



Burning fires in Australia captured by Envisat. Photo courtesy of European Space Agency.

Disaster recovery

According to the ITU, in 2006 alone, 21,800 people succumbed to natural disasters, with 95 per cent of those killed residing in least developed countries. US\$65 billion of economic loss was recorded worldwide. Satellite Evolution reports on how the satellite industry can respond before, during and after these events.

The impact of a disaster, whether it is caused by man or by nature, has far-reaching and devastating consequences for all involved. For all of us, these events are becoming a part of our everyday life. Floods, earthquakes, tsunamis and storms are rarely out of the news. In the past month Peru has fallen victim to a devastating earthquake with a death toll of hundreds and in recent weeks storms with 160mph winds have hit the Caribbean. These disasters are not preventable – their

consequences are out of our hands. However, systems can be put in place to help deal with and mitigate their effects. Disaster preparedness is a phrase that governments and administrations all over the world are putting at the top of their agenda. Perhaps the most important aspect of aiding recovery after a disaster is communication. If communications are not restored as soon as possible, lives may be lost, economies severely disrupted and the poor and vulnerable will be further weakened. The ability to communicate is a basic need and without it help cannot reach those who need it most. In many instances, the areas that are often hit by disasters are the poorest and infrastructure is not in place to support communication. It is a fact that dissemination of information is critical at these times.

Satellite has proved itself over and over again as the means of communication in disaster zones. However, satellite is now used to help prepare for and predict the event of a disaster. In this article we will look at how satellites and satellite-based communications are used before and after a disastrous event.

Earth observation

Earth Observation (EO) Satellites are used to help governments monitor and assess the state of the weather, changes on the land and also in the sea. These changes may help experts to predict the onset of a disaster and therefore warn those in danger. The importance of developing early warning systems and strategies for the



aftermath of a disaster has been recognised by administrations across the world. We are very accustomed to seeing images sent by EO satellites relating to the path that hurricanes take, for example. These images are hugely important and can offer vital information to experts and any advance warning helps evacuation and the implementation of preventative measures.

Environmental threats are now monitored through three Global Observation Systems known as G3OS. G3OS consists of the Global Climate Observing System (GCOS), the Global Terrestrial Observing System (GTOS) and the Global Ocean Observing System (GOOS). Under G3OS, UN agencies, the International Council of Scientific Unions (ICSU) and satellite agencies work together to provide early warning information needed for long-term global environmental changes. Another contributor to this strategy is UN Earthwatch that provides information on environmental concerns that need to be integrated into a new generation of early warning strategies.

Early warning systems

The Asian region has experienced devastating natural disasters over the past few years. The Asian tsunami will always spring to mind as being one of the most horrendous disasters of recent times. Organisations are working to prevent such enormous loss of life from happening again through early warning systems to aid evacuation from areas at risk.

Orbit Research has developed a Tsunami Early Warning System based on satellite technology. There are two major elements to a Tsunami Early Warning System:

- Tsunami detection and threat evaluation; and
- Warning dissemination.

Orbit Research has expertise that can assist in the second element - getting the warning directly to the affected populations as quickly as possible.

The benefits of the proposed system are:

- It uses existing technology - there is very little additional work required to set up the system;
- The system provides instant infrastructure;
- It is completely scalable - from one terminal to thousands; and
- It can provide additional services and benefits (such as Internet connectivity, education).

As stated by the Director-General of UNESCO: "It is up to the authorities in individual countries to set up the communication networks needed to ensure that information on tsunami, and other natural disasters, reaches threatened populations. They are also responsible for education and awareness-raising programmes to inform people about the actions they can take to save lives and limit the damage of such disasters."

The Tsunami Early Warning System uses a network of small satellite terminals, each of which is fully independent, and which contains a small monitoring computer and local alarm system. The alarm consists of a siren and public address system. The public address system can receive voice messages via the satellite communication link in local languages that can enhance the information and reinforce the warning message.

As suggested by UNESCO, each country would maintain a central monitoring station to receive threat information from the international geological surveys.

In Orbit's system, the monitoring station also automatically monitors each of the satellite terminals in its region to ensure that they are operational and ready for use. By combining this type of independent satellite terminal with the provision of a broadband Internet service a number of additional benefits are achieved:

- The visible presence of the system will reassure local people

that important safety information is directly available - helping them to have confidence to rebuild.

- The satellite communications link can be used to provide education and information about Tsunami and other threats.
- The satellite communication link can also be used to provide a wider education function within the community.
- In tourist areas the provision of a broadband WiFi hotspot associated with the Tsunami Early Warning System can enhance the facilities provided - and raise revenue to subsidise the cost of operating the system.
- Internet access can be provided to local communities at low cost.
- Local contracts for the maintenance of the Tsunami Early Warning System will provide local jobs.

Orbit is also looking at the possibility of allowing users to register their mobile phone number via the network to receive SMS tsunami warning information.

ITU – Working to help prevent the impact of disasters

In June 2007, the ITU reached an agreement with ICO Global Communications and the Commonwealth Business Council to utilise satellite communications for improved global response in the face of natural disasters.

ICO Global Communications provide airtime on their F2 satellite for disaster prevention and effective response in the aftermath of natural disasters through both voice communications and other telecommunication applications, including telemedicine. An hour's airtime is provided every day for use through ITU to help countries maintain preparedness, provide early-warning information and elicit quick response. In the event of a disaster, this time will be adjusted according to demand to facilitate rescue and rehabilitation efforts.

"The partnership that we have established with ICO Global Communications and the Commonwealth Business Council is an important milestone towards ITU's effort to save human life," said Dr Hamadoun Touré, Secretary-general of ITU. "Satellite communication provides a platform to deliver a wide range of services and applications even to remote areas. In the digital age, we are able to provide an ICT lifeline to disaster victims and humanitarian personnel entrusted with coordinating rescue and relief operations, especially when terrestrial communications infrastructure is disrupted, overloaded or destroyed."

While ITU manages and coordinates emergency telecommunications, the Commonwealth Business Council (CBC) provides content and manages the entrepreneurial skill development programme.

"ICO strongly supports the goals of ITU and CBC, and we are pleased to be able to contribute ICO's satellite services to these efforts," added J. Timothy Bryan, CEO of ICO, a next-generation satellite operator. "ICO's development and global implementation of S-band technology will serve our interests well as we continue to work with key suppliers to create advanced user terminals to access F2 for humanitarian and emergency uses."

Dr Mohan Kaul, Director General of the Commonwealth Business Council, said, "CBC is pleased to work with ITU and ICO to contribute towards development and disaster preparedness. What is required for the future is increased economic empowerment of wider segments of society, to lift people out of poverty and give them new opportunity. This can be achieved by bringing technology and innovation to the service of many." Dr Kaul added, "We need to pursue the 'democratisation of knowledge' by making technology more widely and freely accessible. By means of tele-education and entrepreneurial development programmes, CBC will equip and prepare global citizens for economic empowerment and disaster management."

After the disaster has struck

Once a disaster has hit a region, the response begins and it must be swift and coordinated as possible. As is often the case in a chaotic situation, it is difficult to determine what is needed and when and so



Envisat is a truly advanced Earth observation satellite with a unique combination of sensors that will vastly improve the range and accuracy of scientific measurements of the atmosphere, oceans, land surface and ice. Photo courtesy of ESA/Denmann production.

It is vital that communication links are restored as soon as is possible. NGOs and other humanitarian organisations will first assess the damage and then take steps to quickly contact communications companies to put into place the required equipment. There are systems in place to ensure that this happens as quickly and smoothly as possible.

The Tampere Convention

The Tampere Convention on the Provision of Telecommunications Resources for Disaster Mitigation and Relief Operations was unanimously adopted by the delegation of 60 states participating in the Intergovernmental Conference on Emergency Telecommunications in 1998.

The Convention is an international tool for ensuring the prompt delivery of communications in the event of a disaster. The Convention came into force just two weeks after the devastating Asian tsunami when it was ratified by the necessary 30th country. There have been several moves to encourage more countries to adopt this incredibly important Convention that ultimately saves lives.

The Tampere Convention calls on States to facilitate the provision of prompt telecommunication assistance to mitigate the impact of a disaster, and covers both the installation and operation of reliable, flexible telecommunication services. Regulatory barriers that impede the use of telecommunication resources for disasters are waived. These barriers include the licensing requirements to use allocated frequencies, restrictions on the import of telecommunication equipment as well as limitations on the movement of humanitarian teams.

The Convention also safeguards the privileges, immunities and facilities granted to persons providing disaster assistance by granting them immunity from arrest and detention and exempting them from taxation and duties. As the first treaty of its kind, the Convention also defines the non-governmental organisations and non-State entities whose personnel would be granted these privileges and immunities when engaged in supporting the work of UN humanitarian and rescue organisations such as the United Nations High Commission for Refugees (UNHCR), OCHA and the International Federation of Red Cross and Red Crescent societies (IFRC).

The Convention defines the overall framework for the cooperation among States parties and all other partners in international humanitarian assistance. It describes the procedures for request and provision of telecommunication assistance, recognising the right of a State party to direct, control and coordinate assistance provided under the Convention within its territory. It defines specific elements and aspects of the provision of telecommunication assistance, such as termination of assistance and settlement of disputes. It requires States to make an inventory of the resources — both human and material — available for disaster mitigation and relief, and to develop a telecommunication action plan that identifies the steps necessary to deploy those resources.

The International Charter for Space and Major Disasters

The International Charter for Space and Major Disasters was initiated at UNISPACEIII in Vienna in 1999. Originally founded by the European Space Agency (ESA), Centre national d'études spatiales (CNES) and the Indian Space Research Organisation (ISRO), the Charter aims to provide a unified system of space data acquisition and delivery to those affected by natural or technological disasters through authorised users. The agreement comes from the recognition that no single operator or satellite can match the challenges of natural disasters. Each member agency commits resources to support the provisions of the Charter helping to mitigate the effects of disasters on human life and property.

The Charter became operational in 2000 and has since been activated several times. Its objective is to obtain a clear and accurate picture of a situation so that the rescue operation may be better coordinated and a clear view of events is established at the earliest opportunity.

Equipment

Provision of emergency communications is absolutely critical in a disaster situation and they must be established as soon as possible for the use of those survivors who need to contact family and also the NGOs who are working to ease the situation and to get aid into the region that has been hit. Various types of equipment may be used in these situations. Here are just a few examples.



BGAN

BGAN is Inmarsat's mobile satellite service that offers broadband data and simultaneous voice through a single, truly portable device. It also offers guaranteed data rates on demand – up to 256kbps – for live feeds and video conferencing. Ideal for first responders, it provides a mobile 'command post' helping to maintain situational awareness. It is easy to transport and quick to set up and use. BGAN is also very reliable due to the fact that network capacity may be dynamically re-directed to areas of high usage and can maintain bandwidth availability even as other agencies arrive at the disaster zone. BGAN is accessible all over the world in Asia, Europe, Africa, the Middle East and North and South America.

IPT Suitcase

Swe-Dish Satellite Systems have developed the IPT Suitcase system which is a compact and quick-to-air satellite system perfect for deployment in disaster situations. It may be operated by just one person and allows live 2 Mbps IP broadband transmission using the L-band interface from virtually anywhere in the world. The system allows IP broadband with built in IP transmission and receive functionality for data, voice and video.

The unit also comprises a GPS receiver, electronic compass and fully motorised antenna that assures trouble-free pointing and it may be easily carried and transported. Its rugged design also means it can cope and operate in the harshest environments – vital when attempting to restore communications in an area impacted by a disaster.

VSAT

The challenge of restoring communications is easily met with VSAT technology. The VSAT may be deployed in a timely and efficient manner. The nature of the technology means that it is able to integrate into an existing system but also has the ability, using a mesh topology, to communicate with any site without the use of a central hub. A star topology will enable two-way communications between any site and a central hub and can provide access to voice, data, Internet and video. Above all, VSATs are cost effective and are now easy to use. A small antenna of only 1m in diameter can provide all the communication required in a disaster situation and may be transported easily to the site due to the fact that the dish will, in many instances, break down into smaller, more manageable and more transportable, pieces.

Vehicles

AAE Systems, a satellite equipment manufacturer and turnkey solutions provider, has designed and produced a line of disaster response vehicles equipped with advanced integrated communication facilities, designed to provide a full featured communications platform for first responders at the disaster scene. The vehicles also incorporate advanced satellite access technology via the company's Eclipse MF-TDMA DAMA product line. Each vehicle is an autonomous comprehensive communications suite in a single cohesive and fully integrated mobile package, allowing full access to all subsystems via the satellite link. Connectivity is quickly established on site through the integration of an auto-acquisition antenna and an Eclipse satellite router with each vehicle. The bandwidth on demand Eclipse DAMA modem creates a network gateway supporting various forms of communication inter-connectivity, ideally suited for any disaster response task. A broad variety of primary communications systems and subsystems are supported on each vehicle to include a WiFi access point supporting WiFi phones, IP-PBX, IP-based video surveillance camera systems, IP-video conferencing subsystem, messaging subsystem, and data and voice connectivity.

Complementing the primary communications elements are a number of mission specific and auxiliary communications subsystems, extending the reach of the gateway to a number of on-the-ground and airborne support elements at the scene. Mission spe-

cific communication systems include a GSM microcell, VHF/UHF land mobile radio, HF radio, and a UHF/VHF ground-to-air air-to-ground radio system. It is very important to realise that once the initial aftermath of a disaster has been dealt with as well as it can, the work does not end there. Satellite communications companies and NGOs often remain in those regions where a disaster has struck to ensure that the re-establishment of communications is maintained and can cope with the possibility of a disaster happening again.

Tachyon Networks, a global satellite communications company, has encouraged both government and private sector organisations across the US to take a closer look at their existing disaster communications plans in light of predictions that the summer and fall of 2007 will be especially active for tornadoes, wildfires and hurricanes.

When a disaster strikes, voice and data networks are usually damaged or destroyed. This makes the recovery process more difficult and time-consuming at the very moment when responders and relief workers need to coordinate their efforts to save lives, communities and businesses.

"The scope of damage and destruction in a wildfire, tornado or other disaster can be simply overwhelming," said Peter Carides, President and CEO of Tachyon. "As we saw with the Gulf Coast hurricanes in 2005 and the Kansas tornado this past May, the impact of such an event can be magnified when you lose access to voice and data communications. So we think these organizations should be asking the question, 'Are our business continuity and disaster recovery plans actually ready for a disaster?' The goal is to survive – which refers to maintaining business continuity, and then to thrive – which signifies the process of recovery from the disaster."

Most business and government organisations already have disaster communication plans in place. But even though these plans are based on the idea of redundancy (the availability of multiple network options), many of them are still subject to a single point of failure – the terrestrial infrastructure of telephone wires and cellular towers. Thus Tachyon suggests a particular focus on the equipment and procedures in place for re-establishing network connectivity in the event that the terrestrial infrastructure has been destroyed:

- Does the plan include sufficient media diversity to deal with a complete loss of terrestrial infrastructure?
- How will the organization continue to operate during the outage?
- How long will it take to bring the replacement network up?
- Will the replacement network deliver sufficient bandwidth?
- Will it continue to perform over the weeks or even months it will take to get terrestrial networks back online?

Tachyon offers always-on, enterprise-grade broadband voice and data communications via satellite, with guaranteed connectivity and quality of service. Tachyon also offers an Auto Deploy solution that gives organisations the power to establish transportable network connectivity anywhere – in ten minutes or less.

Saving lives

Without communications a disaster zone will stay that way for a considerable period of time. Access to a satellite link will save lives, bring aid to the affected area, help treat the injured, reunite loved ones and even help rebuild the area once the initial impact has been dealt with. Over and over, the use of satellite communications helps NGOs and humanitarian organisations to achieve what often appears to be an insurmountable challenge – to reinstate critical communications. The technology is easy to use and transport and very much available. Once the virtues of satellite communications are realised, they can even bring relative prosperity to those who have been affected, helping to build up businesses and make a positive out of something so negative. In these times of climate change and natural phenomena the demand for these dynamic, versatile communications is set to grow and grow. Without them, help would be much, much further away.