



PUBLIC SAFETY AND EMERGENCY SERVICES

THE ROLE OF SATELLITE COMMUNICATIONS IN EMERGENCY MANAGEMENT

INMARSAT GLOBAL GOVERNMENT
COMMUNICATIONS MADE CERTAIN



INTRODUCTION

Disasters take many shapes – ranging from human-made disasters such as structural collapses, oil spills and explosions through to natural disasters such as wildfires, floods and earthquakes. Regardless of the form, disasters disrupt communities and challenge local response teams.

A recent report has costed global economic losses from natural catastrophes such as floods, hurricanes, and wildfires at \$270 billion in 2021 with a further \$10 billion attributed to man-made disasters. According to the United Nations Office for Disaster Risk Reduction (UNDRR), the number of natural disasters has been doubling every 20 years in terms of both frequency and economic cost.

COST OF DISASTERS BY CONTINENT 2021

North America	148
Europe	59
Asia	59
Latin America & Caribbean	6
Oceania/Australia	5
Africa	5

*Data: Swiss Re Institute

A critical component of an effective disaster preparedness and management strategy must deal with the key issue of establishing a secure communications link around a disaster site to aid a coordinated response.

Largely unaffected by conditions on the ground, satellite communications have a key role to play in any emergency management scenario.

PREVENTION:

Mitigation and prevention efforts are now seen as having a crucial part to play in not only preventing disasters, but also in preventing the impacts being compounded through the neglect of manageable risks. Increasingly, government agencies are seeking to take actions that can lessen the severity of a disaster's impact.



INSTALLING AND STRENGTHENING PREDICTION AND WARNING SYSTEMS



HAWAII

Hawaii undertook a \$25.6 million overhaul of its state-wide warning siren network with 490 sirens spread throughout the state that operate on a state-of-the-art satellite-cellular communications system. Tom Simon, systems engineer of Hawaii State Civil Defense, said sirens are absolutely needed in the state as tourists and residents aren't always carrying a smartphone to receive geolocated emergency notifications and even if they are, signal strength may be suspect in a mountainous or elevated region. "Because of the amount of time people here in Hawaii spend outdoors and the potential for tsunamis, we are putting a lot of emphasis on our siren system," Simon said. The new control technology called IsatData Pro jointly offered by Inmarsat and SkyWave allowed the state to standardize siren control and provides redundancy with the satellite signal and cellular signals used as backup for each other, ensuring that downtime is virtually non-existent. In addition to increased redundancy, workers can now access informative data on the status of each siren's condition. The sirens are solar powered and each use four deep-cycle batteries. Technicians can now be miles away and check items such as battery voltage, whether the charger is working and even receive notifications from the siren if someone tries to break into it.

ENVIRONMENTAL MONITORING IN REMOTE LOCATIONS



THE AUSTRALIAN BUREAU OF METEOROLOGY

BoM has data collection points throughout Australia and her territorial waters that are used for weather monitoring, environmental monitoring, and the BoM Tsunami Early Warning System program (TEWS). Collection points were spread throughout a vast, remote and often inhospitable terrain and the sites were often difficult to access and had limited power supply.

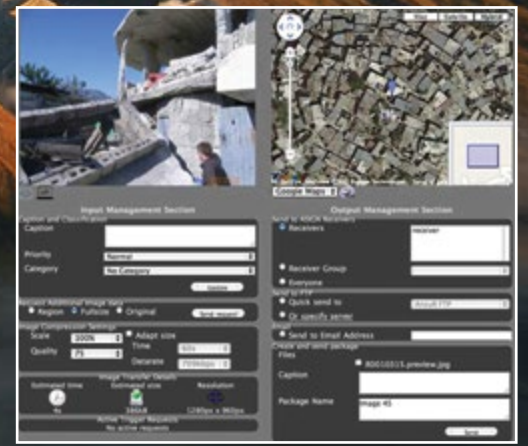
Inmarsat designed and developed a client focussed end-to-end solution incorporating

a dual-band, fully redundant network interconnection between remote data loggers and BoM core infrastructure. This allows the hitherto unavailable collection of data from the most remote and hostile of environments in real time and at regular intervals. This solution allows BoM the capability to remotely monitor and manage all data collection points and have access to all information simultaneously for the purpose of detailed analysis of the collected data

THE INDONESIAN NATIONAL BOARD FOR DISASTER MANAGEMENT

The Indonesian National Board for Disaster Management (known as BNPB - Badan Nasional Penanggulangan Bencana) is responsible for preparing for and managing the country's disaster response. After the recent earthquakes in Indonesia, the terrestrial and mobile networks stopped working and 'Visual Situational Images', required for the assessment of the damage and time-critical decision making, could not be shared.

Twenty regions in Indonesia have pre-deployed equipment consisting of AnsuR's high definition, interactive image communications system - ASIGN - and robust terminals which will be able to access Inmarsat's BGAN mobile satellite communications service. In addition, the pre-emptive deployment will include Unmanned Aerial Vehicles (UAV) with advanced cameras on-board, running ASIGN and additional BGAN satellite communications equipment on the ground. In the event of a natural disaster, BNPB's headquarters will have full situational awareness via this ability to receive images and videos from the site of the catastrophe even when the area's terrestrial communications infrastructure has been either disabled or destroyed. Additionally, Inmarsat's BGAN service will ensure that first responders and those caught up in a disaster can stay in contact with the outside world via both voice and data connections.



IDRS - ENABLING EARTH OBSERVATION SATELLITES

Satellites in lower orbits typically include those used for climate observations and disaster relief efforts, as well as a host of other applications. Traditionally, these satellites have had to wait until they came back into range of a ground station before being able to receive tasking information and transmit telemetry and valuable collected data.

The Inter-satellite Data Relay System (IDRS) service, connects satellites in low earth orbits to the Inmarsat ELERA network, allowing them to continuously

maintain communications with the ground, receiving and transmitting data on demand and in real-time.

The new data link should reduce waiting times for such data transfers from several hours to a handful of minutes. This can enhance lifesaving efforts in a natural disaster or enable observers to spot issues and direct resources to tackle them before they develop or get out of hand.



PREPARATION

When disaster strikes, it is critical that a coordinated response has been planned for to ensure a timely and efficient response capability. One of the most crucial elements of a scalable strategic, operational and tactical approach to catastrophic disasters is to guarantee access to a reliable communications link from ground zero. A community-led methodology, which provides situational awareness of conditions on the ground to assist in coordinating activities and communicating effectively can be effectively undertaken through some preparative measures.



PORTABLE IMMEDIATE COMMUNICATIONS KIT

When a disaster occurs, local terrestrial infrastructure on the ground is often damaged, over-burdened, and sometimes even non-existent. Yet a reliable communications link to command centres becomes the backbone of every disaster response operation. The Inmarsat PICK box, pre-deployed to local Emergency Service points, offers an easily deployable, dependable platform upon which you can base your mission to restore services at the local community level.

Voice communications are the most immediate requirement, and the Inmarsat PICK solution delivers a dedicated

satellite phone as well as a fixed line voice handset which connects through the RJ11 port on the Inmarsat BGAN terminal. Wi-Fi connectivity can also be used to connect BYO devices to enable voice calls and messaging services.

Data services such as access to emails, file transfers and web-based applications can be simultaneously accessed through the Inmarsat ELERA network. The Hughes BGAN plug and pay terminal can be used to set up a small command centre, delivering Internet speeds up to 464 kbps, with inbuilt Wi-Fi allowing several devices to be able to use the terminal concurrently.



PICK
PORTABLE IMMEDIATE COMMUNICATIONS KIT
inmarsat

MANAGED SERVICES

No government mission or requirement is the same, which makes resource management difficult in times of constricting budgets. Satcoms are a force enabler – yet managing the changing demands on your satcom solutions and ensuring they are available, supported and maintained both during down time and times of peak demand can be a drain on resourcing and difficult to plan for. Inmarsat Managed Services can help you bridge the gap between operational requirements and internal resource, ensuring your critical communications links are always available: anywhere, anytime, any mission.



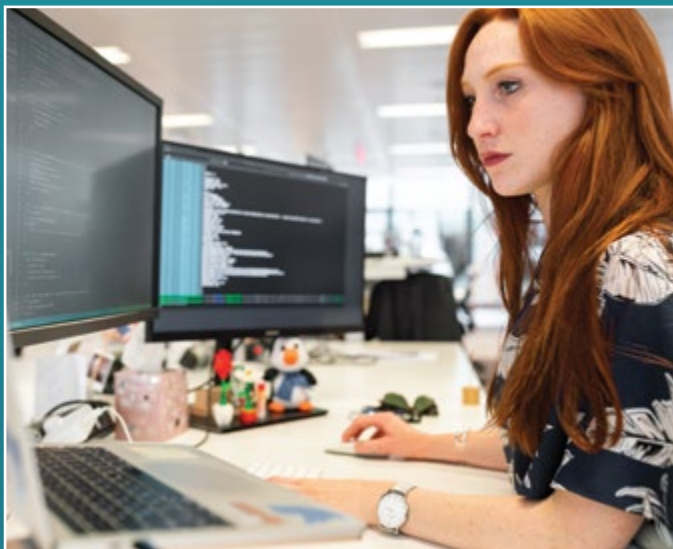
AIRTIME

Inmarsat has been serving governments for over 40 years and understand the particular airtime requirements of the sector. Which is why you can choose from a number of airtime options including pay as you go, subscription services, airtime allowance plans, occasional use plans, leased services, airtime and hardware bundles, and Combined Service Plans, providing the required flexibility and budget options to manage operational expenditure requirements.



TRAINING

We can provide the full range of training from, training needs analysis (TNA) for satcom and networking to deliver training, developing training plans and bespoke training courses, including train the trainer. We can deliver training at your facilities, external training locations or at our purpose-built training facilities, which include secure labs and Network Operation Centres for hands on end to end training components and understanding.



HELPDESK

We provide 24/7/365 Help Desk services to our Managed Service clients to agreed levels of support. We can work with you to establish the SLAs and support levels you require to manage your Inmarsat satellite solutions through our security accredited, technically experienced service engineers.



TERMINALS AND SUPPORT

Our terminals are the hardware that connects you to the satellite network to ensure seamless voice and data connectivity. As your holistic satellite provider, we can advise and deliver the most appropriate terminals and equipment as part of your complete satcom solution. When tied in with our extended warranty, consultancy and service and support, your terminals and equipment will be managed by the same team that ensure that they stay on the air when you need them. We care about helping you stay connected and will ensure that terminals undergo a support schedule including software upgrades, on air testing and battery checks.



INTEGRATED LOGISTICS SUPPORT

We can support your whole of life cycle of the satellite solutions including shipping, warehousing of GFE/CFE, stock holding of both lease and client owned equipment, hot swaps, fully maintained deployable full systems, operations and maintenance manuals, risk and safety assessment services, spares kits.



GERMAN RED CROSS FIELD EVENT

In Germany's largest-ever emergency exercise – MCI SOGRO 500 - a crash involving two aircraft carrying 500 passengers was staged at Frankfurt Airport. First responders swung into action to deal with this Mass Casualty Incident (MCI) getting the 'victims' to hospital and bringing the situation under control.

In the disaster scenario terrestrial communication networks had failed, but the authorities were able to rely on the Inmarsat ELERA BGAN network to transmit vital information. The purpose was to test out emergency response procedures and technology designed to ensure quicker

and more efficient treatment of casualties. More than 1,570 people were involved in the exercise - including police, fire and ambulance, together with more than 455 emergency vehicles. The BGAN terminal, played a vital role in helping the German Red Cross Frankfurt to coordinate the complex rescue operation by ensuring that data for each patient was captured and sent to the incident command centre. It meant that hospitals were able to prepare more quickly for incoming casualties, and patient data was readily available to both rescuers out in the field and medical staff.

"After a short pre-configuration the terminal is easy to operate

and intuitive. It only has to be switched on and pointed with the help of a visual display, an audible signal or a built-in compass to correct the horizontal or vertical angle. After the orientation, which is completed in a few minutes, the terminal automatically dials into the network and is therefore available for transmission of data. The BGAN terminal worked well during the entire duration of the exercise and contributed to the successful testing of the entire system."

Eduard Maul, Siemens C-Lab, developers of the RFID solution for the German Red Cross Frankfurt.



PHILIPPINES DISASTER RESPONSE PROGRAMME

To improve the emergency communications capability of the Philippine government, Inmarsat through the United Kingdom Space Agency, is in partnership with the Department of Social Welfare and Development to bring the latest in emergency communications equipment and connectivity to the disaster response system of the Philippines.

The project aims to transform disaster responses by prepositioning powerful but easily deployable equipment, supported by training. Deployment at the disaster area will provide the infrastructure to run national and local disaster response communications,

at scale and quickly with the national coordinating authority as project partner. The project will use new Global Xpress (GX) satellite equipment, easily transportable and with capacity an order of magnitude more than earlier systems. The rapid availability of robust and extensive communications will provide rich data direct from the disaster site enabling health, rescue, water, shelter, and food suppliers to evaluate the situation rapidly and support the proper coordination of the response effort. The programme seeks a reduction in the human cost of death, injuries and illness, and the economic impact mitigated.

The background image shows a dense forest at night. A large, bright fire is burning in the distance, casting a warm, orange glow over the scene. The trees are silhouetted against the bright light of the fire. In the foreground, two people are standing on a path, their figures also silhouetted. The overall atmosphere is one of a major emergency or disaster response.

RESPONSE

The response phase occurs in the immediate aftermath of a disaster, the aim being to save lives, protect property, reduce economic losses, alleviate suffering, and making affected areas safe for both disaster response teams and the local population. Response actions may include activating an emergency operations centre, coordinating evacuations and safe shelters, and providing emergency rescue and medical care, firefighting, and search and rescue. Adequate prevention and preparations strategies employed across government areas prior to disasters play a significant role in the ability to conduct efficient and effective response activities.

MISSION CRITICAL COMMUNICATIONS: VEHICLE AS A NODE (VAAN)

The increased incidence of wildfires across the globe have also seen widespread cell site failures and power outages. These disruptions to emergency communications are a public safety threat, resulting in Command and Control being unable to communicate with firefighters, ambulance staff and Police officers. This lack of ability to coordinate within, and interoperability between, agencies has resulted in chaos and the loss of life. Government require Push-To-Talk (PTT) radio users to be fully interoperable with all other radio users and have crisis proof communications using their existing equipment during times of crisis. Inmarsat offers satellite communications (SATCOM) solutions that provide first responder teams with secure and reliable connectivity to public safety networks. Our Vaan provides always-on connectivity—in vehicles, command centres and at ground zero.

Over 700 Fire Rescue New South Wales vehicles are soon to have critical communications anywhere. The Hypha Group has been awarded the contract to supply Fire & Rescue service New South Wales the satellite equipment and airtime to facilitate firefighters with critical communications over the next three to five years. The contract is to supply Cobham SATCOM Explorer terminals, over the Inmarsat satellite network, forming part of FRNSW's Connected Firefighter Program. It allows crews to better communicate in the protection of communities when there is a significant need for reliable communications for emergency services during a major emergency. The Connected Firefighter means access to best-in-class communications technology by upgrading ageing hardware and delivering new technology that will keep FRNSW connected now and into the future. Advancement of this cutting-edge technology is

part of an investment by the NSW Government in response to the recommendations made after the deadly Black Summer wildfires of 2019/2020.

"This project will be transformational for our front-line firefighters across NSW. In a State the size of ours, satellite communications is an essential piece of the communications puzzle. Once the rollout of this technology is completed, firefighters will have the benefit of voice communications, Automatic Vehicle Location, and mobile data no matter where they are or what emergency they are dealing with."

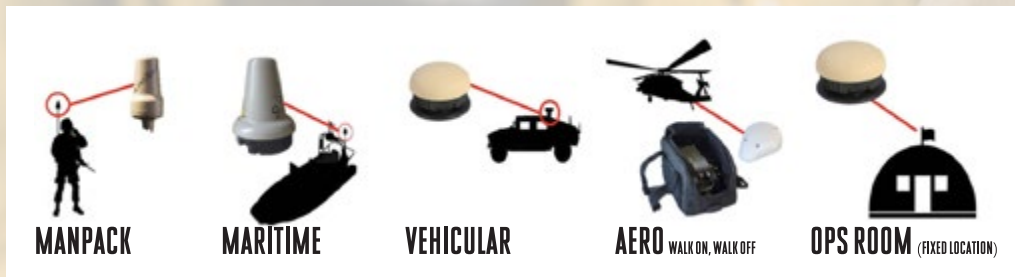
Graeme Tait,
Operational Communications
Systems Officer at Fire & Rescue
New South Wales



LTAC: YOUR RADIO REPEATER IN SPACE

For regular VHF users, L-TAC offers a fast-to-deploy and cost-effective capability for extending terrestrial coverage, either in remote terrains where there is no local VHF repeater or where natural or criminal action has destroyed the repeater. The provision of an L-TAC capability provides remote teams with a means of communication without the expense of a massive rollout of radio repeaters in an extended area. In a public safety scenario, the existence of both UHF and VHF L-TAC variants will enable normally disparate teams such as military, police and civil agencies to work more closely together. Even though they may all be using different radio types and frequency bands, by taking out an L-TAC lease, they can interconnect with each other without the current need for a retransmission facility, delivering true interoperability between agencies in an affected area.

Variants are available for all paradigms including backpack, vehicular, aero walk on kits, maritime and operations room applications.





BGAN PATROL: PERSON AS A NODE

BGAN Patrol is an On-The-Person User Terminal able to deliver in excess of 50 - 100 kbps BGAN background IP connectivity, while a first responder is on-the-move, extending existing line of sight IP connectivity to operational applications

ON THE GROUND DELIVERING RELIABLE CONNECTIVITY WHEN SECONDS COUNT

Delivering a reliable communications link for not only emergency service operations, but also for affected populations, is a core part of Inmarsat's safety heritage. We have been the official satcoms partner of Télécoms Sans Frontières since 2000. In recent time, we also support RE:ACT, not only with equipment and airtime but with manpower too.



TÉLÉCOMS SANS FRONTIÈRES

Over 20 million people supported. Nearly 1,000 NGOs connected. Since its creation in 1998, Télécoms Sans Frontières (TSF) has provided emergency communications in more than 140 natural disasters and conflicts. Our partnership with the emergency telecommunications NGO has been going strong for 20 years.

TSF is the principal communications provider to the United Nations in disaster situations, enabling governments, UN agencies and other NGOs to coordinate emergency response, distribute lifesaving supplies and ultimately rebuild communities. Free satellite phone calls and Wi-Fi offered to the victims of natural disasters or human conflict help reconnect families.

Working out of regional bases in France, Thailand, Nicaragua, Mexico and the United States, expert teams are ready to be deployed with kit including Global Xpress and BGAN terminals and IsatPhone 2 satellite phones almost as soon as disaster strikes. Our connectivity is also used for training in high-risk countries so that local teams can use the equipment in future crises; and in programmes designed to bridge the digital divide, giving remote communities access to online data and tools that support learning, healthcare, and the local economy.



RE:ACT

Direct humanitarian action, in the fastest time, for those hardest to reach and most vulnerable. RE:ACT's mission has seen its teams of volunteers, most of them military veterans, rapidly deployed all over the world in the wake of natural disasters. Because of their training and resilience, RE:ACT volunteers are able to go farther in the field and stay longer, delivering life-saving aid to the most isolated communities.

Inmarsat has provided RE:ACT with Global Xpress and BGAN for reliable connectivity to coordinate relief efforts and IsatPhone 2 handheld satellite phones, not only to keep the teams safe and in touch with base operations, but also to provide a communications lifeline for those affected by disaster.

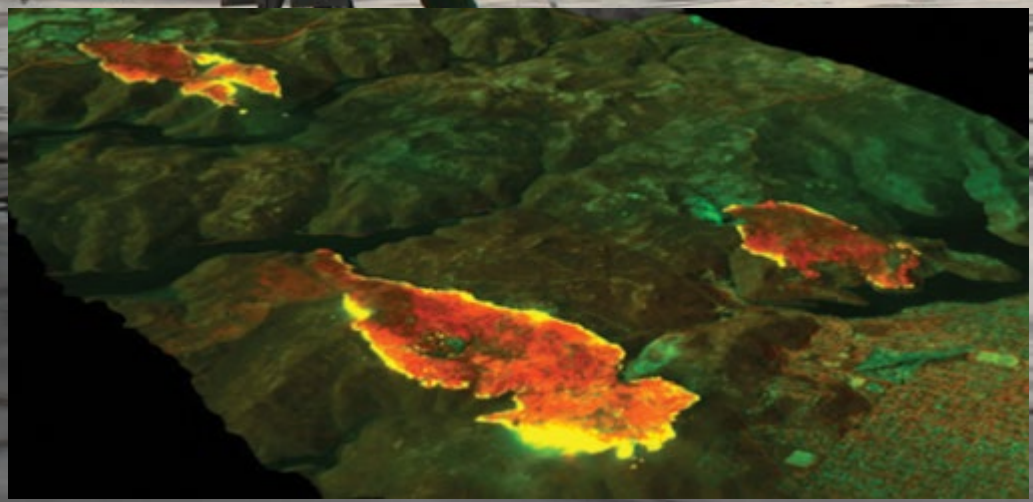
In addition, we're supplying manpower. So far nearly 80 members of staff have signed up as volunteers to help deliver humanitarian relief wherever it is needed, fundraising, and supporting training and development.

FIRE SCANNING CAPABILITY



Australia is faced with increasing potential threat of natural disaster and Inmarsat has a key role to play in response activities. Each of the nation's states maintains a highly effective professional and volunteer fire-fighting service. The Rural Fire Service required a system that would allow critical fire scanning and situational data to be transmitted directly from a small airframe to incident control and command centres on the ground. A state-of-the-art solution that exploited SwiftBroadband's smaller

aircraft equipment allowed the Rural Fire Service to transmit fire scanning data directly to their incident control centres. This ensured the aircraft could continue their mission and patrol ever-increasing areas without having to stop, or circle, to transmit information. The client reported a healthy reduction in operating expenses and fuel utilisation through the ability to fly further and longer whilst maintaining contact with command and control for mission instructions.



MAN MADE DISASTER RESPONSE: CONTAINING OIL SPILLS



Transport Canada's Marine Program is the lead federal department responsible for preventing pollution from ships transiting waters under Canadian jurisdiction. Through its National Aerial Surveillance Program (NASP), the surveillance aircraft keep a watchful eye over marine traffic and their presence also acts as a deterrent by discouraging illegal discharges of pollution at sea. The NASP uses the SwiftBroadband multi-channel service, through Inmarsat Distribution Partner, SatCom Direct, for its daily surveillance operations to communicate with government officials and/or first responders. Inmarsat satellite services are used to send images and screen captures, in near real time as well as streaming video in real time. The service is also used for flight-following and tracking of aircraft and to send data—received from the Automatic Identification System of ships in the area—to Canada's Marine Security Operations Centres in near-real time (transmitted every 15 minutes during the flight). The Inmarsat SwiftBroadband service enables the NASP aircrew to communicate with government officials and first responders on the ground.

"The use of the Inmarsat satellite communications has been proven to be an invaluable asset to the NASP. It allows the aircrews to have immediate/direct contact with government officials and/or first responders, which greatly aids in the response to an incident."

Louis Armstrong,
Chief, Intelligence, Surveillance and Reconnaissance at Transport Canada

DEPLOYMENT: VOLCANIC ERUPTION IN THE BICOL REGION IN 2018



Mount Mayon, an active volcano in the province of Albay in the Bicol Region of the Philippines, began showing volcanic activity late afternoon of 13 January 2018. Mayon continued to show more and more dangerous volcanic activity the next several weeks. Phivolcs further raised the alert to level four, which means that a hazardous eruption is imminent. It is just one level below the highest level of five, which means the volcano is already erupting.

The Philippine Government immediately mobilized its response assets in all levels of governance (NDRRMC, 2018). Nearby municipalities quickly evacuated their people to safer areas at the first sign of eruption. Evacuation centres, relief items, and humanitarian workers were pre-positioned in anticipation of an escalation of events.

As part of its response protocol, an Incident Command Post (ICP) was established near the affected area to coordinate the response efforts of various government agencies including the Philippine armed forces. The ICP, a temporary area set-up for tactical-level command and control operations. The ICP is usually composed of different government agencies involved in disaster response.

Although the eruption did not knock out terrestrial communications, the ICP had no access to basic communications. The building they were occupying did not have the facility for internet connectivity. Furthermore, the general unreliability of the services of telecoms companies outside of Manila means that they cannot support the mission-critical connectivity

needs of the ICP.

The incident command team members expressed the importance of internet connectivity, adding that they cannot properly coordinate without it. DSWD offered the satcoms kits from the IPP to service the communications needs of ICP.

The DSWD Rapid Emergency Telecoms Team (RETT) set up the GX Terminal on the rooftop of the hospital. To maximize the use of the bandwidth the RETT team prioritized the connectivity to email and commercial instant messaging and VoIP apps like Viber and Facebook Messenger. Thirty users (from various government agencies) were able to use chat functions, VoIP, file transmission (reports, images, etc), and video conferencing, and internet connectivity at all times.

Additionally, DSWD RETT deployed BGAN units from the IPP (an Explorer 710 and an MCD 4800) to various evacuation centres, expediting the delivery of reports from to ground to the command centres. Government humanitarian workers were able to send reports and pictures from the evacuation centre right away.

According to DSWD RETT member Joseph Teston, he noticed that decision makers quickly acted upon requests because they were able to see the actual situation through the images sent from the ground.

The coordination among government agencies became faster and more effective due to the availability of communications. The ability to rapidly send and receive life-saving information was also vital in delivering aid quickly to the affected areas.

RECOVERY

The final stage of disaster management includes all the steps needed for delivering a full recovery, bringing everything back to a pre disaster stage with the removal of any remaining threats from the initial disaster. Effective recovery requires an integrated, multi-disciplinary approach and achieving these outcomes draws a far greater requirement of data bandwidth. Inmarsat's Global Xpress, high speed data solution is the perfect tool for embarking on the road to full recovery. Meanwhile Orchestra, the Network of Networks, integrates all aspects of the communications toolkit - from 5G mesh to LEO, GEO and HEO networks to deliver a wide range of fully redundant communications tools.

GLOBAL XPRESS: SECURE, END-TO- END WIDEBAND CONNECTIVITY

Inmarsat's GX network was initially launched in 2010 and achieved full global service coverage in 2015, creating the world's first and only unified global mobile network. Operating in the Ka-band, Global Xpress integrates seamlessly with our L-band network to deliver powerful and reliable connectivity anytime, anywhere. Following the establishment of a voice communications link, data requirements from ground control often become increasingly demanding. Global Xpress allows for higher data rates to ensure a return to pre-disaster conditions. Global Xpress delivers higher data rates through more compact and affordable terminals than those in the Ku-band. A broad portfolio of terminals are available for government applications in mobile, portable and fixed formats to suit all environments. In a climate of continuing budget pressures, Global Xpress offers some respite with more affordable services and terminals. With a dependable, affordable, flexible range of terminals, and airtime packages that can be chosen to suit disaster response applications, Global Xpress helps deliver an interoperable recovery solution across multiple agencies and levels of government.

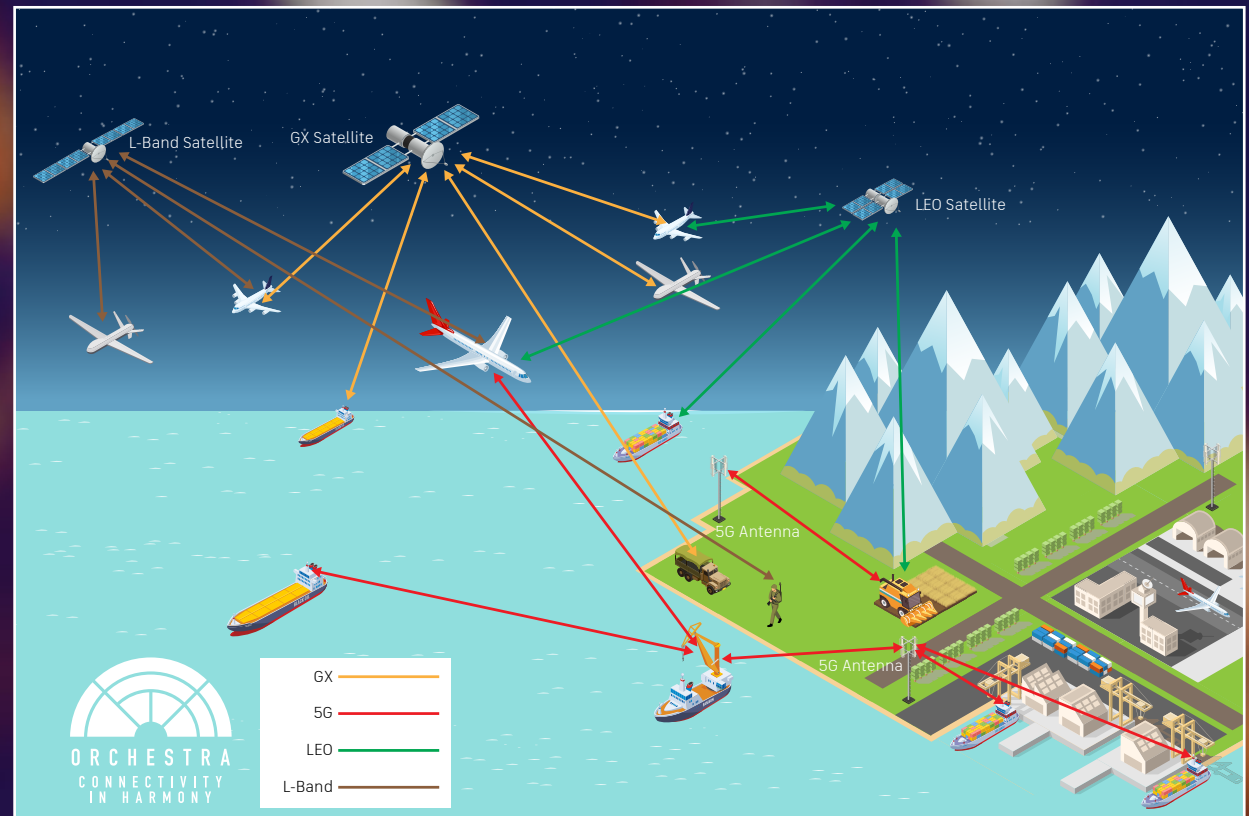


ORCHESTRA

Inmarsat ORCHESTRA will be the first of its kind. A unique, global, multi-dimensional, dynamic mesh network that will redefine connectivity at scale with the highest capacity for mobility worldwide and at hot spots, as well as the fastest average speeds and the lowest average latency of any network, planned or in existence.

In the largest ever transformation of Inmarsat's market-leading services, ORCHESTRA will be a seamless configuration of our ELERA (L-band) and Global Xpress (Ka-band) networks with terrestrial 5G, targeted low earth orbit (LEO) capacity, and dynamic mesh technologies, to create a single advanced solution for global mobility. This revolutionary layered approach is designed to meet the accelerating bandwidth requirements of more diverse, demanding and ever more widely adopted applications in the commercial and government mobility markets. By drawing on the unique capabilities of each component, it will deliver high performance connectivity everywhere, while eliminating the longstanding industry-wide challenge of congestion at high demand hot spots.

For the disaster and emergency response community, ORCHESTRA will deliver bespoke, high-speed, local area, temporary 'sovereign' networks to connect international aid, forces or government agencies in the field while securely relaying critical data home for analysis.





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