Use of Inmarsat for Disaster Relief Communications

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Since the outset of Inmarsat's operations in 1982, there have been many calls for the use of Inmarsat mobile terminals in disaster relief operations, especially during the critical early hours and days after a disaster when all other communications systems have broken down.

This paper describes Inmarsat's ability to meet many essential disaster communications requirements and addresses other important issues, particularly the cost of disaster communications and the issue of national regulatory restrictions on entry and use of mobile satellite terminals which often impede the delivery of communications services at the time when they are most needed.

Elements of a Disaster Relief Communications Network

A number of key elements are essential to any successful disaster relief communications network, many of which were identified at the UN Disaster Relief Co-Ordinator's (UNDRO) Conference in Geneva in March 1990:

- ready availability of radio equipment;
- conformity of equipment to worldwide standards, for use in any region;
- easy transportability;
- simplification of administrative matters, rapid customs clearance to ensure ease of entry and use in the country concerned and re-export of equipment;
- ease of deployment, setting up and use of the equipment;
- self-sufficiency and independence of the equipment from national communication systems;
- interconnection with international networks and clear, reliable communications;
- security of communications;
- moderate costs;
- early warning and preventative capabilities.

How far does Inmarsat measure up to these requirements?

The Inmarsat Global System

Inmarsat is a global intergovernmental organization, with 64 member states from all regions of the world. Its global network comprises operational and spare (backup) satellites providing seamless coverage over all of the globe except the extreme polar regions. Communications to and from the mobile earth stations (MESs) in the field are connected via the satellites to land

earth stations which interface with the fixed international and national public switched telecommunications networks.

Inmarsat's original mandate to provide maritime communications was extended in recent years to include aeronautical and land mobile satellite communications.

Inmarsat's global mobile satellite system operates on a commercial basis but one of its institutional priorities is to provide communications for distress and safety of life in all areas of the world.

The Inmarsat Mobile Terminal

Inmarsat satellite terminals for use on land are of two kinds. The first is the Inmarsat-A terminal which, provides a direct dial/telephone link for transmission of voice, facsimile, data and telex links. A number of models have been approved as transportable terminals; they are lightweight, and can be fitted into one or two suitcases with folding parabolic antennas of around a metre in diameter, weighing between 22 and 72 kilos.

Still video transmission by satellite is finding a number of applications relevant to disaster relief:

* Weather charts can be stored as digital video files on a database and transferred via the satcoms link to relief workers equipped with transportable PCs.

* Disaster relief agencies have used satcoms equipment to transmit pictures of buildings affected in earthquakes so experts can evaluate the damage.

* Medical teams use satcoms to transmit pictures of injuries suffered by people in remote areas. The images are interpreted by medical experts who then advise the appropriate treatment.

The Inmarsat-C terminal which started commercial services in January 1991, is a much smaller, low cost portable terminal providing two-way store and forward data and text communications. It has an omni-directional antenna and weighs only a few kilos. It can be hand carried or fitted in a vehicle. At the fixed end of the link, messages can be received or originated by a variety of means, e.g., telex, electronic mail, etc.

An important element in global mobile-satellite communications is international standardization. All terminals operating in the Inmarsat system conform to common international standards. Inmarsat has worked closely with the consultative committees of the ITU to agree upon standardized interworking arrangements between mobile systems and fixed terrestrial networks.

These terminals are produced by manufacturers around the world, conforming to type-approved technical criteria established by Inmarsat.

Suitability of the System for Disaster Communication

The Inmarsat system satisfies many of the key requirements mentioned above for disaster communications, i.e.

- portable Inmarsat-A and Inmarsat-C terminals can easily be carried to remote regions;
- they can be set up for operation within minutes and do not require special skills to operate;
- with batteries or generator power supplies, they are self-sufficient and independent of local systems, which is important during the crucial early hours of a disaster when local systems have broken down;
- there is no need to go through local hubs which are prone to single point failure;
- the quality of the communications is high, reliable, being unaffected by atmospheric conditions or distances.
- direct connection can be established within minutes to anywhere in the world or between independent relief teams working in different parts of a stricken area;
- communications are inherently secure: they are difficult to intercept and can be encrypted if security of information is essential.

Inmarsat's Experience in Disaster Relief Situations

At an early stage, Inmarsat authorized the use of Inmarsat-A terminal for emergency relief operations on land. Over the years the system has been used in such disasters as the Mexican earthquake and the volcanic eruption in Colombia in 1985, hurricane devastation in Caribbean and Northern Mexico in the same year, and earthquakes in Soviet Armenia in 1988 and more recently in Iran and the Philippines.

Inmarsat-A terminals have been used by relief agencies to help coordinate delivery of medical assistance, food, temporary shelter. It has been used extensively by news agencies whose reports are important in alerting the international community to the disasters and in procuring foreign assistance.

A further example is the use of Inmarsat terminals by the International Rescue Corps (IRC) based in the UK. One graphic illustration is the IRC mission to Montserrat which was devastated by a hurricane in September 1989. By using an Inmarsat-A portable terminal, a communications link with the outside world was quickly established and used by 21 national and international organizations for vital communications including daily weather bulletins to the islanders.

Other recent examples of use were by CARE in Bangladesh, and in relief efforts with refugees on the Turkish-Iraq border. Help in reconstruction of Kuwait is aided by use of Inmarsat-A terminals.

Cost Considerations

Cost is a factor which features large in connection with relief activities. The capital cost of mobile satellite terminals is set by the manufacturers not by Inmarsat. The Inmarsat-A terminal ranges from $25,000 upwards, and the portable variety is in the range of US$35,000. This may be considered too high to enable governments and relief agencies to obtain them in considerable numbers. The Inmarsat-C terminal is at present in the $6,000 to $8,000 range which makes it much more accessible though it is limited to data communications. Inmarsat is developing a small voice and data terminal - Inmarsat-M - which, within two years should provide a better solution for rapid, low-cost, voice-band communications.

The availability of standby terminals at national/government centres and international disaster relief organizations, as was proposed at the UNDRO Conference last year, would be a partial solution to this problem.

The question of charges for utilization is a different matter. In December 1988 there was an urgent call for Inmarsat-A terminals to support disaster relief following the earthquake in Soviet Armenia. Some free use of the system was requested and granted by Inmarsat and some land earth station operators. This free use relates to Inmarsat's space segment utilization charges. The land earth station operator's charges are additional and it is up to each operator to decide to waive its own charges to the end users.

The Inmarsat Council has subsequently authorized free use for disaster relief efforts on certain conditions, i.e.:

(a) the policy covers only natural disasters such as earthquakes, floods, volcanic eruptions and hurricanes, the onset of which is sudden and rapid;

(b) the request for free use should come from an Inmarsat Signatory or, in the case of a non-member country, from the recognized telecommunications administration;

(c) free use should apply only to outbound calls from specified mobile earth stations;

(d) free use should be limited in duration until normal communications are restored or are capable of handling disaster relief traffic;

(e) in making a request, the Signatory or telecommunications administration should indicate whether it is waiving Land Earth Station and/or terrestrial charges;

(f) in the application for free use, it should be stated whether the relevant telecommunications regulatory authority is willing to expedite or waive any

licensing requirements for the import or export of the specified mobile earth station(s); and

(g) free use should only apply to disaster relief efforts, that is, for example, for the coordination of medical assistance, distribution of relief supplies such as food and medicine, etc.

International Cooperation

In the wake of disasters in recent years, Inmarsat has reached understandings with the ITU and UNDRO regarding use of its satellite terminals. Inmarsat has offered to respond to direct requests from the Secretary General of ITU for free access to the space segment in connection with ITU-initiated disaster relief action. We have suggested that ITU and UNDRO should, in the event of a disaster, assist through their world-wide contacts to obtain rapid clearance of terminals through customs and other barriers; other problems discussed have been the need to have trained personnel familiar with the use of the equipment who can be made available to ensure no delay in actual operation. Another requirement is the ready availability of standby terminals at central points, i.e. either at the headquarters of international organizations involved with relief operations or at regional or national centres, as part of a rapid response mechanism which is so vital to safety of life in the critical early hours.

Other cooperation includes the understanding with the Pan-American Health Organization as described below.

Overcoming the Regulatory Barriers

One of the major recommendations of the UNDRO Conference in 1990 was to obtain international agreements to facilitate the entry, exit and operation of communications equipment by relief teams in stricken countries. Many international organizations concerned with relief operations or news coverage have identified national regulatory barriers as one of the primary difficulties they face. Indeed, it is these restrictions, and not technical problems, that are the main obstacle to the establishment of rapid communications in emergency situations.

Inmarsat has already had experience of such regulations in connection with the use of satellite terminals on board ships in national waters and on aircraft flying through national airspace. In cooperation with the International Maritime Organization (IMO) and the International Civil Aviation Organization (ICAO) Inmarsat is seeking to remove such controls. The Inmarsat Assembly of Parties in 1985, adopted an International Agreement on the Use of Inmarsat Ship Earth Stations in Territorial Sea and Ports, to allow ships, on a reciprocal basis to use their satellite terminals in such areas.

When Inmarsat decided, in 1989, to establish land mobile-satellite services, it had to consider the effect of national regulations on the use of radio equipment. Inmarsat carried out a survey among States in 1989 which indicated that most States regulate the use of all kinds of radio communications in their territories for both non-emergency and emergency communications. Most states also restrict or forbid the importation of mobile radio equipment.

The reasons for these restrictions can be traced to traditional state policy concerns about interference with other radio services, and the desire to encourage the use of national systems and security aspects. It may be questioned whether these considerations apply to global mobile satellite services, and these concerns could be addressed through appropriate safeguards. These would ensure national control and involvement is maintained, while local industry and commerce are allowed to benefit from new technology and new services.

Removing these barriers is one of the most difficult problems to solve. Apart from the ITU, there is no established regulatory mechanism applicable to land mobile services on an international level comparable with the regulatory functions of IMO and ICAO.

Inmarsat took the view that the new global mobile satellite services could only be fully implemented if these regulations were modified for both emergency and non-emergency communications. To achieve this, it was essential to win the confidence of national regulatory authorities and to demonstrate the benefits of mobile satellite communications. Inmarsat therefore, in cooperation with its Members and international organizations concerned, is taking steps towards the lifting of these barriers, both on a regional and a global basis, and progress is being made.

In Europe, Inmarsat has cooperated with the European Conference of Postal and Telecommunications Administrations (CEPT) which, in September 1989 recommended the establishment of common regulations to allow transborder operation of mobile terminals in Member countries; in October 1990, a further recommendation provided for recognition of Inmarsat-C type-approval marks on mobile terminals and the free circulation and use of such terminals without an individual licence in each country of use.

The Gulf Cooperation Council (GCC) States are considering the establishment of unified rules for use of Inmarsat terminals within their countries.

In Central and South America, Inmarsat has cooperated with the Pan-American Health Organization (PAHO), the regional office of the World Health Organization (WHO), which has taken an important initiative in regard to disaster relief communications. PAHO found that it was able to re-establish reliable post-disaster communications rapidly after hurricane damage in the Caribbean in 1988 and 1989 by use of an Inmarsat-A transportable terminal. In order to prevent delays in future it has now obtained operating permits in advance to bring in, use and take out the Inmarsat terminals from some seven Caribbean countries and eleven Latin American countries; such permits are limited to humanitarian disaster relief assistance; other action being taken includes the issue of identification cards to disaster relief assessment teams to facilitate customs clearance.

In the Asia Pacific Region, an intergovernmental Meeting jointly convened by Inmarsat and the Asia-Pacific telecommunity (APT) in 1990, recommended that governments adopt unilateral and bilateral measures to permit transborder use of mobile satellite terminals.

In Africa, a Conference jointly convened by Inmarsat and the Pan Africa Telecommunications Union (PATU) in September 1991 will also consider transborder regulatory issues.

On a global level, Inmarsat is convening an intergovernmental meeting in October 1991. A number of organizations attending the present conference will participate. The Meeting will be invited to consider recommending a global framework of uniform measures to facilitate the transborder use of mobile satellite terminals for both emergency and non-emergency uses; recommended measures which relate specifically to emergency uses would include the definition of disaster or emergency relief operations, and establishment of standby pools of terminals for rapid dispatch to a region in need.

Inmarsat is also working closely with the ITU and IMO in connection with the Resolution adopted at the World Administrative Conference for the Mobile Services in 1987 on the "Study and Implementation of a Global Land Maritime Distress and Safety System".

Preventative Measures

A word should be said about the preventative capabilities of satellite communications in providing advance warnings of possible disasters. One of Inmarsat-C's capabilities is the monitoring of data in remote locations, often referred to as SCADA (Supervisory Control and Data Acquisition). Examples of this would be to use Inmarsat-C to monitor water levels in rivers or deltas prone to flooding and volcanic or seismic activity. An entire Inmarsat-C installation can be set up with sensors and specialized data interface. It can be powered by battery or solar panels or even wind generators, so as to be self-contained and would require only periodic visits for maintenance.

Conclusion

The Inmarsat system has been demonstrated to be of considerable benefit in the event of disruptions following disasters. The introduction of new services, reduced costs and the removal of barriers to the transportation and use of such equipment, will further enhance the scope for relieving hardship and preventing additional loss of life or property. The ready availability of standby terminals at central points would also enhance the effectiveness of rapid-response disaster relief operations.