurricane Katrina.

## MOBILE CELLPHONE COMPANIES RELY ON SATELLITES

Every day, billions of terrestrial-based mobile phones rely on GPS satellites for timing, but mobile phone companies also utilize satellite services during a disaster.

When Hurricane Maria devastated Puerto Rico, AT&T utilized satellite phones and both Verizon and AT&T deployed satellite trucks in regions hit hard by hurricanes in order to restore service. T-Mobile and Sprint also used VSAT terminals to provide backhaul support for restoration of cellular and text services.

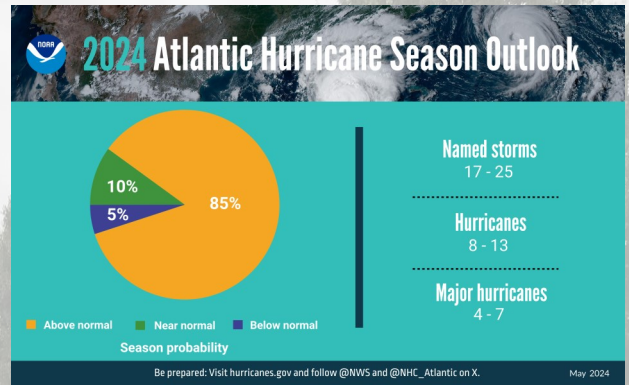


Above) VSAT terminals restoring connectivity in Puerto Rico following Hurricane Maria. (Photo credit: Colin Chaperon for the American Red Cross)

# NOAA 2024 Atlantic Hurricane Outlook Predicts Above Average Number of Hurricanes, Major Hurricanes and Named Tropical Cyclones

The 2024 season is expected to have above-normal activity due to a confluence of factors, including near-record warm ocean temperatures in the Atlantic Ocean, development of La Nina conditions in the Pacific, reduced Atlantic trade winds and less wind shear.

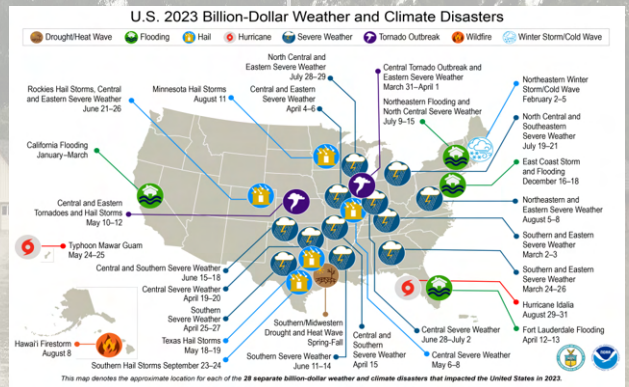
(Right) On May 23, 2024, NOAA National Weather Service forecasters at the Climate Prediction Center predicted an above-normal hurricane activity in the Atlantic basin this year. NOAA is forecasting a range of 17 to 25 total named storms. Of those, 8 to 13 are forecast to become hurricanes (winds of 74 mph or higher), including 4 to 7 major hurricanes (category 3, 4 or 5; with winds of 111 mph or higher). Source and Image Credit: NOAA



## The Maui Wildfire Was One of Many Costly U.S. Weather-Related Disasters in 2023

Since records began in 1980, the U.S. has sustained 376 separate weather and climate disasters (based on the CPI adjustment to 2023). The total estimated cost of these 376 events exceeds \$2.660 trillion.

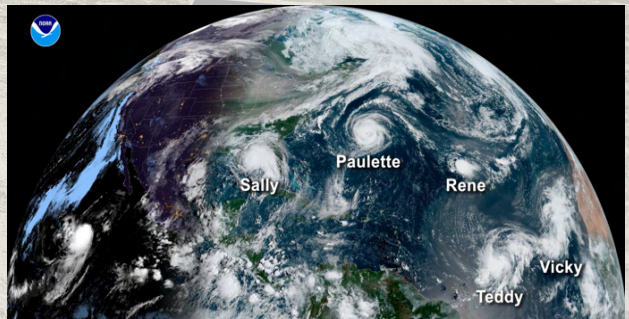
((Right) In 2023, the U.S. experienced 28 weather and climate disasters each incurring losses that exceeded \$1 billion. 2023 surpassed 2020, with 22 events, for the highest number of billion-dollar disasters in a calendar year. These disasters included: 17 severe storms, four flooding events, two tropical cyclones, two tornado outbreaks, one winter storm, one wildfire and one drought and heat wave event. Source and Image Credit: NOAA



## The 2020 Record-Setting Hurricane Season Produced 30 Named Storms

This makes 2020 the most active season on record and breaks the previous record of 28 storms set back in 2005.

(Right) On September 14, 2020, the GOES-16 satellite took this image of five Atlantic tropical cyclones in the Atlantic. A total of 10 named storms formed in Sept of that year, the most for any month on record. Photo Credit: NOAA



Wildfire debris in Lahaina, Hurricane Harvey flooding in TX (Photo credits: NOAA and Maxar.com)

Superstorm Sandy Destruction



For more information, please contact the Satellite Industry Association via email at [info@sia.org](mailto:info@sia.org)

Further reference materials: [SIA Public Safety Policy Webpage, click HERE](#)

[SIA First Responders Guide for Satellite Communications, click HERE](#)



## APPENDIX A: HURRICANE SEASON SATELLITE INDUSTRY RESPONSE AND RECOVERY INITIATIVES

**DIRECTV:** DBS broadcaster DIRECTV provides subscribers access to national news, national weather and (to the extent they are unaffected) local broadcast channels during a natural disaster. This capability can remain intact even when cable / fiber television distributors may experience disruption. In addition, over the last decade, DIRECTV has established two types of temporary channels during such events. First, the Severe Weather Channel provides live local coverage from participating broadcast stations in the affected area. Second, the four-channel Severe Weather Mix features round-the-clock live coverage from the Weather Channel, AccuWeather, CNN and Fox News Channel—which would continue to be available even if local signals were not.

These temporary channels enable people living within the likely path of a hurricane to view multiple resources immediately and simultaneously as the storm moves from one city to another, potentially placing them in harm's way.

DIRECTV launched such efforts to assist viewers during Hurricane Idalia (2023), Hurricane Ian (2022), Hurricane Ida (2021), Hurricanes Marco and Laura (2020), Hurricane Michael (2018), Hurricane Irma (2017), and Superstorm Sandy (2012), among other national emergency situations.

**EchoStar: Hughes Network Systems, LLC (HUGHES):** Since the 2017 hurricanes in Puerto Rico (PR) and the US Virgin Islands when Hughes partnered with FirstResponse1 to establish emergency connectivity throughout the islands, Hughes VSAT equipment and connectivity has been a constant presence, supporting FEMA efforts in the aftermath of weather and seismic events that continue to plague the region. Hughes is in regular contact with USG agencies, FEMA and the National Weather Service, to support local connectivity in the wake of hurricanes, wildfires, tornadoes and other disasters. For further details regarding Hughes satellite internet in PR post-Hurricane Maria, please click [HERE](#) or view the video at <https://youtu.be/FizJEH6HnKQ>.

Hughes supported key USG agencies to ensure critical communications were available and made donations to key relief organizations in the affected areas to help ensure they had the services that were needed. Today, Hughes assists government responders and business owners in disaster planning, management and emergency response. View the Hughes Reliable Emergency Communications website page [HERE](#).

**Intelsat** In 2020, after Hurricane Laura made landfall as a Category 4 storm on the U.S. Gulf Coast, Intelsat and its customer Cubic provided critical internet connectivity to first responders and residents in Lake Charles, Louisiana. Intelsat and Cubic sprang into action, providing crucial internet connectivity to the area's first responders, medical personnel, and other residents for eight days while their traditional communications infrastructure was re-established. Cubic deployed its [GATR inflatable, ultra-portable satellite antennas](#) and the GATR 950 modem –powered by Intelsat's FlexGround service – to several different sites in the Lake Charles area, providing communications-infrastructure support to Lake Charles Memorial Hospital; a Red Cross site enabling internet access to help residents call home and use instant messaging; the connectivity was also used for coordination between other Red Cross distribution points throughout the area. Communications also supported [Team Rubicon](#), a veterans' organization that serves communities by helping people prepare, respond and recover from disasters.

Much needed communication relief arrived on the remote island of Vanuatu in the Solomon Islands thanks to Intelsat. Cyclone Harold battered the area, making landfall as a Category 5 storm, the second strongest tropical cyclone to ever hit the country. The storm caused extensive damage and knocked out communication networks, broadcast radio and television infrastructure, and power.

Intelsat, as part of its work with the U.N. Emergency Telecommunications Cluster (ETC), donated telecom capacity to the hard-hit island area on the Intelsat 18 satellite's South Hemi beam. This vital communication support helped connect the islands to the mainland areas, enabling families to get in touch with their loved ones and spur support for additional post-storm efforts.

**Iridium:** Iridium worked directly and through its partners with federal, state, and local government emergency management agencies to ensure access to reliable communications. Following the storms, Iridium worked with non-governmental organizations (NGOs) and first responder organizations to help supplement their communications capabilities by providing emergency 'seeder' phones where possible and appropriate. These devices proved to be vital in the initial days after the hurricanes hit in terms of providing communication for first responders responsible for rescuing people and saving as many lives as possible.

During the hurricanes of 2017, hundreds of Iridium phones were used to support emergency services through groups such as the International Telecommunications Union (ITU), Homeland Security, the U.S. Department of Defense, the State of Florida Governor's Office, and many NGOs. At one point, there were over 3,100 unique Iridium subscribers in the Caribbean region, enabling more than 221,000 total minutes of voice and data. Iridium Push-to-Talk provided real-time group communication and enhanced the coordination of life-saving efforts and evacuation of numerous areas in post-storm flooding conditions.

For more information, please view the Iridium website Disaster Response and Relief page [HERE](#).

## SATELLITE INDUSTRY DISASTER RESPONSE AND RECOVERY INITIATIVES (continued)

**Ligado:** Ligado's satellite network has been used by the DHS, FEMA and the FBI in PR and USVI and usage soared in the region. In the immediate aftermath of Maria, Ligado worked with the United Way's MISSION UNITED to meet the communications needs of those impacted by the Hurricane. Donated satellite phones and service were used by public safety officials, volunteers, and community organizations in PR so that they could stay in touch with areas where the communications infrastructure has been destroyed. The Company has fulfilled all requests for additional satellite phones and network capacity to support government and NGO relief. Additionally, Ligado responded to Hurricanes Harvey and Irma by getting hundreds of new satellite phone units into the hands of public safety officials and other first responders actively involved in disaster relief efforts.

**O3b:** O3b, an SES subsidiary, utilized the Ka band spectrum through its Medium Earth Orbit non-geostationary satellite constellation to help bring local wireless networks in PR online while the terrestrial infrastructure was being repaired.

**Planet** In 2020, Hurricane Eta and Hurricane Iota made landfall only days apart, heavily impacting several countries in Central America. These Category 4 and 5 hurricanes resulted in widespread flooding, damage, and lives lost. Planet made disaster imagery available through Planet Explorer, the Company's online imagery browser. Planet provided limited access to Explorer for up to 30 days to qualified disaster volunteer organizations, humanitarian organizations, and other coordinating bodies. In addition to hurricanes, Planet has also focused its imagery on other disasters including the 2020 dam breach in Michigan, last summer's wildfires in California and the flooding in Kentucky in the March 2021. Explorer is also continuously updated with the most recent imagery. To learn more or to gain access to Planet's Explorer, please email [disaster-access@planet.com](mailto:disaster-access@planet.com).

Today, natural disasters are becoming more frequent and increasingly severe as the effects of climate change continue to accelerate. From "megafloods" to "megafires" - these events are growing on a scale that requires new data for fast and accurate decision making. Daily satellite monitoring helps officials quickly understand and analyze what is happening on the ground.

To maximize preparedness and accelerate recovery efforts, Planet has prepared an e-book that can aid in reducing risk, streamline processes and cover more ground throughout the disaster life-cycle.

The Planet e-book also details several U.S. and global disaster use cases along with satellite graphics and data used by emergency responders in 2022 and 2023. To request a copy of the e-book, please visit the Planet for Disaster Emergency Management e-book page [HERE](#).

**SES:** In 2017, SES provided C-band services to relief workers in PR and utilization of Emergency.lu rapid deployment kits in Saint Martin, Sint Maarten and Dominica. These terminals were quickly brought in for use by responders in response to Irma and Maria to provide internet connectivity. Once installed, teams deployed Wi-Fi access points so that humanitarian aid organizations could have connectivity, numbering around 400 registrations. Emergency.lu was also used to restore communications at Princess Juliana airport. Additionally, SES provided C-band capacity at no charge for the benefit concert to benefit victims of hurricane Irma and Maria.

**SES-GS:** SES-GS used its Ku-band capacity for U.S. Government Responders in PR and other islands in the Caribbean.

In 2022, SES GS rapidly deployed high-throughput low-latency medium earth orbit (MEO) satellite service and ground terminals to restore broadband connectivity for local communities and first responders in Lee County, Florida, who were impacted by Hurricane Ian in 2022.

SES GS, alongside SES and SimbaCom, responded with the deployment of the high-performance connectivity service in support of the AWS Disaster Response program and their standby partner, Help.NGO. The interim service was provided over the affected very large territories in the hours immediately following the major devastation caused by Hurricane Ian in September.

**Spire Global** Throughout the 2020 hurricane season, the severe impact of the COVID-19 pandemic on aircraft flights is well known. Less obvious and equally important was the reduction in aircraft-based weather observations available to weather prediction centers and the related negative impact on weather models. Spire helped mitigate this loss by providing its own GNSS radio occultation ("GNSS-RO") data. Spire GNSS-RO harnesses the power of global navigation systems to capture weather data. As Spire's LEMUR satellites orbit the Earth, they receive signals from GPS satellites rising and falling on the horizon. These signals, which travel through the atmosphere, are bent by the atmospheric conditions that they encounter. Once analyzed, the bent signals provide critical information about air temperature, pressure, and humidity, resulting in improved weather predictions.

Spire offered its global GNSS-RO data on an emergency basis during the COVID-19 crisis free of charge to Federal agencies to support the Federal crisis response and to help alleviate the adverse impacts of the crisis on weather forecasting. This helped alleviate the adverse impacts on weather forecasting caused by grounded aircraft, which in turn benefitted the general public and assisted Federal crisis response efforts.

## SATELLITE INDUSTRY AND GOVERNMENT DISASTER RESPONSE AND RECOVERY INITIATIVES (continued)

**Spire Global (continued)** Spire is also working with OroraTech, for the Canadian Space Agency (CSA) to demonstrate wildfire detection methods from space. The contract is the initial step towards CSA's planned WildFireSat mission, which aims to monitor all active wildfires in Canada from space on a daily basis to support wildfire management, provide more precise information on smoke and air quality conditions, and more accurately measure the carbon emitted by wildfires. Canada's wildfires generated an estimated 480 million tons of carbon emissions in 2023, equivalent to 1,761 million tons of CO<sub>2</sub> according to the Copernicus Atmosphere Monitoring Service (CAMS). Detecting wildfires early – or even preventing them before they begin – can save lives, protect communities and prevent a large contributor to emissions. For more information regarding this initiative, please click [HERE](#).

**Telesat:** In response to an urgent request from a telecommunications service provider (TSP), Telesat established two VSAT networks in PR following hurricane Maria, utilizing Telstar 12V capacity and hub VSAT services at Telesat's Mount Jackson Teleport. Telesat also assembled remote hardware kits that were delivered to the TSP customer in PR, and engaged an on-site field service representative to deploy the two networks and assist the TSP customer.

In 2020, Telesat successfully demonstrated the ability for first responders to establish reliable voice and data connectivity with Telesat's next-generation Lightspeed test satellite. Through Halton-Peel Public Safety Broadband Network Innovation Alliance, along with Telesat and Motorola Solutions engineers, the teams successfully enabled the extension of mission critical PSBN LTE data services over a satellite link to Telesat's operations center. The Telesat Lightspeed constellation is expected to begin launching in 2026.

**Viasat:** Viasat has a decades-long legacy of saving lives and providing critical safety communications. The company has forged strong links with government emergency planning teams and the humanitarian sector to help mobilize global satellite communications to aid disaster relief. Inmarsat's decades-long relationship with Télécoms Sans Frontières (TSF) is a testament to the vital importance of SATCOM.

As the first official partner to the emergency telecommunications NGO in 2000, Viasat has provided airtime and financial aid to support its work in the aftermath of some of the most devastating disasters in over 70 countries. For example, during and in the aftermath of Hurricane Laura in the southern United States in 2020, when Inmarsat, with its valued partners, delivered rapidly-deployed voice and high-speed data services including IsatPhone handheld satellite phones, BGAN (Broadband Global Area Network) and Global Xpress to support official emergency and disaster response teams, providing vital communications and other important humanitarian services.

When Turkey and Syria were devastated by a 7.8 magnitude earthquake in 2023, Viasat quickly set up internet service and hotspots to aid with the recovery and restoration and to help those impacted by the disaster stay connected with the information and resources they needed.

Viasat also provided first responders with the critical connectivity required to support disaster relief efforts while terrestrial infrastructure was down after the devastating fire in Maui.

During the 2017 hurricane season events, in Texas and Florida, the NGO recovery teams deployed 26 Viasat portable satellite broadband terminals to help volunteers connect online to provide critical medical attentions, place people in shelters, and help continue to heal the impacted communities.

Viasat also provides SATCOM solutions for first responders under FirstNet.

**Florida:** In 2022, according to the Government of the State of Florida, 100 portable cell phone towers were being deployed to support connectivity in Southwest Florida post-Hurricane Ian. Portable cell sites are useful because they can connect to satellites for data and then act as temporary cell towers to which phones connect.