INTELSAT's Role in the Provision of Disaster Telecommunications

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What is INTELSAT?

Today, the important role played by telecommunications in a nation's economic development is realized by planners and decision makers and is recognized as an economic force worldwide. Establishment of telecommunications networks, both international and domestic, is not a luxury; it is a necessity. Every nation wishes to control its own economic and social destiny, and this cannot be achieved unless an adequate communications infrastructure exists.

INTELSAT, the International Telecommunications Satellite Organization is a not-for-profit commercial cooperate of 120 member nations, created on 20 August 1964. It owns and operates a global system of communications satellites that provides international telecommunications services to 180 countries, territories, and dependencies and domestic telecommunications services to 40 nations.

INTELSAT's services are provided by 15 satellites ringing the globe, far above the equator. Through these satellites, the INTELSAT system links virtually the entire world via full-time/earth station-to-earth/station pathways among more than 1,300 antennas.

Overview of Disaster Telecommunications

1. What is disaster telecommunications

Disaster telecommunications are those communications required under special circumstances, for example, in the aftermath of earthquakes, floods, tidal waves, or erupting volcanoes. These conditions create urgent, immediate needs for communications facilities in unpredictable locations. The disrupted communications system has to be replaced immediately by a new system and the most effective way to do this is via satellite.

Disaster communications is not a standard INTELSAT service, but new communications system can be set up in a very short time via INTELSAT's existing infrastructure. The wide variety of applications available through INTELSAT, provides the flexibility necessary to establish emergency communications on a rapid basis.

2. INTELSAT Disaster Telecommunications Applications

INTELSAT has three types of services which could be utilized for disaster telecommunications. They are:

- domestic/regional services;
- services using transportable earth stations;
- Intelnet.

INTELSAT Domestic/Regional Services

Satellite communications are a vital tool to foster economic and social development, since they provide a cost-effective method to link a country's urban and remote regions. INTELSAT domestic services let countries have access to satellite capacity on an incremental basis, while avoiding the costs and risks of designing, procuring, launching and operating their own satellite program.

INTELSAT has offered capacity for domestic services since 1973, and currently about 40 countries throughout the world rely on INTELSAT to meet national telecommunications requirements. INTELSAT offers a range of domestic services meeting all types of applications. Each domestic network can be tailored to meet a country's specific communications traffic and geographical requirements.

INTELSAT has introduced regional services as an extension of its domestic services to allow the use of INTELSAT capacity for a mix of domestic and international traffic. Regional services enhance connectivity between neighboring countries with geographic, cultural and economic ties.

Domestic/regional telephone and television services are available in pre-emptible and non pre-emptible leases. These services are carried on six INTELSAT satellites in the three ocean regions.

Applications of Domestic/Regional Services

INTELSAT's domestic satellite services are generally used for national terrestrial networks for a wide range of applications, including:

- television and radio broadcasting;
- public switched telephony;
- public data networks;
- private business networks.

The major application is television, but in case of a disaster INTELNET could also be used for voice and data application.

Use of Transportable Antennas

1. Satellite News Gathering

Transportable satellite uplinking is the fastest growing application in the international television business. In 1985 the first Ku-band transportable earth station came into service. Today, 27 INTELSAT Signatories have 280 C/Ku-band stations registered with the INTELSAT system.

It is used routinely to broadcast live news from any location where a major event occurs -- the crisis in the Persian Gulf region or the excitement of the World Football Cup matches. It is an application that can be utilized with any of INTELSAT's broadcasting service options - occasional use television, short or long-term leases, for point-to-point, or point-to-multipoint links. The antennas are usually in the range of 1.6 to 1.8 meters which is good for disaster communication application.

2. Voice and Data Communications

In addition to the video links provided via satellite news gathering applications, INTELSAT also provides short-term voice and data communications with remote locations under emergency conditions. Very small, readily transportable earth terminals have been used for under INTELSAT's normal procedures for access by non-standard earth stations.

INTELNET

Intelnet is a private network application used by banks, insurance companies, news agencies, oil and gas companies, government agencies and other multinational organizations. It permits access close to the customer's location, and can be configured to meet specific communications requirements with minimum technical and operational restrictions.

Intelnet is a digital service designed for use with very small aperture terminals (VSATs) at many remote points operating with a larger central hub earth station. Data collection networks using Intelnet can also be a valuable tool in disaster prevention. By placing VSAT terminals with seismic or other sensing devices in disaster prone areas, a network can be established with a national or regional hub station to monitor activity and plan for emergency applications.

The communications system consists of two parts - a hub station and a remote station to provide one channel of interactive service. A hub station consisting of a transmitter and receiver requires at least a Standard B antenna (10 to 13 meters). The hub station is not part of the remote station and is usually housed at an existing earth station. The remote station can be easily moved and operated from any site from which the satellite to be accessed is "visible". The remote station consists of a 1.2 meter antenna and a transmitter and receiver. The 1.2 meter antenna is currently the smallest antenna for such an interactive service, but there are systems in development with antennas smaller than 1.2 meters. INTELSAT is now working to develop a system with an antenna size of 0.6 meters and a terminal in suitcase size. Such a system provides optimum flexibility for disaster telecommunications.

Intelnet is offered in all three ocean regions in C- and Ku-band on a pre-emptible and non pre-emptible basis, subject to the availability of space segment resources. Intelnet is offered as a leased transponder service, available in any multiples of 100 KHz (1 MHz, 5 Mhz, 9 MHz, 18 Mhz, 36 Mhz and 72 Mhz). Intelnet can operate with various modulation, coding and multiple access techniques.

Since Intelnet is offered on a full and fractional transponder basis, the space segment is defined in terms of resource allocation of bandwidth and power. Users design their own transmission parameters to operate within their leased space segment and this, along with the modulation technique, is assessed as appropriate for use in the INTELSAT system when a transmission plan is submitted. Thus, Intelnet in effect can be used to meet virtually any communications need.

Fourteen Intelnet networks are now in operation, most in the Indian and Pacific Ocean Regions. Each network typically consists of 50 or more VSAT terminals operating with a central hub station which is provided at a gateway earth station. The most common use of Intelnet to date has been for the worldwide distribution of news information, news photos and financial information. Intelnet is, however, ideally suited to provide thin-route networks for telephony as well as data using very small terminals at low cost, and with considerable flexibility for expansion.

INTELNET highlights include:

- Being the most flexible of INTELSAT's business services.
- Allows the user to define the network characteristics and implement them within capacity allotments from 100 Khz to 72 Mhz in 100 Khz increments.
- Gives the user control of the trade-offs between ground and space segment costs.
  - Can be used for international and domestic digital voice and data networks.
  - No restrictions on antenna size.
- Ideally suited for "Very Small Aperture Terminals" (VSAT) and customer premise applications.

Summary of Existing Interactive INTELSAT VSAT Applications:

1) Intelnet Leases:

Hub antenna sizes: from 7.2 m to 30 m
Remote antenna sizes: from 1.2 m to 4.5 m

2) Domestic leases or transponder purchases: these networks can be tailored to each country's specific needs. Thus there is a broader spectrum of network topologies, modulation techniques, and applications. The characteristics of these networks can be summarized as follows:

C-band Hub Antenna Sizes: from 7.3 m to 11.0 m
C-band remote Antenna Sizes: from 1.8 m to 4.6 m
Ku-band Hub Antenna Sizes: from 4.6 to 13.0 m
Ku-band Remote Antenna Sizes: from 1.8 m to 4.6 m

VSAT-TO-VSAT:

Telecommunications links between VSAT's could be very effective for disaster communications. For example, rescue teams could communicate with each other directly from remote locations. The technical features of such a network could vary depending on the circumstances of each case. Variables that would need to be considered include:

- The satellite accessed;
- The frequency band (C- or Ku-band);
- The modulation technique;
- The bandwidth used;

INTELSAT Role in Past Disaster Telecommunication efforts

It is possible to provide telecommunication links in sudden disaster situations. Yes! There are many examples that demonstrate INTELSAT's flexibility for providing telecommunications in a disaster, these include requirements for emergency communications in Iran, the Philippines, Bangladesh, Gulf crisis, Colombia, Mexico, the U.S.S.R. and the U.S.

1) Iranian earthquake:

In June 1990 Iran suffered a devastating earthquake, severely disrupting communications between the stricken regions and the rest of the country.

Iran needed a portable communication system to link the earthquake affected villages with the public switched telephone network. INTELSAT loaned Iran a portable communication system to resume telecommunications.

It took two days to set-up the communication link and two days more to teach the Iranian technicians.

INTELSAT's emergency relief provided useful communications for several months between the stricken area and the rest of the world.

2) Medical Assistance To The Armenian Earthquake Victims:

On Monday, 17 April 1989, INTELSAT and its U.S. Signatory COMSAT, joined NASA in a U.S. - U.S.S.R. satellite medical assistance demonstration project, designed to make U.S. medical expertise available to victims of the December 1988 Armenian earthquake.

INTELSAT, at COMSAT's request, provided a free space segment for this "telemedic spacebridge" project, which connected specialized medical facilities around the U.S.A. with the Diagnostic Center in Yerevan, Armenia. This made possible live consultation between medical experts in the two countries on the treatment of earthquake victims with long-term physical and psychological trauma.

The space segment was provided between 25 April 1989 and 15 July 1989, 4 hours per day, 5 days per week.

The INTELSAT system also has been used successfully for emergency communications during such international disasters as Hurricane Gilbert and the Mexico City earthquake demonstrating INTELSAT's flexibility in providing disaster telecommunications needs.

3) The Gulf Crisis

The "Gulf Crisis" is a current event, that shows the flexibility of SNG services for transmitting coverage of major events.

INTELSAT has carried record numbers of television transmissions over its global constellation of 15 spacecraft since Iraq invaded Kuwait, to meet the broadcast news media's skyrocketing demands. INTELSAT has 11 of its 15 satellites located in the Atlantic and Indian Ocean regions, and was capable of sending and receiving telecasts in and out of the Persian Gulf.

A quick early decision, to reposition a spot beam on the INTELSAT V (F-2) satellite over the Gulf region helped to provide Ku-band coverage required for the operation of the transportable earth stations, and additional capacity was provided to meet broadcasters' needs.

During world events such news coverage can be provided immediately. Once a news team decides to travel to a particular location, the next decision is to determine whether to use fixed earth stations located in a particular country which already have access to INTELSAT satellites, or bring in a small transportable antenna.

4) Natural Disaster in Bangladesh

As an aftermath of the recent natural disaster in Bangladesh, one of the two INTELSAT earth stations was incapacitated.

INTELSAT immediately made 13 circuits available to Bangladesh on a temporary basis. INTELSAT also offered a portable earth station until the regular communications links were restored. INTELSAT also offered to send a staff member to Bangladesh to assess the damage done to the earth station.

How INTELSAT's Existing Infrastructure Can Be Used for Disaster Telecommunications

Time is of the essence in establishing a disaster telecommunications network. Use of INTELSAT's existing earth stations to establish disaster telecommunications links is the speediest alternative. These systems could serve as the hub for VSAT networks configured to respond to the communications requirements on the particular disaster. Naturally, it will take longer to establish a disaster relief network if no hub earth station or VSAT is available.

If there is no transportable earth station available within the affected country, it could seek assistance from other countries. With 15 satellites in orbit and more than 1,300 antennas stations in operation worldwide, INTELSAT could facilitate the implementation of the required telecommunication links in a short time.

INTELSAT's Intelnet service is an adequate tool for disaster relief. A special application for Intelnet is the use of data collection networks using VSAT's. Data collection with seismic or other sensing devices in disaster-prone areas is very important for disaster prevention and the planning of disaster relief operations.

It is also important to have an emergency contingency plan to provide telecommunications in a disaster for different emergencies. Such a plan could shorten the time required for implementation of a disaster communications network.

This plan should show how to set-up the telecommunications links in different cases, where the best positions are for transportable terminals, and which earth stations and satellite capacity could be used. For such a plan it is important to have agreements with neighbor countries or other nations including possible support of their infrastructure.

INTELSAT is prepared to work together with administrations or organizations to develop a preventive disaster relief plan. An adequate infrastructure using preventive data collection (Intelnet service) and disaster telecommunication planning is the way for optimal disaster telecommunications relief.

What Role Could the U.N. Play?

INTELSAT has provided lease capacity for telecommunications service to the United Nations since 1983. This capacity is used for telecommunications between U.N. headquarters and U.N. personnel engaged in peacekeeping and emergency relief missions. The emergency relief activities include natural disasters, epidemics, famines and environmental emergencies, all of which typically cause extensive loss of life and/or property and require prompt international response.

There are currently three such INTELSAT leases, two of 9 MHz each in the AOR and one 9 MHz lease in the IOR.

The U.N. earth stations operating with these leases are increasing, and there are now hubs in New York and Geneva. These U.N. hub terminals could be utilized in disaster situations with microterminals to provide emergency communications.

The three U.N. leases:

UNO #1: 9 MHz in Transponder 38/38; INTELSAT IV (F-4)

@ 332.5 degree East; SCPC/CFM

	size [m]	G/T [dB/K]
New York (USA)	11	31.0
Jerusalem (Israel)	7	26.4
NAQ (Lebanon)	7	26.4
IC (Cyprus)	4.5	24.0

UNO #2: 9 MHz in Transponder 37/37; INTELSAT IV (F-5)

@ 66 degree East; SCPC/CFM

	size [m]	G/T [dB/K]
Naqoura (Lebanon)	7	26.4
Baghdad (Iraq)	7	26.4
Rawalpindi (Pakistan)	7	26.4

UNO #3: 9 MHz in Transponder 38/38; INTELSAT IV (F-4)

@ 332.5 degree East; SCPC/CFM

	size [m]	G/T [dB/K]
New York (USA)	11	31.1
Honduras	7	26.4
Jerusalem	7	26.4
Naqoura	7	26.4
Namibia	7	26.4
Nicosia	4.5	24.0
Angola	1.8	15.0

The Future

Global View:

Demand for INTELSAT services increases every year. INTELSAT's inter-national and domestic services for voice, data and TV are currently provided over 15 satellites. Eight additional satellites are currently on order: the INTELSAT K which will be deployed in the AOR in 1992; five INTELSAT VII's, the first of which will be deployed in the POR in 1993 and two INTELSAT VII-A's.

The INTELSAT VII series features significantly increased power and coverage capability, enabling provision of service thorough a new generation of smaller and less expensive ground stations.

Future of "Disaster Telecommunications":

INTELSAT's domestic/regional services, transportable antenna capabilities, and Intelnet service, all have potential application for disaster communications. INTELSAT is a dynamic, user responsive organization that continually seeks to enhance its global telecommunications abilities. The INTELSAT system with its wide range of services and global connectivity is the right system for "disaster telecommunications".