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Towards Europe-wide systems and services -

**Green Paper on a common approach in the field of
satellite communications in the European Community**

Communication from the Commission

SHORT PRESENTATION

Satellite communications have developed dramatically during recent years. As the European Community approaches the Europe-wide market of 1992, satellite communications are becoming a vital element for the trans-European services and networks needed for the single European market, and the broader continental dimension which is developing from the revolutionary changes in Eastern Europe.

Since satellite communications represent by far the largest commercial application for satellite technology, they will determine, to a large extent, the commercial success of Europe's effort to gain a strategic and future-proof position in space. They have developed into an essential element of the common European audio-visual space, which is a central precondition for Europe's future political and cultural identity and coherence.

This Communication is being written at a time when the European Community is about to achieve its aim of completing the internal market by 1992. Satellite communications can make an important contribution to this process, given the appropriate regulatory and market developments.

In the field of satellite communications the challenge is particularly great. The Community's internal market is still highly compartmentalized. This may, if no changes are brought about, hamper the development of its satellite industry, which is still in its infancy in service terms - despite its advanced position in technological terms. This compartmentalisation has not allowed the appropriate use of the potential of the new satellite communications technologies for the provision of Europe-wide systems and services.

The need for change is therefore undeniable. The compartmentalisation of the Community's satellite communications market cannot be maintained in view of 1992.

Abolishing these restrictions is not only in the interest of users, service providers and equipment manufacturers, but also in the interest of the Member States themselves. The Commission's move for liberalisation in the field of terrestrial telecommunications, based on the Green Paper for the development of a common market for telecommunications services and equipment, was supported by all Member States, since they were convinced that they would otherwise forego the potential growth of this market, the business opportunities for their industry and the supply of their users with advanced telecommunications services.

In the field of satellite communications, the same considerations apply.

Furthermore, the recent changes in Eastern Europe define a range of applications which may prove particularly suited to satellite technology. Only with a lifting of restrictive national regulations within the Community, thereby allowing the implementation of Europe-wide satellite terminal networks, can the European Community play a full role in meeting the emerging satellite communications needs of its Eastern neighbours. Otherwise Central and Eastern Europe's satellite technology and equipment needs are likely to be met by suppliers from third countries, who can build on the existence of major satellite terminal networks already implemented in their home countries due to their more liberal regulatory regime.

Several Member States have already liberalised parts of their satellite communications sector on their own initiative. In particular, some Member States have authorised a number of operators to provide satellite services across borders towards other Member States. This raises a number of questions with regard to fundamental principles of the Treaty of Rome such as the free circulation of goods and services. It is important that these questions be resolved at Community level so that divergent national solutions are avoided.

The objective of this communication is to prevent such a divergent situation by proposing a future-oriented structure for the development of satellite communications for the Single Market of 1992.

The paper intends to extend the application of the general agreed principles of Community telecommunications policy to satellite communications, taking into account the specificities of this means of communication. Four major changes are proposed:

- *Full liberalisation of the earth segment, including both receive-only and transmit/receive terminals*, subject to appropriate type approval and licensing procedures where justified to implement necessary regulatory safeguards;
- *Free (unrestricted) access to space segment capacity*, subject to licensing procedures in order to safeguard those exclusive or special rights and regulatory provisions set up by Member States in conformity with Community law and based on the consensus achieved in Community telecommunications policy.

Access should be on an equitable, non-discriminatory and cost-oriented basis.

- *Full commercial freedom for space segment providers, including direct marketing of satellite capacity to service providers and users*, subject to compliance with the licensing procedures mentioned above and in conformity with Community law, in particular competition rules.
- *Harmonisation measures as far as required to facilitate the provision of Europe-wide services*. This concerns in particular the mutual recognition of licensing and type approval procedures, frequency coordination and coordination with regard to Third Country providers.

With the combination of these changes, a broad range of specialised services will become possible.

It is intended to proceed in the following manner:

- This Communication should lead to a debate in the Council, the European Parliament and the Economic and Social Committee and among all those concerned within the Community - the telecommunications and broadcasting sector, telecommunications and space industry, the trade unions, and in particular the many new users and service providers, such as education and training institutions - on the use that should be made of satellite communications, on the need for further development of satellite services and on the necessary regulatory framework to fulfil these requirements;
- After an appropriate consultation period, the Commission will present its conclusions to the Council on the implementation of a Community policy for satellite communications including the necessary regulatory instruments.

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I. INTRODUCTION

The working out of a coherent European position regarding the future regulation and development of satellite communications in the European Community was singled out as a priority in the 1987 Green Paper on the development of the common market for telecommunications services and equipment and the subsequent implementation action plan.^{1,2}

In its Resolution of 30 June 1988³ adopting the general principles of the Green Paper, the Council considered as a policy goal in telecommunications the "working out of a common position on satellite communications, so that this new information medium can develop in a favourable environment, taking account of the general rules of operation and exploitation of the network environment, as well as the competition rules of the Treaty and existing international commitments of the Member States".

It is the intention of this paper to follow up this objective.

The major part of the current regulatory and organisational structure of satellite communications in Europe was created more than a decade ago. In the meantime, dramatic technological advances have opened completely new avenues of use which go far beyond the role of satellites in public voice telephone transmission between Telecommunications Organisations for which this structure was originally principally designed. Television via satellites to cable TV head-ends and, more recently, directly to businesses and homes has developed into a major application of satellites in Europe. The development of small dishes of only 0.5 - 2.5 meters diameter for a variety of user applications - compared to up to about 30 meters for the traditional earth stations for trunk telephony and TV programme interchange use - have opened completely new opportunities for rapid development of Europe-wide systems by service providers - both public and private - tailored to very specific needs of individual customer groups.

¹ Towards a Dynamic Economy - Green Paper on the development of the Common Market for telecommunications services and equipment, COM(87) 290, 30/06/1987.

² Towards a competitive Community-wide telecommunications market in 1992 - Implementing the Green Paper on the development of the Common Market for telecommunications services and equipment, COM(88) 48, 09/02/1988.

³ Council Resolution of 30 June 1988 on the development of the Common Market for telecommunications services and equipment up to 1992, O.J. C 257, 04/10/1988, p. 1.

As a consequence, besides the traditional "point-to-point" applications of satellite communications developed by the Telecommunications Organisations to provide international and long-distance links in the context of the international organisations originally set up for this purpose - INTELSAT, INMARSAT, EUTELSAT - completely new applications have led to the development of new distinct markets, such as "point-to-multipoint" one-way and interactive two-way Very Small Aperture Terminal (VSAT) systems. These range from a few dozen up to several thousand terminals, and have the potential to become a vital component of Europe-wide business communications. Other applications include satellite news gathering (SNG) systems - the collection of news and data from multiple points - these are becoming important in the context of Europe-wide information and broadcasting activities, and direct-to-home satellite television.

In parallel, the number of satellite systems in place - on an international, national and to some extent private basis - is multiplying in Europe, corresponding to the new diversity of use which goes far beyond the past vision of satellite communications as an additional transmission system between national telephone systems.

However, the new services and markets can only become a reality in Europe, if the current regulatory restrictions - originally designed for another context and for other purposes - are carefully reviewed.

A number of Member States have recognised the basic change in market conditions brought about by the multiplication of possible uses and have started to review the regulatory conditions of the sector on their own initiative, abolishing restrictions of use liable to prevent the full development of the new services and systems.

Satellite communications were set aside for later consideration in the Green Paper on the development of the common market for telecommunications services and equipment. The consensus achieved, on the basis of this Green Paper and the subsequent political decisions, in particular at the Telecommunications Council on 7 December 1989 on the general future regulatory conditions of the telecommunications sector in the European Community, can now be the basis on which to build a common regulatory position in the field of satellite communications. Such a common regulatory position on satellite communications, while safeguarding the exclusive or special rights of Telecommunications Organisations allocated by Member States in conformity with Community law and the directives on competition in the markets for telecommunications terminal equipment and services,^{4,5} must take proper account of the requirement to use the *full* potential of satellite

⁴ Commission Directive of 16 May 1988 on competition in the markets in telecommunications terminal equipment (88/301/EEC), O.J. L 131, 27/05/1988, p. 73.

⁵ Commission Directive of 28 June 1990 on competition in the markets for telecommunications services

communications for the development of Europe-wide services with a view to the 1992 single market and the continental dimension introduced by the developments in Central and Eastern Europe. It must recognise the need to abolish those restrictions which prevent such new activities and create a framework which promotes them, as well as the need to support Europe's position in space and the objectives of Community audio-visual policy.⁶

A first step towards allowing full use of the potential of satellite communications was taken with the abolition of exclusive and special rights on the importation, marketing, connection, bringing into service and/or maintenance of receive-only satellite earth stations not connected to the public network, in the context of the liberalisation of the Community's terminal equipment sector⁷. It now seems timely to extend the application of the agreed general principles of Community telecommunications policy to satellite communications:

- liberalisation of use, while allowing for the implementation of regulatory safeguards through appropriate type approval and licensing schemes, as compatible with Community law and, in particular, competition rules;
- separation of regulatory and operational functions, in order to avoid conflicts of interest;
- implementation of harmonisation measures, as far as required for ensuring effective working of Europe-wide services and equipment markets.

Based on these considerations, a phased approach is proposed in chapter VI., in order to achieve a consistent Community policy on satellite communications:

1. Agreeing on basic proposed positions, which apply the general principles set out above to the satellite communications sector;
2. Initiating a number of measures at Community level which, based on the proposed positions, aim at allowing effective Europe-wide provision and use of services;

90/388/EEC, O.J. L 192, 24.07.1990, p. 10.

⁶ Communication by the Commission to the Council and to the European Parliament on audio-visual policy, COM(90) 78, 21/02/1990.

⁷ Commission Directive of 16 May 1988 on competition in the markets in telecommunications terminal equipment (88/301/EEC), O.J. L 131, 27/05/1988.

3. Launching a number of lines of action, in order to create a favourable environment for such operations, in particular with regard to the international commitments of Member States in this area, and concerning standardisation and the promotion of the full use of satellite technologies to the best advantage of Europe's communication system.

II. The Satellite Scene in Europe

1. The General Environment

Telecommunications satellites were originally conceived for the establishment and enhancement of international communications, and this is still their main application. Even where satellites are used for *national* services, since satellite beams cannot be shaped to follow national boundaries exactly, the regulation of satellite communications, and the co-ordination of frequencies used by these satellites, are issues going beyond the purview of national legislative or administrative systems.

Frequency bands for satellite services are allocated by World Administrative Radio Conferences (WARC's) and Regional Administrative Radio Conferences (RARC's). Use of frequencies within these bands is co-ordinated and administered by the International Frequency Registration Board, a body of the International Telecommunications Union (ITU), both internationally and with regard to the Member States of the Community. For the purposes of frequency allocation at WARC's and RARC's, civil satellite services are mainly divided into fixed, mobile, broadcasting and radiodetermination services. At the time when this division was made, it reflected the fact that the different services were provided by different organisations: fixed services by telecommunications organisations, mobile services by international consortia, and broadcast services by broadcasting authorities (though often through earth stations operated by telecommunications organisations).

Historically, the Radio Regulations of the International Telecommunications Union provide definitions of these categories, which are called the Fixed-Satellite Services (FSS), the Broadcasting-Satellite Services (BSS), the Mobile-Satellite Services (MSS), and the Radiodetermination-Satellite Services (RDSS) (see Glossary). However, with current rapid technological development, these originally clear distinctions are becoming more and more blurred, for example between Fixed Satellite Services and Broadcast Satellite Services and between Mobile Satellite Services and Radio Determination Satellite Services (see chapter III.).

The general development of satellite communications at the international level has been characterised by the establishment of INTELSAT - the International Telecommunications Satellite Organisation ; INMARSAT - the International Maritime Satellite Organisation ; and the European Telecommunications Satellite Organisation, EUTELSAT.

1.1 INTELSAT and INMARSAT

INTELSAT, the International Telecommunications Satellite Organisation, was established in 1964 by 11 countries; it now has 119 members and provides international telephony, data and video (point-to-point) services as well as in certain cases, television broadcast services in the fixed satellite service (FSS) frequency band. INTELSAT's governing charter is a 1973 intergovernmental convention known as the INTELSAT Agreement signed by the member governments of the organisation. This is supplemented by an Operating Agreement, signed mostly by the telecommunications organisations of the member countries as appointed by the national governments⁸.

The INTELSAT Agreement, inter alia, binds national governments which sign it, not to establish, acquire or utilise other satellite systems without (a) performing "technical co-ordination" with the INTELSAT system to avoid mutual interference, and (b) proving that the separate system and services will not cause "economic harm" to INTELSAT (the so-called Article XIV procedure). The second proviso aims at limiting competition from separate systems and services which are considered by INTELSAT a potential threat to its revenues.

INTELSAT's turnover in 1989 was 480 million ECU.

All Member States of the Community are members of INTELSAT. The ownership share of Community Member States in INTELSAT was 28.2 % as at 1 March 1990.

⁸ Some members have created special organisations for representing them as signatories to the international satellite organisations : the United States has created COMSAT ; Italy has created TELESPIAZIO.

The only Eastern European members, Yugoslavia and Romania have 0.20% and 0.05 % respectively and other European countries account for a further 3.4 %. As far as provision of the actual satellites for the system is concerned, European manufacturers have never succeeded in becoming the prime contractor for any INTELSAT satellite series, although European companies have been involved as subcontractors to US manufacturers, notably in the INTELSAT VII series now being developed.

INMARSAT, the International Maritime Satellite Organisation, was established in 1979 by an intergovernmental Agreement; it now has 61 Member States. Operations are carried out by the designated signatories (the telecommunications organisations⁹) of the member states. Modifications to the original INMARSAT convention allow it to operate land mobile and aeronautical mobile services in addition to maritime mobile services, all using the Mobile-Satellite Services (MSS) frequency band around 1.5 - 1.6. GHz, the so called L-band.

INMARSAT's turnover in 1989 was 98.4 million ECU.

With the exception of Ireland and Luxembourg, all Member States of the Community are members of INMARSAT. European states have made a major contribution to the development of this service - almost 52 % of the shareholdings in INMARSAT are held by authorities of European states. The Community Member States investment shares total about 34 percent. MARECS satellites, developed in cooperation with European industry by the European Space Agency (ESA), are currently used by INMARSAT (one as a prime satellite for the Atlantic Ocean Region, a second as a back-up in the Pacific). In addition, British Aerospace heads the consortium constructing the INMARSAT second generation satellites, scheduled to come into operation in 1990. The overall European industrial content of this contract is some 60 percent. INMARSAT has issued its Request for Tenders to industry for the third generation of satellites at the beginning of October 1989, calling for availability of these satellites in 1993.

⁹ see 8)

1.2 EUTELSAT

EUTELSAT, the European Telecommunications Satellite Organisation, is an intergovernmental organisation with members from 28 European countries, including all member countries of the European Conference of Postal and Telecommunications Administrations, the CEPT. Recently, Poland and Romania have become members ; discussions are continuing with other Eastern European countries.

EUTELSAT provides and operates telecommunications satellites for telephony, data and video services within Europe, in the Fixed-Satellite-Service (FSS) frequency band. The EUTELSAT system has undergone the co-ordination process outlined above, *i.e.* it has proven that it will not cause significant economic harm to INTELSAT. In addition, Article XVI of the EUTELSAT convention foresees technical co-ordination and "economic harm" co-ordination similar to Article XIV of the INTELSAT convention for satellite systems offering services in Europe.

While the original rationale for EUTELSAT was the provision of international telephony within Europe, the take-up of this service has proved slow, initially due to the extensive terrestrial microwave networks, and latterly because of the growing availability of fibre optic cable. On the other hand, a considerable market has developed for television distribution using the FSS frequency band rather than frequencies designated for broadcasting. EUTELSAT now derives nearly 75% of its revenues from television distribution.

The members of EUTELSAT are mostly the national Telecommunications Organisations¹⁰ which have been designated generally by the member states as signatories to the Operating Agreement. Under the terms of this Agreement, it can only rent space segment to its signatories. With the exception of the European Broadcasting Union (EBU), other organisations wishing to set up a satellite service using EUTELSAT space segment are obliged to purchase it from their national signatory.

EUTELSAT's turnover in 1989 was 100 MECUs.

¹⁰ For some smaller non-EC countries, the Governments are signatories such as Monaco, Vatican City, Lichtenstein, San Marino, and Malta. See Footnote 8. concerning Italy.

All Member States of the Community are members of EUTELSAT. The EC Member States have an investment share totalling 88.0 percent. EUTELSAT's other 15 signatories control the remaining 12.0 percent of the investment share. As in the other two organisations, each year the investment share per signatory is calculated on the basis of their percentage of traffic carried over the satellites. The satellites for the EUTELSAT second generation are currently being developed by a European consortium, under prime contractorship of Aerospatiale. The first of these satellites has been launched successfully in August 1990.

An overview of European investment shares and Community signatories to the agreements is given in Fig. 1.

Figure 1

Shareholding of Community Member States and Community Signatories in INTELSAT, INMARSAT, and EUTELSAT

ORGANISATION	INTELSAT		INMARSAT		EUTELSAT	
MEMBER STATES	SIGNATORY ¹	IN-VEST-MENT	SIGNATORY ¹	IN-VEST-MENT	SIGNATORY ¹	IN-VEST-MENT
BELGIUM	REGIE DES TELEGRAPHES ET TELEPHONES (RTT)	0.66	REGIE DES TELEGRAPHES ET TELEPHONES (RTT)	0.74	REGIE DES TELEGRAPHES ET TELEPHONES (RTT)	3.54
DENMARK	GENERALDIREKTORATET ² FOR POST-OG TELEGRAFAESNET	0.65	GENERALDIREKTORATET ² FOR POST-OG TELEGRAEVSNET	2.55	GENERALDIREKTORATET ² FOR POST-OG TELEGRAVAESNET	2.13
FRANCE	FRANCE TELECOM	4.41	FRANCE TELECOM	4.23	FRANCE TELECOM	13.36
GERMANY	DEUTSCHE BUNDESPOST TELEKOM	3.50	DEUTSCHE BUNDESPOST TELEKOM	2.43	DEUTSCHE BUNDESPOST TELEKOM	12.95
GREECE	HELLENIC TELE-COMMUNICATIONS ORGANISATION (OTE)	0.50	HELLENIC TELE-COMMUNICATIONS ORGANISATION (OTE)	2.93	HELLENIC TELE-COMMUNICATIONS ORGANISATION (OTE)	0.05
IRELAND ³	TELECOM EIREANN	0.13	-	-	TELECOM EIREANN	0.05
ITALY	TELESPAZIO	2.10	TELESPAZIO	2.15	TELESPAZIO	8.29
LUXEMBOURG ⁴	ADMINISTRATION DES P & T	0.05	-	-	ADMINISTRATION DES P & T	3.69
NETHERLANDS	PTT Nederland NV	1.14	PTT Nederland NV	2.55	PTT Nederland NV	3.84
PORTUGAL	COMPANHIA PORTUGUESA RADIO MARCONI	0.60	COMPANHIA PORTUGUESA RADIO MARCONI	0.27	COMPANHIA PORTUGUESA RADIO MARCONI	1.12
SPAIN	TELEFONICA	2.22	TELEFONICA	2.00	TELEFONICA	22.09
UNITED KINGDOM	BRITISH TELE-COMMUNICATIONS PLC ⁵	12.24	BRITISH TELE-COMMUNICATIONS PLC ⁵	13.81	BRITISH TELE-COMMUNICATIONS PLC ⁵	16.90
TOTAL MEMBER STATES INVESTMENT SHARE		28.20 %		33.66 %		88.01 %

- ¹ The Convention is an inter-governmental agreement. However, member states have designated the organisations indicated as signatories to the Operating Agreement on their behalf.
- ² Telecom Denmark controls the availability of space segment capacity for telecommunications purposes.
- ³ Ireland is not a member of INMARSAT.
- ⁴ Luxembourg is not a member of INMARSAT.
- ⁵ A signatories affairs office has been created as a unit fully separated from British Telecom's business activities, in order to handle requests for satellite capacity.

The evolution of satellite communications in the Community has been deeply marked by the role of the telecommunications organisations as signatories to the international satellite agreements, the exclusive right of the EUTELSAT, INMARSAT, INTELSAT signatories to purchase and resell space segment capacity, the implication of the technical co-ordination and "economic harm" procedures foreseen in the agreements, and the natural tendency of the telecommunications organisations, in their role as signatories of EUTELSAT, INMARSAT, and INTELSAT, to utilise the space segment capacity of these organisations in the light of their national requirements.

2. The Development of Satellite Systems in Europe

With the exception of the use of the large international systems with European coverage such as the INTELSAT facilities, the use of satellite communications in Europe is a relatively new experience. Only since 1983 has Europe had its own first operational satellite, called ECS-1 or better known by its operational name EUTELSAT I-F1. At that time Europe had implemented 3 experimental satellite systems totalling 6 satellites of which 5 reached orbit. These were the Franco-German Symphony 1 and 2, Italy's SIRIO 1 and 2 and ESA's Orbital-Test-Satellite, OTS 2.

By 1983 the United States had considerably more experience, with development of some 25 experimental satellites since the end of the fifties. American industry had already built 150 operational telecommunications satellites for use all over the globe. After development of only six experimental satellites, Europe also decided to start building operational satellites to supply the growing European market. These first operational satellites were mainly intended for point-to-point telephony communications and the distribution of television signals around Europe. More than three quarters of the capacity of these satellites is now used for TV distribution purposes.

From an industry point of view, the space industry in Europe is catching up, albeit slowly. Having manufactured only 6 telecommunication satellites in the period 1980-1984, in the years 1985-1989 7 telecommunications satellites were produced and at present the European space industry has 17 orders with a total value of about 1 billion ECU for the period up to 1994.

Europe will have a large amount of satellite capacity available in the 1990s. All non-military European national, private and intra-European systems together will make available a total of 24 operational DBS (television) channels on the Broadcasting-Satellite Services (BSS) satellites in 1993. In the Fixed-Satellite Services (FSS) a total of around 380 European transponder equivalents¹¹ will be available in 1993 against about 170 transponder equivalents in 1990. Not included here are the international systems such as INTELSAT and INMARSAT, and non-European systems with European coverage, such as the U.S.-based PanAmSat and the (planned) ORION satellites and the USSR-based GORIZONT and RADUGA systems.

An overview of current existing and planned satellite systems with European coverage ("footprint") and their planned applications is given in Fig. 2 and 3.

Main applications are expected to be television distribution, telephony (mainly for extra-Community traffic), and new applications (see chapter III.). As mentioned, EUTELSAT is deriving nearly 75 % of revenues from television distribution. The traditional applications - long-distance trunk telephony and short-term high bandwidth requirements such as studio-to-studio television transmission - still account for a major, though declining, proportion of international satellite services. Satellite links still account for nearly 60 % of transAtlantic telephony, though this is expected to fall to 30 - 40 % by 1995 (see chapter III.). However, within Europe, satellite-carried voice telephony accounts for only 2 - 3 % of intra-European international and national long-distance calls.

As is shown by Figures 2 and 3, the European space segment has experienced substantial diversification during recent years, which may be expected to continue in the near future. In addition to the space segment provided by the international telecommunications satellite organisations which will continue to play a strong role and which currently provide a major part of the space segment currently accessible from Europe, a large number of new systems are entering the market, sponsored both by the national telecommunications organisations and by other private organisations.

¹¹ Transponder capacity is taken equivalent to a channel of about 36 MHz. A single transponder can normally carry one television channel or up to about 1700 telephone voice channels.

Figure 2**Current and Planned European Civil Satellite Systems**

NAME	OWNING ORGANISATION	LAUNCH	MISSION	NOTE
EUTELSAT-1F1	EUTELSAT	1983	Telephony, television distribution, business communications, mobile communications	
EUTELSAT-1F2	EUTELSAT	1984	Telephony, television distribution, business communications, mobile communications	
TELECOM 1A	FRANCE TELECOM	1984	Telephony, television distribution, business communications, etc.	
EUTELSAT-1F4	EUTELSAT	1987	Telephony, television distribution, business communications	
EUTELSAT-1F5	EUTELSAT	1988	Telephony, television distribution, business communications	
ASTRA-1A	SES-ASTRA ¹	1988	Television distribution	
TELECOM 1C	FRANCE TELECOM	1988	Telephony, television distribution, business communications, etc.	
TDF1	FRANCE TELECOM	1988	DBS (television)	
TVSAT-2	Deutsche Bundespost TELEKOM	1989	DBS (television)	
TELE-X	SWEDISH SPACE CORPORATION	1989	DBS, small terminal networks data and telephony services	
MARCO-POLO-1	BSB ²	1989	DBS, Data broadcasting	
DFS-1 KOPERNIKUS	Deutsche Bundespost TELEKOM	1989	Telephony, television distribution, data and business communications	
OLYMPUS ³	ESA	1989	Experimental communications, DBS	
TDF2	FRANCE TELECOM	1990	DBS (television)	

Figure 2

NAME	OWNING ORGANISATION	LAUNCH	MISSION	NOTE
DFS-2	Deutsche Bundespost TELEKOM	1990	Telephony, television distribution, data and business communications	
MARCO-POLO-2	BSB	1990	DBS, Data broadcasting	planned
EUTELSAT II F1 to F6	EUTELSAT	1990 (F1) et seq	Telephony, television distribution, business communications, mobile communications	F2 to F6 planned
ITALSAT ⁴	TELESPAZIO	1991	Telecommunications, data, and business communications	planned
ASTRA-1B	SES-ASTRA	1991	Television distribution	planned
TELECOM 2A	FRANCE TELECOM	1991	Telephony, television distribution, business communications, Security.	planned
TELECOM 2B	FRANCE TELECOM	1992	Telephony, television distribution, business communications, Security.	planned
LOCSTAR 1 and 2	LOCSTAR ⁵ Consortium	1992	Mobile communications and radiolocation	planned
HISPASAT 1 and 2	SPANISH AUTHORITIES/ Telefonica	1992-1993	TV distribution, DBS, data and business communications	planned
SARIT	RAI	1993	DBS	planned
ARTEMIS	ESA	1993	Experimental mobile communications, data relay	planned
ASTRA-1C	SES-ASTRA	1994	Television distribution	planned
EUROPESAT F1 to F5	EUTELSAT	1995 et seq	DBS	planned
KEPLER	Deutsche Bundespost TELEKOM	1996	DBS, Business and data communications, TV distribution	planned

Figure 2

NAME	OWNING ORGANISATION	LAUNCH	MISSION	NOTE
ASTRA-2 Series	SES-ASTRA	DBS, small terminal systems, mobile	planned
DFS-3	Deutsche Bundespost TELEKOM	...	telecommunications and business communications	planned
EUTELSAT-III	EUTELSAT	1997 et seq.	telephony, television distribution, business communications, mobile communications	planned

Note : This list does not include a number of programmes which have been announced but for which launch dates are not known : ATLANTIC satellite (Hughes Communications / J. Stafford) ; VIDEOSAT (France Telecom) ; F-SAT (France Telecom) ; APEX (France Telecom). Nor does it contain highly elliptical orbit systems that are in early study phases (ARCHIMEDES / ESA, SYCOMORES / France)

- ¹ SES shareholders include Luxembourg, Belgian, German, and Scandinavian banking and investment interests, and British television interests.
- ² The BSB Consortium currently includes as major shareholders : Granada, Pearson, Bond Corporation, Chargeurs SA, Reed International.
- ³ Capacity used by BBC Enterprises, RAI, EUROSTEP Association, Telecommunications Administrations, Research Institutes, etc.
- ⁴ ITALSAT will use new frequency bands at Ka-band (20-30 GHz) to improve performance to small ground terminal systems and is a pre-operational system.
- ⁵ The Locstar consortium includes as shareholders CNES, MATRA, GEC-Marconi, Daimler-Benz, etc.

Figure 3

Non-European satellites used for services with European coverage

NAME	OWNING ORGANISATION	LAUNCH	MISSION	NOTE
INTELSAT V ¹ Generation	INTELSAT	see notes	Telephony, television distribution, business and data services, (mobile leased by INMARSAT)	
INTELSAT VI ² Generation	INTELSAT	see notes	Telephony, television distribution, business and data services	
MARISAT F1-F2	INMARSAT Consortium	1976	mobile leased by INMARSAT	in orbit spares
MARECS-B2	ESA	1984	Maritime, aeronautical, land mobile (leased by INMARSAT)	
PANAMSAT	PANAMSAT/ ALPHA-LYRACOM	1988	Video and business Services	
GORIZONT Series ³ and REDUGA	INTERSPUTNIK	see notes	Telephony, telegraphy, television and sound broadcasting	
INMARSAT-II series	INMARSAT	1990 et seq.	maritime, aeronautical land mobile	planned
INTELSAT K	INTELSAT	1992	Television distribution business and data services	planned
ORION ⁴	ORION	1993	Video and business services	planned
INMARSAT-III series	INMARSAT	1994 et seq.	maritime, aeronautical land mobile	planned
INTELSAT VII Generation	INTELSAT	see notes	Telephony, television distribution, business and data services	planned

Note : This list does not include announced programmes for which dates are not firmly known, such as the IRIDIUM programme (sponsored by MOTOROLA) and ORBCOMM programme (Orbital Communications Ltd).

- ¹ Currently, 6 satellites of the INTELSAT-V generation are used for intra-European services - either television distribution (F4, F6, F7, F11) or Business and Data Communications (F2, F13).
- ² One satellite of the INTELSAT-VI generation is now operational, and a second is about to become operational.
- ³ Launch dates, capacity, coverage and further details of the GORIZONT and REDUGA satellites are not published, though several are known to be in orbit. They are owned by the USSR and leased to Intersputnik the members of which are, Afghanistan, Bulgaria, Cuba, Czechoslovakia, Germany, Hungary, North Korea, Laos, Mongolia, Poland, Romania, the USSR, Vietnam, and Yemen.
- ⁴ The ORION system, although derived from a licence awarded to a U.S. company, ORION Networks, to provide competing trans-Atlantic services to INTELSAT, is expected to have major European investment when its financing is completed.

3. **Current International Coordination Mechanisms: Orbital Positions and Frequencies**

A major influence on satellite communications in Europe are the international coordination procedures with regard to orbital positions and frequencies administered by the International Telecommunications Union (ITU).

Any discussion of the future development of the sector in the Community must take careful account of these procedures and the international commitments of Member States in this area.

Since 1947 the use of radio frequencies is subject to examination in order to limit harmful interference and to ensure the correct use of frequencies in accordance with the internationally agreed Table of Frequency Allocations in the Radio Regulations. The International Frequency Registration Board (IFRB), a permanent body of the ITU, has been given the role to act as the body which administers the internationally agreed frequency allocation and orbit allotment plans and the related criteria for coordination as laid down in the Radio Regulations. The aim is to come to a globally acceptable, effective, equitable and economic utilisation of the radio frequency spectrum and the geostationary satellite orbit. The IFRB receives about 1200 notices/informations per week which need to be examined as required under the Radio Regulations and related agreements.

The aim is to provide, to the maximum possible extent, and on a global scale;

- guarantees, in general, for the interference free operation of radio stations, these being space stations or earth stations, by giving international recognition or protection;
- mechanisms for international coordination of radio networks (including satellite networks) for which the high initial investment requires pre-operational agreements between users;
- guarantees regarding equitable access to the spectrum and the geostationary satellite orbit to all nations.

The provisions of the Radio Regulations can only be modified by the specific world-wide or regional conferences convened by the ITU which are called World (or Regional) Administrative Radio Conferences (WARC or RARC). The convening of such conferences requires detailed technical preparation, often aided by study work undertaken by two other ITU bodies : the International Radio Consultative Committee (CCIR) and the International Consultative Committee for Telephony and Telegraphy (CCITT).

As mentioned earlier, for the purpose of different specific technical application requirements and the assessment of resulting possible interferences, the frequency allocations in the Radio Regulations for space services are divided into various services, the most important being the fixed, mobile, broadcasting and radiodetermination satellite services.

For the fixed satellite services, an allotment plan was developed during the WARC conferences of 1985 and 1988 using some of the 4/6 and 11/14 GHz¹² band frequencies. This plan allots, inter alia, 800 MHz of bandwidth within specified frequency bands on a pre-assigned country-by-country basis and provides each country with at least one orbital position within a predetermined arc. These national allotments consist of a list of parameters which identify the allotment. For national systems the plan provides for a set of procedures to be followed in order to coordinate the national satellite network planned. This WARC-88 plan provides for allotments for existing systems and for those systems (including regional) which have been advance published before May 1988, like the regional EUTELSAT system. The second part of the plan provides for some flexibility in the fixed satellite frequency band through agreed procedures for the non-planned frequency bands through so-called Multilateral Planning Meetings (MPM's) in which future sub-regional or regional systems can be coordinated. These MPM's are a formalisation of the coordination process to ensure equitable access to the remainder of the frequencies and the geo-stationary orbit. However, despite the proviso of these MPM's, the establishment of future pan-European services on (sub-)regional systems is thought still to present significant difficulties due to the complexity and the length of the procedures.

Prior to the described developments for the fixed satellite services, in 1977 a

¹² The main frequency bands used for satellite communications are in the ranges 1 - 2 GHz (L-band), 2 - 3 GHz (S-band), 3 - 7 GHz (C-band), 7 - 8 GHz (X-band), 10 - 19 GHz (Ku-band), and 17 - 31 GHz (Ka-band; experimental use mainly). The bands mainly used in Europe are those at Ku-band for intra-European traffic, with Ka-band now being used for experiments (OLYMPUS, DFS-Kopernikus, ITALSAT), C-band for transcontinental use on INTELSAT trunks and L-band for mobile communications via INMARSAT.

similar, but far more rigid, approach was taken in the establishment of an allotment plan for the broadcasting satellite services. The WARC-77 Broadcasting satellite plan strictly regulates and allocates precise orbital slots and frequencies on a country-by-country basis for the provision of direct broadcast satellite services (DBS) in an agreed exclusive band in the 12 GHz range. The plan was developed to satisfy the requirements and concerns that existed in 1977 and is based on presumptions which have been overtaken by technological development (see chapters III. and IV.). Amendments to the 1977 plan concept were proposed during the RARC-83 conference but that concerned only the region encompassing the Americas. These improvements on the WARC-77 plan criteria have subsequently been inserted in the Radio Regulations under the terms of the RARC-83.

The improvement of the technology and the rigidity of the WARC-77 plan have led to use, in Europe, of the fixed-satellite services frequency bands for the provision of TV distribution services which can also be received by small home dishes (see chapters III. and IV.). The plan is currently of substantial concern to some of the European space segment providers who plan to provide HDTV services directly to the European audience, and for which the use of higher power DBS satellites is inevitable.

The procedures for coordinating mobile-satellite networks are based on the WARC-79 and WARC MOB-87 results, which have subsequently been incorporated in the Radio Regulations.

In each of the above cases the procedural ways to coordinate and agree new satellite systems have a certain commonality and the same objective. The details of the procedural routes however are considerably different. The common elements can be grouped in three different steps as follows:

1. Advance publication of intent and publication of the available technical specifications of the satellite system in question on which the potential need for coordination can be assessed.
2. The resulting coordination, or agreements with other administrations which are affected by e.g. the intended coverage overspill of a satellite system. Obviously, for systems which are within plan criteria, no coordination is required.

3. After completion of the coordination (or establishment that coordination is not required), notification of frequency usage to the IFRB for inclusion in the so-called Master Frequency Register, so that these systems can claim protection from harmful interference from future systems.

For all intended satellite systems, a set of procedures needs to be followed in accordance with the plans and regulations; each with their own specified time periods in order to achieve timely coordination before the system becomes operational. For most of the national systems which are conceived in accordance with the original plan design parameters, the coordination process will not be required as these systems should be within plan criteria.

However, for other satellite systems, mostly (sub)-regional systems, which are not in accordance with original plan design parameters and therefore not within the plan criteria, the coordination procedures with all affected countries need to be undertaken. These procedures are time consuming, very complex, affect a large number of administrations and also depend on the cooperation and willingness of the affected administrations to come to an agreement. Certainly in the case of sub-regional or regional satellite networks in Europe, the number of administrations to be consulted can be considerable - in the case of the Community Member States, both between any of them and any other neighbouring countries affected by the planned satellite system. For multi-service satellite systems the procedures are particularly complex as at least two and sometimes three sets of procedures need to be followed.

The current situation with regard to the coordination of frequencies and the administration of the orbital source is therefore characterised by:

- the Community Member States acting individually with regard to the international bodies responsible, within a number of Member States the national telecommunications organisations having been mandated by the Member States to act on their behalf in these bodies, while in others the respective ministry represents the Member State¹³;
- non-existent or only loose coordination among the Member States in the framework of the European Conference of Postal and Telecommunications Administrations (CEPT), though this is now changing (see Chapter IV);

¹³ In the case of EUTELSAT the coordination procedures with regard to the ITU are carried out by the French Administration; in the case of INTELSAT, by COMSAT International (U.S.); and in the case of INMARSAT, by British Telecom.

- non-existence of instruments at the Community level to ensure coordinated positions with regard to these bodies - and therefore with regard to the management of the orbital resource and associated frequencies.

The current reform of frequency coordination within the CEPT, under the impact of Council Resolution 90/C 166/02 of 28 June 1990¹⁴, with the creation of the new European Radiocommunications Committee and the European Radiocommunications Office provides the prospect of substantial strengthening of cooperation in the frequency field.

4. Current Regulatory Conditions in the Community

The regulatory situation in the Community can best be analysed in terms of

- provision and operation of the earth segment, including both receive-only and transmit/receive earth stations;
- the right to use/provide service and/or the licensing conditions required to use/provide service via the space segment;
- access to the frequencies and geostationary satellite orbit, and provision of space segment capacity.

An overview of the situation in the Member States is given in Fig. 4. Overall, the situation in the Member States can be characterised as follows:

4.1 Earth Segment

With regard to receive-only terminals the Green Paper on telecommunications¹⁵ stated that "given the trend in satellite communications towards point-to-multipoint broadcasting applications for closed user groups, the regulatory regime for receive-only earth stations (ROES) for satellite communications should be assimilated to the regime for telecommunications terminals and TV receive-only satellite antennas and fully opened to competition."

¹⁴ O.J. C 166 of 07.07.1990, p. 2. Council Resolution of 28 June 1990 on the strengthening of the Europe-wide cooperation on radio frequencies, in particular with regard to services with a pan-European dimension.

¹⁵ Green Paper on the development of the common market for telecommunications services and equipment, COM(87) 290 of 30.06.1987.

Subsequently, Directive 88/301/EEC¹⁶ implemented this position for "receive-only satellite stations not connected to the public network of a Member State". Fig. 4 shows the current status. The majority of Member States have implemented this position¹⁷. However, a number of Member States continue to request licenses to operate such equipment.

The ownership and operation of transmit/receive terminals has been traditionally associated in the Member States with the regulation of the up-link/down-link and therefore was restricted, under exclusive or special rights to those who had the right to operate up-links, both as regards provision and operation of equipment (compare Fig. 4).

However, a number of Member States are currently moving towards replacing exclusive or special rights in this area by a system of type-approval and licensing regimes (see below).

4.2 Right to use/provide a service and licensing/type-approval

As shown by Fig. 4, in many Member States, the private operation of satellite-based services is not permitted at all. Where it is permitted, the question of the terms of licences for such services arises. The right to offer satellite services is still often granted on a discretionary basis by Member States' governments.

For receive-only earth stations, a relatively liberal approach has been developed in the majority of Member States, under which receive-only earth stations are treated under the same regime as other terminal equipment (see above). But even in this area, the separation of regulation from operations is still by no means complete in relation to the approval and (where applicable) licensing procedures.

Traditionally, Member States have confined the right to transmit satellite (up-link) signals to the telecommunications organisations. However, more recently, a number of Member States have introduced - or are considering - liberalisation of access to the up-link, such as the UK for one-way services, and the Federal Republic of Germany for one-way and two-way services, under appropriate licensing regimes, including liberalisation of transmit/receive terminals (compare Fig. 4). In the Federal Republic of Germany private users and service providers

¹⁶ Commission Directive of 16 May 1988 on competition in the markets for telecommunications terminal equipment (88/301/EEC), O.J. L 131 of 27.05.1988, p. 73.

¹⁷ Status 1st October 1990.

will in the future be allowed to operate hub-stations and transmit/receive stations under a licensing regime. In the United Kingdom, 7 licences have been granted to operate one-way satellite services including the up-link, in addition to the two organisations, BT and Mercury, which have responsibility for network infrastructure.

Figure 4

Regulatory Environment of Satellite Communications in Community Member States

COUNTRY	RECEIVE ONLY TERMINALS		HUB STATIONS AND THE PROVISION OF ONE-WAY-SERVICES ¹		TRANSMIT/RECEIVE TERMINALS HUB STATIONS AND THE PROVISION OF TWO-WAY SERVICES ²	
	TELEVISION	OTHER SERVICES	NATIONAL	INTERNATIONAL	NATIONAL	INTERNATIONAL
BELGIUM	////////	////////	██████	██████	██████	██████
DENMARK ³	////////	////////	////████	////████	██████	██████
FRANCE	////////	██████	██████	██████	██████	██████
GERMANY ⁴	////////	////////	////////	////////	////////	////////
GREECE	////	////////	██████	██████	██████	██████
IRELAND ⁵		////////	////████	////████	////████	////████
ITALY		██████	██████	██████	██████	██████
LUXEMBOURG ⁶		////////	██████	██████	██████	██████
NETHERLANDS ⁷		////////	////████	////████	////████	////████
PORTUGAL ⁸	////////	////////	██████	██████	██████	██████
SPAIN		////////	██████	██████	██████	██████
UK ⁹			////////	////////	██████	██████

Private supply without licencing, type approval or co-ordination.

Provision exclusive to telecommunications organisation

Private supply, subject to licencing, type approval or co-ordination

¹ Provision of one-way services refers to the provision and operation of the uplink.

² Where two-way services are concerned, provision and operation covers hub station and remote transmit/receive terminals.

³ Receive only terminals are subject to type approval and licence for the establishment and operation. The network operator has the exclusive right to provide bearer services (uplink/downlink), whereas private organisations can provide value-added one-way services.

⁴ It is under consideration to delete the individual authorisation for receive-only terminals so that they will only be subject to type approval. The provision of one or two way services has been liberalised, subject to licencing.

⁵ Telecom Eireann has exclusive rights in the provision of national services and is licensed to provide international services. However, competition in the provision of national or international services is not precluded by legislation.

⁶ Terminals in the Fixed Satellite Service are subject to licensing without type approval or coordination.

⁷ PTT Nederland NV has the "right of first refusal" to provide fixed uplink earth stations for one-way or two-way services. If the PTT is not willing or able to provide, within a reasonable time and on reasonable conditions, a system which is equivalent to what the customer wants, the latter may ask the Telecommunications and Post Department of the Ministry of Transport and Public Works for a licence to establish, maintain and/or operate his own fixed uplink earth station.

⁸ TVRO terminals larger than 3m in diameter require a licence. Legislation is under preparation for the liberalisation of the market of receive only terminals for other services.

⁹ No individual licence is needed for receive only terminals; they are covered by a class licence which is available to all without the need to register or to pay a fee or to be individually co-ordinated. One-way services are subject to licencing for operation within Europe (meaning the European Community, EFTA and other European countries as broadly defined).

4.3 Access to - and provision of - space segment capacity

To obtain space segment capacity, the users or satellite service providers must in general lease capacity from an existing satellite operator. In the European context, as mentioned, the main relevant operators are the international satellite organisations INTELSAT and INMARSAT and the European satellite organisation EUTELSAT; and national or private satellite operators (space segment providers), which provide capacity on systems such as Telecom-1-2, DFS Kopernikus-1 and BSB (refer to Fig. 2). Given that the Member States' telecommunications organisations are the Signatories to the international satellite organisations within each Member State¹⁸, this means that a potential user requiring space segment capacity is generally obliged to buy this from the telecommunications organisation. In many cases, the telecommunications organisation is a competitor or substitute provider of the service in question. This implies an inherent conflict of interest for the telecommunications organisation.

However, more recently, there are first signs of the establishment of the principle of separation of regulatory and operational responsibilities also with regard to the satellite communications activities of the telecommunications organisations, both concerning the coordination of frequencies as well as the coordination procedures within the international telecommunications satellite organisations.

Recognition of this principle has led in the United Kingdom to the establishment of a separate 'Signatory Affairs Office', separate from British Telecom operational and commercial staff, to manage UK access to the space segment.

The operating agreements of the international satellite organisations give the signatories the right of exclusive resale of space segment capacity. However, as mentioned, the European Broadcasting Union (EBU) has been permitted to purchase space segment capacity directly from EUTELSAT for applications like Eurovision.

¹⁸ As mentioned, in Italy a special organisation (TELESPAZIO) has been created for this purpose.

Given the national nature of the signatories and their interests as national telecommunications organisations, the current system also has as a major consequence that EUTELSAT cannot develop independent commercial strategies for establishing trans-European satellite services. The Signatories tend to plan and direct the operation of the organisation mainly as a function of their national telecommunications requirements. As a consequence, EUTELSAT has mainly developed in a field, where it enjoys more commercial freedom, i.e. in the field of the distribution of television services.

As regards the provision of space segment capacity, potential operators of space segment (satellite systems) are subject to the coordination procedures with regard to frequencies and orbital positions set out previously, and to the coordination procedures with the international telecommunications satellite organisations discussed further in chapter V. Both procedures are initiated by Member States at the national level.

5. Summary

Satellite communications have developed in an international environment which is characterised both by the emergence of the international telecommunications satellite organisations INTELSAT and INMARSAT and the European telecommunications satellite organisation EUTELSAT as well as by the coordination procedures of the International Telecommunications Union in the field of frequencies and the management of the orbital resource. This entails important international commitments for the Member States which must be taken into account in any analysis of the sector.

While the international satellite organisations will continue to provide a major part of the European space segment and INTELSAT and EUTELSAT account for a major percentage of satellite capacity currently accessible from Europe, a large number of new actors are entering the field and a large number of new satellite systems are emerging which will substantially enlarge - and diversify - the European space segment over the coming years.

The current regulation of earth segment and space segment in the Member States still reflects, in most cases, the situation in the sixties and seventies where the only technically and economically feasible application of satellite communications was their use as an additional transmission path to carry international or national long-distance traffic for telecommunications organisations. The current situation in the

Member States is still characterised by substantial restrictions on supply and operation of satellite terminals (earth stations) and access to the space segment (satellite capacity), as well as a lack of harmonisation of procedures. Current regulation still does not integrate basic principles of modern telecommunications regulation in a multi-actor environment, such as the clear separation of regulatory and operational functions.

However, under the impact of technological and market trends, there are now substantial changes under way in a number of Member States which point towards a more open environment, necessary for the full use of the new potential and the development of Europe-wide satellite systems and services.

III. TECHNOLOGICAL AND MARKET DEVELOPMENTS

The nature of the overall market for satellite services is in a state of rapid change. New applications are emerging while older ones are being partially superseded.

The traditional main telecommunications application of satellites intercontinental telephony and studio-to-studio television programme transmission - is not likely to grow rapidly in future, due to the low cost, high capacity and quality of the new fibre optic cables coming online on major routes. While in the recent past satellite-based voice telephony via the INTELSAT system accounted for nearly 60 % of trans-Atlantic traffic, the share of traffic dropped dramatically in 1990 with the opening of the TAT8 and PTAT trans-Atlantic optical fibre optic cables.

At the same time, developments in both ground and space segment technology have created the possibility for new business services, notably based on small terminals that can be located at users' premises which can, given the right regulatory conditions, ensure full use is made of the satellite capacity which will be available.

In addition, the use of satellites for television transmission directly to users is set to grow with the advent of higher powered satellites and new transmission techniques such as MAC and its planned successor, High Definition (HD) MAC.

This chapter will focus on the emerging implications of recent technological and market trends and those over the coming decade. These trends must be major considerations regarding the future regulatory environment of satellite communications in the Community.

Europe saw the development of a series of experimental satellite programmes in the early 1970s which resulted in the 1980s in the development of an initial generation of operational European satellites (EUTELSAT-I series, TELECOM-I series, DFS-Kopernikus). These satellites were mainly designed to facilitate telephony interconnection and videodistribution.

In the 1970s and early 1980s, satellite communications were regarded as a direct substitute for terrestrial long-distance telephony - mainly international transmission links. The single concept of "break-even distance" was used to determine whether or not satellites were suitable for a given application. This criterion neglected the intrinsic advantages of satellites over terrestrial systems: their widespread geographical coverage and their ability to assign capacity dynamically, allowing the immediate deployment of networks and services over a wide area. Satellites are thus ideal for providing new or specialised services, especially to peripheral or less-favoured regions. Market developments suggest that the future role of satellites in Europe will be to *complement* terrestrial communications systems: there are few services for which both would be equally suitable and could therefore be regarded as competing technologies.

The early experiences with these satellite systems and the ongoing advances of technology have led to the development of more sophisticated satellites such as the TV-SAT/TDF Direct-Broadcasting Satellites (DBS), and the telecommunications satellites of the EUTELSAT-II series and TELECOM-II series currently under development. But it is only now that satellite communications technology is entering full maturity and that the experience gained and the technology developed are being used to define new generation satellite communications systems which will satisfy the Community's needs for satellite services within the overall envelope of telecommunications development.

The following sections analyse developments in technology and the various market sectors and illustrate the increasing diversification of satellite services and service providers.

Technological progress now allows substantially more diversified configurations for purposes other than simple alternative transmission paths for the network. These configurations can be safely operated by service providers other than the telecommunications organisations, once appropriate regulatory safeguards have been established.

While traditional telephony services and entertainment broadcast services still account for 90% of satellite communications revenues in the Community, the new business services such as point-to-multipoint one-way and interactive two-way systems and the satellite news gathering (SNG) systems - the collection of news and data from multiple points - show major growth potential if regulatory conditions are adjusted to allow their development.

1. Space Segment Development

The technological changes taking place in the space segment are the basis of the growing versatility of use and diversification of satellite services. The greater power and improved antennas of modern satellites allow the earth stations to be correspondingly smaller - a major factor in the increased opportunities of use of satellite technology. Improved frequency use and management techniques have increased the effective available bandwidth; and the working life of satellites has at least doubled.

1.1 Space Technology

The technology for spacecraft antennas has evolved rapidly during the last decade. As a result of the increasing scarcity of spectrum and crowding of the geostationary orbit new ways have been found to re-use frequencies by means of greater aperture efficiency and multiple spot beam operation (a technology by which a satellite antenna emits several narrowly focused beams designed to reach a number of relatively narrow circumscribed "spots" on the ground rather than covering all of a certain geographical area). Pressure to improve frequency utilisation will continue over the coming decades.

Direct interconnection of satellites and clusters of satellites by means of intersatellite links (ISL) is currently foreseen in order to further increase network flexibility and interconnectivity. Cluster space configurations, which are seen from the ground as though positioned at a single orbital location, allow rational growth of the satellite networks. Interconnections between satellite networks would extend the access coverage of networks while avoiding double-hops, and at the same time permit interconnection of services. It could also increase ground station elevation angles to overcome coverage problems. Development of optical communications technology for satellites has started in Europe within ESA's research activities and the first optical satellite interconnection link will be tested in orbit in the early 1990s.

More recently plans are emerging to use satellites outside the geostationary positions in near earth orbits, establishing broad coverage by fully using the new methods of direct inter-space communication within large systems of satellites, or in highly elliptical orbits to take advantage of the higher elevation angles of such systems. This technique is expected to develop during the nineties at a world level and will manifest itself foremost in the mobile communications area.

1.2 Use of New Frequency Bands

The congestion of the frequency bands and the increasing pressure for more bandwidth allocations to various services has led to the development of 10/20 GHz and 20/30 GHz technology. Both ESA's experimental OLYMPUS satellite and DFS/Kopernikus (Germany) already carry communications equipment for experimentation with these new bands. ITALSAT will be the next satellite carrying Ka-band as well as 40/50 GHz experimental communications equipment.

The use of the 20 - 30 GHz band permits, in principle, transmissions to and from very small user terminals and is therefore interesting for direct user applications such as business services including video conferencing.

Because of the bandwidth requirements, wideband High-Definition TV transmissions are also expected to take place in the 20/30 GHz band in the future, although in the near term the narrowband HDTV (HD-MAC) could be provided on the existing Ku-band frequencies of 12/17 GHz.

1.3 Increase in Lifetime

It is expected that the overall lifetime of satellites will continue to increase to possibly 20-25 years in the future with the use of very large scale integration in satellite communications equipment, electric propulsion, Ka- and Ku-band power transistor transmitters, more efficient solar arrays etc.

2. **Earth Segment Development**

Based on the growing sophistication of space segment technology, continuing developments in earth station equipment, above all in more efficient antennas and more sensitive receivers, there has been a dramatic decrease in the size and cost of ground stations, be it for telephony and television distribution, or for business communications.

While the first generation of satellite earth stations were large installations with antenna diameters of about 30 meters and with only one or a very limited number of stations per country, connected to and seen as part of the public telecommunications infrastructure, and giving access to the satellites of INTELSAT, and, later, also to the satellites of INMARSAT and EUTELSAT, this situation has now changed dramatically. New earth stations are now available for specific user applications, with antenna diameters of 0.5 - 2.5 meters and which can be installed under user control directly on user premises.

The development has led in particular to the emergence of VSAT ("Very Small Aperture Terminals") based networks, albeit in Europe on a very limited basis due to the restrictive regulatory provisions¹⁹.

For the particular case of Direct Broadcasting by Satellite, for which when originally conceived only 'high power' satellites were considered suitable, the increased sensitivity of low noise receivers has enabled reception of television signals from 'medium power' TV distribution satellites such as ASTRA and EUTELSAT, directly by domestic units and with reasonable quality with dish diameters as low as 60 cm. This has led to a blurring between those services defined as Broadcasting-Satellite Services (BSS) according to the definitions used internationally under ITU regulations, and broadcasting applications operating in the framework of Fixed-Satellite Services (FSS).

Although future developments are not expected to be as spectacular as during the last decade, it is foreseen that new technologies will still offer substantial improvements in terms of both costs and performance such that the use of small terminals for all satellite services will become increasingly more interesting.

3. Traditional Services

These services include traditional "point-to-point" voice, voiceband data and data transmission, using satellite communications basically as an alternative network transmission path. For such services, satellite transmission is generally *more expensive* than terrestrial transmission for short, intra-European distances. Originally conceived as the main satellite telecommunications application, it has turned out that on economic grounds it is only justifiable for "edge-to-edge" connections between peripheral countries, and to provide flexible and

¹⁹ VSAT networks nowadays consist of a 9-13 m hub network control facility and a potentially large number of remote 1.0-2.5 m one or two-way user earth stations.

reconfigurable redundant, 'back-up' routings to improve network restoration times in case of outages on terrestrial links. Of the total 1989 telecommunications services revenues in Western Europe²⁰ of nearly 95 billion ECU, the vast bulk is carried terrestrially. At national level, satellite carried voice telephony accounts for far less than 1 %. For international calls *within* Europe, satellite carried voice accounts for no more than 2% - 3%. As mentioned however, satellites play a far greater - though declining as a proportion of the total - role for inter-continental communications, accounting for nearly 60 % of traffic throughout the eighties.

Satellite costs per channel are expected to fall over the medium-term, as technological improvements lead to better space segment utilisation and earth stations become smaller and cheaper. However, the cost of terrestrial technologies is falling faster. The quality and capacity of international cable links is improving all the time and there has been some speculation as to the effect of the increasing capacity of TAT (Trans Atlantic) and PTAT (Private Trans Atlantic) cables on the use of satellites. These new digital fibre optic cables, the first of which (TAT-8) was finished in December 1988, provide greatly increased capacity at reduced cost compared to analogue cables. The advent of fibre optic cables is expected to reduce the proportion of transAtlantic voice circuits carried by satellite from near 60 % in 1989 to 30 % - 40 % of the total by 1995²¹.

4. New Services

The new services generally consist of services which - with the exception of television distribution - are directed at specific business user groups and are not intended for the general public. They are nowadays largely digital in nature and include special voice and data services and video conferencing.

²⁰ Community and EFTA countries.

²¹ The trans-Atlantic submarine fibre optic cable TAT8 is able to carry 40.000 telephone calls simultaneously, compared to only a few hundred on conventional coaxial cables.

4.1 Standard satellite-based digital services

Standard satellite-based digital business services at 64 kbit/s and higher bit rates (SMS²²/IBS²³ type services) are currently provided in Europe by the national telecommunications organisations - within their role as signatories to the EUTELSAT and INTELSAT agreements - through central, multi-customer earth stations with terrestrial tails to individual customer sites.

Within Europe, however, the developing terrestrial digital network will increasingly offer these services. With the exception of the case where an earth station serves a community of users and is heavily used, it is forecast that terrestrial cable networks will provide *point-to-point* digital services at a *lower cost* than satellite systems. It is expected therefore, that while satellites will continue to be used in the short term where terrestrial facilities are inadequate, in the medium term significant migration of customers to terrestrial services may be expected, except where long distances are involved.

The situation has been further complicated in Europe by the dual interest of the telecommunications organisations as both exclusive distributors of satellite services of INTELSAT and EUTELSAT and as the operators of the terrestrial infrastructure, as well as the fact that in particular EUTELSAT - in the current circumstances - is impeded from marketing its new services directly to customers throughout the Community. In the case of the SMS services, this has led to a situation where the services were introduced late and there was not sufficient marketing coordination. Telecommunications organisations which introduced the service in reasonable time, could not offer the wide international coverage necessary to gather a critical mass of customers to make the service rapidly viable.

As a consequence, EUTELSAT's SMS business service failed to reach predicted growth levels, reflecting the current weakness of satellite communications for traffic within Europe, as opposed to that between continents.

²² SMS: Satellite Multi Service (business communications service of EUTELSAT).

²³ IBS: INTELSAT Business System.

4.2 Very Small Aperture Terminal (VSAT) Networks

At the world level, a new high-growth market is emerging for point-to-multipoint private satellite networks based on the new small-sized terminals individually designed for each customer's needs and often operated by third party service providers. As terminals become smaller and cheaper and can be safely installed on user premises by service providers and operated under user control, provision of such wide-area multipoint networks via satellite becomes more cost-effective, with the high flexibility of satellite techniques allowing individual customer-optimised solutions. These networks represent a new departure in that both terminal equipment and transmission links are completely dedicated to a single user, whereas in SMS/IBS type services both are shared. Private terminal networks offer the possibility of developing new business applications across widespread geographical areas. Terrestrial networks are unsuited, both due to their technical and tariff structures, for these new point-to-multipoint one-way and two-way interactive applications - often of a transnational nature - and so the applications would be unlikely ever to be developed. The terminals for the fixed satellite service are frequently referred to as VSATs ("Very Small Aperture Terminals" or "micro-terminals"). However, mobile and radiodetermination terminals can also be considered part of this class of terminals.

The services on private terminal networks are generally provided by value-added service providers using space segment leased from a space segment operator. Thus they provide revenues both to the operators and to the service providers. It is estimated that in 1989 the value added in Europe by satellite business service providers was 55 MECU.

This is still a small sector in terms of total revenues, compared to satellite-based telephony transmission and other traditional satellite applications, and revenues generated by satellite television channels. However, it is estimated that by the mid-1990s, business services revenue could be near 900 MECU, or more than 30 % of total satellite service provision revenues - if regulatory constraints are lifted.

Examples of such value-added services are : Satellite Information Services in the United Kingdom, which has been delivering racing results and betting prices to bookmakers and totalisator agencies in the U.K. for over two years, comprising nearly 10.000 receive-only terminals; ISIS, a similar service in France; and PolyCom, which offers news feeds to radio stations and newspapers, stock market information to brokers and meteorological information to radio, TV and other media.

As regards two-way VSAT terminals, by 1990 only a few hundreds of terminals were installed in the Community, due to the restrictive regulatory conditions - even if some major initiatives were under way²⁴.

4.3 Vide Conferencing

For videoconferencing, satellites are currently the main transmission medium but competition from switched terrestrial 2 Mbit/s networks for services within Europe may be expected to develop over the next decade. It is important to recognise that two-thirds of the revenues generated by videoconferencing are for transmission and thus must be considered carrier revenues for business services, but about one third of the costs relate to the earth segment (hire of studio or connection of a customer's temporary or permanent studio) and can thus be considered as value-added. This market sector is also growing very rapidly. In 1987, the value added was estimated at 1 - 1.5 MECU, and in 1988 the figure is estimated at 3.9 MECU. Carrier revenues in 1987 were estimated at 2 MECU and thought to have risen to 7.8 MECU in 1988.

4.4 Other New Satellite Services

Satellite News Gathering (SNG) - the collection of news and data from multiple points - and other multipoint-to-point applications represent a growing demand. Though at present no comprehensive figures are available, it may be noted that under pressure of the events in Eastern Europe, Eutelsat was used for 800 hours of such 'occasional use' television in November and December 1989. The regulatory regime is of vital importance to the development of the service. At present, the lack of an internationally recognised standard for SNG terminals has led national telecommunications organisations - the INTELSAT and EUTELSAT signatories - often to deny SNG operators access to space segment. A Recommendation on SNG terminals is being developed by CCIR (International Radio Consultative Committee, an ITU body) and is expected to be adopted in 1990. This should provide a basis for advancing towards equitable and non-discriminatory access to space segment for SNG operators.

²⁴ For example, in the Federal Republic of Germany, the Daimler Benz company plans the implementation of a major VSAT network. In Italy Telespazio is planning the implementation of a number of VSAT networks covering Italy.

Business television (e.g. for distance learning and videoconferencing) is expected to be a growing market. It is in this market segment that further enhancements of services are expected to be demanded so that an integration will take place of videoconferencing with graphics and data distribution. Other foreseen demands are the possibility for real time measurements of audience reactions, a flexible use of audio return links (not necessarily via satellite), new scrambling techniques, and new coding techniques which allow low bit rate transmissions more cheaply ("slow-scan video").

In addition, satellites offer the possibility of providing channels, circuits and networks at short notice for a multiple of uses and to locations not served by the terrestrial network - for example : scenes of disaster; early services in advance of permanent terrestrial facilities; temporary restoration arrangements; and communications to short-term events at remote locations.

5. Entertainment Broadcasting Services

5.1 TV Distribution

TV and related distribution services currently represent most of the demand for satellite capacity in Europe, and this situation may be expected to continue. Currently, some 60 channels are distributed by satellites in Europe; and, as mentioned, EUTELSAT derives 75% of its revenues from television distribution. Growth in television distribution (mainly to cable heads and SMATV systems) is expected to continue, and should the percentage of capacity used for TV distribution remain the same - approximately 80 % in Europe - then more than 300 transponders²⁵ can be expected to be *potentially* available for TV distribution by European satellite systems in 1992. The availability of medium-power TV distribution satellites is seen as a major component in sustaining this market, by providing multiple channels at relatively low cost. It will also give impetus for a large-scale availability of small television receive-only (TVRO) antennas for general use, which can receive these satellite channels Direct-To-Home. Small and cheap TVRO terminals with an antenna diameter of less than 1 metre are now available. However, the adjustment of regulatory conditions will be a key factor in the development of this market.

²⁵ One transponder is roughly equivalent to the capacity required for one to two TV channels.

Both television distribution via the EUTELSAT system as well as, more recently, via other systems such as Telecom1, DFS Kopernikus and Astra work in the framework of frequencies defined for Fixed-Satellite Services and not in the frequency bands reserved by the WARC'77 conference for BSS (Broadcasting Satellite Services) where the Direct Broadcasting Services (DBS) are located. As mentioned, this has made it increasingly difficult to maintain the distinction between BSS services and broadcasting applications operating in the framework of Fixed-Satellite Services. There is therefore an evident need for the development of cheap TVROs capable of spanning DBS and fixed service TV distribution bands (10.95 - 12.75 GHz).

5.2 Direct Broadcasting Services (DBS)

As far as television broadcasting is concerned, Direct-Broadcasting-Services or DBS - defined as broadcasting services by WARC'77 - is likely to become another important user of European satellite systems, next to TV distribution in the Fixed-Satellite Services.

DBS satellites are high-powered satellites conceived along the lines foreseen by WARC 77, which allocated satellite channels, orbital positions, frequencies and polarisations, essentially country by country for Europe, Africa, and Asia, for broadcasting directly to individual users' receivers (refer also to chapter II.).

At that time, the plans were based on national coverage, with comparatively little 'overspill' from the programmes of a particular country to its neighbours. Home receivers were expected to need receiver dishes of 90 cm diameter with the technology existing at that time.

All the five existing European direct broadcast satellite programmes (TV-SAT/Germany, TDF1-2/France, BSB 1-2/UK, TELE-X/Scandinavia, Olympus/ESA) are of this type. Reception of services of these satellites is now possible with dishes of 30 - 60 cm diameter; a mark of the technological evolution.

There is therefore an evident need for the development of cheap TVROs capable of spanning DBS and fixed-satellite service TV distribution bands (10.95 - 12.75 GHz).

In 1989, TV and video accounted for 44% of total European satellite carrier revenue, or of nearly 61% when extra-Community traffic via INTELSAT is excluded, even before any of the direct broadcasting satellites came on stream. 1990 has seen the addition of TV revenues from all 16 of ASTRA's TV distribution transponders and the coming on-stream of a further 14 DBS transponders from TDF 1-2 (5), TV-SAT 2 (5), Olympus (2) and Tele-X (2), while BSB, with 5 channels, became operational in April 1990. In 1992 a total of 24 DBS channels is expected to be available. Thus TV revenues should grow substantially in the next two years.

By the end of 1989 a total of 750.000 Direct to Home (DTH) terminals were installed in the Community, with the majority being installed in the United Kingdom. The projection for the end of 1990 is an installed base of about 1.8 million units.

The projections for the installation in Western Europe of antennas for entertainment broadcasting reception by 1994 are estimated at 6 million units.

Directive 86/529/EEC has identified the MAC family of transmission techniques as the standard to be used for Direct Broadcasting Satellites. The Directive expires on 31 December 1991. The future evolution of transmission techniques in this area will be characterised by the fact that a major challenge for the future will be the harmonised introduction of High Definition Television (HDTV) in Europe.

5.3 High Definition Television (HDTV)

Satellites will play a crucial role in the introduction of High Definition Television (HDTV), which enables larger TV screens, with a wider aspect ratio and better picture resolution to be made available to the public at acceptable prices. The introduction of HDTV within Europe will almost certainly use DBS satellites in the short and medium term.

HDTV is a high priority area in overall Community audiovisual policy²⁶. This is discussed in more detail in chapter IV.

²⁶ See Communication by the Commission to the Council and to the European Parliament on audio-visual policy, COM(90) 78 of 21.02.1990 and Council Decision of 27 April 1989 on High Definition Television (HDTV), O.J. L 142 of 25.05.1989, p. 1.

6. Mobile Services and Position Fixing Services

Mobile services are developing rapidly. Although until recently limited to the maritime Mobile-Satellite Services (MMSS) on big ocean-going vessels, mobile-satellite services for maritime services to smaller vessels, for aeronautical, and especially land mobile applications, are now at the centre of interests. The intended provision of services, both messaging and position-fixing, for land mobile users has meant a renewed interest, especially from long-haul trucking companies, enterprises with smaller coastal and waterway vessels, high-speed train operators etc.

6.1 Maritime Services

Currently, the INMARSAT system provides voice communication which, although of high quality, requires comparatively large and expensive (30 000 ECU) terminals with dish sizes of about 1 meter on board ships. However, INMARSAT intend to introduce in 1990 a service supporting low data rate communications to small, cheap terminals - via so-called INMARSAT standard C terminals antennas of about 20 cm. It is anticipated that by 1992-1993, voice communications will be possible using similar small terminals. This will bring direct benefit to a whole range of ships including those which predominantly stay within the coastal waters of the Community, as opposed to the current system, which is much more optimised for the requirements of large, ocean-going vessels.

6.2 Land Mobile Services

Recent studies indicate that Land Mobile-Satellite Services (LMSS) and the terrestrial pan-European digital cellular network (GSM)²⁷ will be mainly complementary and rarely in competition with each other. The higher price and bigger size of the LMSS terminals are mainly of interest to specific user groups of limited size seeking instantaneous and full European coverage, such as long-haul trucking companies and vessel operators. On the other hand, GSM offers better quality voice and a higher system availability in urban areas and, combined with smaller user terminals (down to hand-held size) and a lower price, is intended as a

²⁷ Council Recommendation of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community and Council Directive of 25 June 1987 on the frequency bands pertaining thereto, O.J. L 196 of 17.07.1987, pp. 81 and 85, respectively.

The new pan-European system - also called the "GSM"-system - will be implemented in the Community

mass service for private and local business users. Nevertheless, some level of integration of the services at system level may be developed in order to exploit both systems to their full potential.

A recent study indicates a total captured market for satellite-based land mobile services (including position-fixing²⁸) in Europe of only 220,000 data terminals and 65,000 voice terminals by the year 2000 in Europe, compared to a forecast of 16 million terminals for terrestrial cellular systems by that time.

Plans for mobile or position fixing services in Europe have been announced by INMARSAT, EUTELSAT and LOCSTAR. ESA has announced an experimental European Mobile Services initiative, to be embarked on a satellite of a third party.

This makes it all the more imperative to free the economic operators from a maximum of restrictions so that the available capacity can be offered to users under optimum conditions and at competitive prices.

6.3 Aeronautical Services

Aeronautical services have developed faster in the United States than in Europe. In a combined effort, the USA and Canada have set up an entity called M-SAT to provide aeronautical services over the North-American landmass, with the AMSC consortium as the U.S. partner (see below).

In addition to this, on a global scale, INMARSAT aims to provide aeronautical services, including passenger voice telephone traffic. However, air traffic control information and airline information may prove to be more important.

Just as in the case of maritime satellite communications, initial service will be optimised for the longer, trans-Oceanic routes. Nevertheless, there remains a clear possibility that the use of satellite communications to aircraft over the European landmass can make specific contributions to flight safety and airline efficiency.

from 1991 onwards (see also chapter V.).

²⁸ Position fixing services allow the determination of the position of ships, vehicles etc. down to precisions of 15-100 meters, depending on the system. For Europe all land mobile-satellite services will offer position fixing services as an option.

7. Development in other major markets: United States and Japan

The technological and market developments have led to substantial changes in other major markets, in particular in the United States and Japan.

7.1 The United States

The United States have undertaken substantial liberalisation of the satellite communications sector. It is now the far largest market for satellite communications systems and services.

7.1.1 Domestic "Open-skies" policy

As early as 1972, the US Federal Communications Commission (FCC)²⁹ established a domestic fixed-satellite service licensing policy based on the principle of open entry - ie. that all qualified applicants should be allowed, where possible, the opportunity to provide domestic satellite communications services, both for accessing in-orbit satellite capacity for operating satellite networks as well as for launching and operating space segment capacity. This policy has since become known as the "open-skies" policy.

The FCC has adopted flexibility in the allocation of orbital location and spectrum (e.g. through the use of two-degree orbital spacing), with the effect that to date there have been sufficient orbital locations available to allow the FCC to grant applications of all qualified domestic fixed-satellite applicants.

U.S. entities licensed to construct, launch and operate domestic satellites may provide capacity on a common-carrier basis to other entities - either those that provide telecommunications services to third parties or those that use the capacity for their own internal purposes³⁰.

²⁹ The US Federal Communications Commission (FCC) is the US Government body which is empowered to regulate interstate and foreign commerce in communications. The FCC grants licences for the use of channels of interstate and foreign radio transmission, and prescribes the technical, financial and other qualifications of a licensee, including those entities licensed to construct, launch and operate domestic and international satellites.

The FCC establishes licensing policies for the fixed, mobile and broadcasting satellite services. The policies which it adopts in each area are intended to achieve specific objectives, mainly related to the development of the US satellite industry.

³⁰ A common carrier is a provider of services to the general public. They may also seek FCC approval to sell transponder capacity on a non-common carrier basis.

Entities leasing or owning domestic transponder capacity may also offer that capacity to users on a non-common carrier basis. Where the entity owns and operates the transmitting earth station accessing the particular transponder, it must receive a licence to construct and operate the earth station. A *"blanket" licensing procedure* is available for entities that operate *large numbers of technically identical domestic very small aperture terminal (VSAT) transmit-receive earth station facilities* in the 12/14 GHz band. Networks operating in the 4/6 GHz band however (a band not used in Europe for this purpose), must be co-ordinated and is subject to individual station licenses. This blanket processing entails the grant of a single licence for the overall domestic earth station network, without specific information on each station. The FCC does not license (or require to be licensed) domestic receive-only earth stations in the 12/14 GHz band because fixed-satellite service is the only service allocated to this spectrum on a primary basis and interference is therefore unlikely. Entities operating domestic receive-only earth stations in the 4/6 GHz band may voluntarily seek licensing if they desire; the licensing gives protection against interference from terrestrial facilities sharing the spectrum on a co-primary basis.

The "open-skies" policy has led to a rapid evolution of the U.S. domestic Fixed-Satellite industry. Eleven companies hold 52 licences to construct, launch and operate domestic Fixed-Satellites. Thirty of these are in operation. In addition, thousands of entities hold transmitting earth station licences for accessing in-orbit satellite capacity. The industry has been characterised by innovation and diversity as the number and kinds of providers and services offered have steadily increased. Satellite service providers range in size from large facilities-based carriers to very small resellers of transponder capacity. Services include all type of data, voice and video transmissions. Earth station developments, have been as dynamic as space station developments as the size and cost of antennas has decreased while their performance characteristics have improved.

The value of the business has increased accordingly. In 1990, small satellite dish networks are expected to earn \$ 300 million to \$ 400 million in revenues for their operators. VSAT network sales are expected to grow at an annual rate of 30 to 40 per cent during the coming years. In 1984, when Ku-band transponders first came on stream, there were around 2000 earth stations in place. By 1988 that total had grown to 16,000 stations, while now (1990) approximately 40,000 stations are installed of which about one third are transmit/receive stations - compared to a few hundred transmit/receive VSAT terminals in Europe. Recently Hughes Network Systems Inc. announced that it was to supply a single network of approximately 10,000 dishes to General Motors, for completion by 1992.

The early adjustment of the regulatory conditions for domestic satellite communications in the United States has given the US space industry a substantial advantage on the world market in this area. In spite of the dynamic satellite market thus created in both space segment and earth segment, satellite communications has not had a visible negative impact on telecommunications revenues earned by the terrestrial telecommunications carriers. After one decade of domestic "open sky policy", total satellite communications revenues account for no more than 2 - 3 % of total telecommunications revenues while liberalisation has in practice led to a substantially higher and more diversified development of the US space sector in this area.

7.1.2 U.S. approach to international satellite communications

In contrast to its approach to domestic satellite communications, the US approach to international satellite communications is still characterised essentially by the structures established during the sixties.

In the US, Comsat, created in 1962 as a special body, is the organisation which carries out the signatory role undertaken in Europe by the telecommunications organisations³¹ in relation to INTELSAT and INMARSAT. However, more recently, common carriers and private users also have the right, under certain restrictions, to purchase or lease capacity from U.S. international satellite system providers separate from the INTELSAT system ("separate systems"). These entities may either own their own earth stations or lease earth station services.

³¹ With the exception of Italy, where Telespazio has been created as a special organisation for assuming this role (see chapter II.).

In November 1984, the United States issued a Determination that alternative satellite systems were "required in the national interest". This determination states that the United States shall consult with INTELSAT regarding such systems "as are authorised by the Federal Communications Commission". The Departments of State and Commerce jointly laid down the restrictions to be imposed on the alternative systems prior to final authorisation by the FCC, in order to ensure U.S. fulfilment of its international obligations and the furtherance of its telecommunications and foreign policy interest:

- separate systems were to be restricted to communications not interconnected with public-switched message networks (except for emergency restoration service); and
- one or more foreign authorities were to authorise use of each system and enter into consultation procedures with the United States Party under Article XIV(d) of the Intelsat Agreement to ensure technical compatibility and to avoid economic harm.

In 1985 the FCC established regulatory policies for the consideration of separate satellite system applications. Separate system operators may not operate as common carriers. No communications over separate systems may interconnect with the public switched networks. The "no-interconnect" restriction applies to all levels of users of these facilities. Common carriers and enhanced service providers may acquire and re-sell separate system space segment capacity consistent with this restriction. Use of separate systems by U.S. common carriers requires authorisation from the FCC.

Applications for international separate satellite systems are subject to public notice and opportunity to comment. Final authorisation to construct, launch and operate a separate system is not given until INTELSAT Article XIV(d) obligations are satisfied. Besides these obligations, carriers are subject to the same legal, financial and technical requirements as U.S. domestic satellite applicants.

Six entities hold conditional construction permits and one entity, Pan American Satellite (PAS), has a licence to construct, launch and operate an international separate satellite system. PAS and Orion have completed Article XIV(d) consultation. PAS has an operating satellite providing service between the U.S. and Central and South America, the Caribbean and Europe. Final authorisation for Orion is pending.

In June 1990, PAS filed with the FCC to lift the restrictions on interconnection of its services with the public switched network (interconnection with voice and data message handling services), stating that this limitation restricted it from operating in more than 90 % of the potential market.

7.1.3 Mobile-satellites services in US

In the field of mobile-satellite services, the U.S. satellite telecommunications policy is still strongly based on considerations of national interest. In 1984, the FCC proposed the establishment of a new public domestic mobile-satellite service (MSS), and invited interested parties to submit applications for authority to construct, launch and operate an MSS system. In 1986 it concluded that joint ownership of the first generation MSS system would permit a variety of competitive mobile-satellite services to be made expeditiously available to the public. The FCC reasoned that only one domestic MSS system should be authorised for the first generation because there was:

- a limited amount of L-band frequency spectrum apportioned jointly to Aeronautical Mobile-satellite Services (safety) (AMSS(R)) and MSS, and none of the twelve parties seeking licences submitted a proposal which would permit licensing more than one system;
- a need to provide priority and pre-emptive access for AMSS(R); and
- a need to co-ordinate spectrum use with other planned satellite systems such as INMARSAT and Canadian and USSR systems.

Therefore, the FCC instructed those applicants which met basic qualification requirements to form a joint venture and propose an MSS system to operate in accordance with the general licensing provisions. The FCC subsequently licensed American Mobile-satellite Corporation (AMSC), the consortium of MSS applicants, to construct and operate a combined AMSS(R) and MSS satellite system. This approach has been contested as being restrictive and discriminatory with regard to non-U.S. based potential service providers.

7.2 Japan

Japan's first experimental satellites were designed and constructed by American contractors. Under the terms of the co-operation agreement, however, Japan was able to purchase licences and sign numerous co-operation agreements, and thus to follow a strategy of improving its equipment and increasing the Japanese involvement in successive satellites. During the 1970's and '80's, the contribution of Japanese industry increased steadily, to the point where the last two generations of experimental telecommunications satellites, ETS IV (1981) and ETS V (1987) have been 100% Japanese manufactured. Similar progress has been made in launchers: Japan expects to be able to launch its own telecommunications satellites by 1992.

On the applications side, a major change occurred in 1985 with the privatisation of NTT and the enactment of the Telecommunications Business Law³².

In the wake of the implementation of the law, the Ministry of Posts and Telecommunications (MPT) has licensed two large satellite groups as Type I (domestic) carriers, competing with NTT. They are Japan Communications Satellite Co. (JC Sat.), owned by Hughes Communications, C. Itoh and Mitsui, and Space Communications Corporation (SCC), owned by Ford Aerospace, Mitsubishi Electric and Mitsubishi Corporation.

Each company has ordered a two-satellite system from its American partner. JC Sat. now has both satellites in orbit, and SCC has one: its second satellite, Superbird B, was lost due to a launch failure in February 1990. Its replacement is due to be launched in 1992.

In a change of policy, Japan also modified its position with respect to the role of NASDA³³, the National Space Development Agency, in the technological development of telecommunications satellites. With the deregulation of telecommunications and the granting of licences to private companies using American satellites, the government has decided to count mainly on the beneficial long-term effects of the development of satellite-based communications - in particular of the earth segment, where Japanese manufacturers have already achieved an extraordinary dominance - and satellite services.

³² The Law classifies telecommunications business into two main types: Type I or facility-based businesses, which provide telecommunications services by establishing their own circuit facilities, and Type II or resale businesses which provide services by using circuits leased from Type I carriers. The proportion of foreign ownership of any Type I carrier is limited to 30 %.

³³ Since the early seventies, the National Space Development Agency (NASDA) formed in 1969, has been the

The creation in early 1987 of Space Telecoms Research Group at the initiative of MITI, the Japanese Ministry of International Trade and Industry, was one of the factors marking the gradual withdrawal of NASDA and making way for private-sector support of the space industry by telecommunications companies. The new company received 70% financing from the Japan Key Technology Centre, which is supervised by MITI, and 30% from ten private or semi-private companies including NTT, KDD and NHK.

The two private satellite systems already authorised will offer 108 transponders when all 4 satellites are launched. This is equivalent to the capacity of all five Eutelsat II's and both Astras, to cover a market with just half the population of Europe. This capacity will be further increased by the national CS3 satellite (24 transponders). By April 1990, SCC and JC Sat. had leased about 60% of their transponders: 40 out of 64 on the JC Sat. 1 and 2 satellites, and 25 out of 44 on SCC's Superbird A and B.

A third Japanese-American consortium proposing a private system is Satellite Japan Corporation (SJC), a joint venture of RCA Astra Electronics, Sony, Nisaho-Iwai Trading and Marubeni Trading. Satellite Japan has not yet been authorised by MPT, which fears considerable over-capacity. Similar fears were expected before the JC Sats and Superbird came into operation but it now seems likely that both will prosper.

While the satellites were mainly designed to cater for television distribution - and indeed have been notably successful in leasing transponder space, both to NTT and to cable operators - other applications have also developed rapidly. In particular, commercial broadcasters are very interested in the use of satellites for satellite news gathering (SNG). These applications already account for four transponders on Superbird-A, and SCC expect that this will rise to 8-12 transponders. In fact, the availability of, and freedom of access to, space segment has led to the creation of a number of independent service providers. These companies are also expected to move into the provision of business television services, another rapidly developing application - e.g. one business TV company in Japan is selling used cars by satellite.

Private satellite business networks are another area of major interest. Several of the big Japanese electronics firms have announced plans for networks to link up their manufacturing plants, regional offices and distribution outlets by fax or video. Mitsubishi, a co-owner of JC Sat., uses the system to deliver information to its corporate sites. Some of the networks involved are very large and may comprise of up to 5000 terminals. While one-way applications are set to dominate the market initially, several Japanese electronics companies have developed prototype 2-way VSATs.

8. Summary

During the last decade, satellite communications technologies have undergone dramatic change.

In addition to the traditional large earth stations for trunk telephony and TV programme interchange, new satellite terminals are now available for Direct-To-Home television and for specific user applications which operate with antenna diameters of 0.5 - 2.5 meters depending on applications and which can be installed under user control directly on user premises.

The technological change has opened a broad range of new opportunities for both satellite service providers and users - particularly in point-to-multipoint service provision via satellites. The new service types which are developing, tend to be complementary to the traditional services, instead of competing with them. While in trans-Atlantic communications, satellite links still account for nearly 60 % of the traditional trunk telephony (although this percentage is now decreasing), satellite-carried voice telephony accounts for only 2 - 3 % of intra-European international and national long-distance calls. EUTELSAT derives 75 % of its revenues from television distribution.

Technology has now made it possible to broaden the availability of satellite terminals and services to individual users. The introduction/expansion of major new satellite services lines - such as wide-area VSAT networks to serve the Europe-wide communications requirements of specific user groups - will depend on the development of a regulatory framework which will allow it to happen on a Europe-wide basis. More generally, Europe's growing number of satellites must be put to the full use of the European economy.

Satellite services must be allowed to define and develop their specific markets, in order to maximise the benefit of Europe's overall investment in its space segment and to provide the European users with the trans-European services they need.

The United States and Japan have adopted a market-oriented policy in their domestic satellites market, in order to develop the industry. After eighteen years of domestic open sky policy, the United States has become a leader in new satellite communications applications. By now there are approximately 40,000 VSAT terminals in operation in the United States, of which about one third are transmit/receive stations, compared to a few hundred transmit/receive stations in Europe. Japan is now preparing its entry into the world market on the basis of the de-regulation of the sector in its home market.

While essential for satisfying the requirements of specific business and consumer groups, satellite communications services will pose no threat to the financial viability of the terrestrial infrastructure. In the United States, even after nearly two decades of domestic open sky policy, total satellite communications revenues account for no more than 2 - 3 % of total telecommunications revenues while liberalisation has led to a substantial and more diversified development of the sector. For Europe it is forecast that total satellite communications revenues will reach no more than 1.5 - 2.5 % of total telecommunications revenues by the year 2000. Currently, the total revenue of all satellite operators in Europe accounts for no more than 0.4 % of total telecommunications revenue in the European Community.

Figure 5 gives an overview of key-figures on satellite communications in Europe.

Figure 5**SATELLITE COMMUNICATIONS IN EUROPE - AN OVERVIEW¹**

1. SPACE SEGMENT	
Total number of satellites (1990) with European coverage (footprint) ² -----	32
out of which European satellites-----	17
Total capacity (transponders) (1990) -----	350
out of which INTELSAT ³ -----	48%
EUTELSAT-----	23%
Increase of capacity of European satellites from 1989 to 1993 -----	215%
(% increase in number of transponders) ⁴	
Increase in number of European satellites from 1990 to 1993 -----	88%
2. EARTH SEGMENT	
Business terminals ⁵ (1989) -----	9000
- receive-only ⁶ -----	8600
- two-way ⁷ -----	400
Terminals used for television reception (1989)-----	840000
- private household -----	90%
- cable feeds -----	10%
3. SATELLITE BASED SERVICES	
Total revenues derived by satellite operators (1990-estimated) ⁸ -----	440 MECU
Out of which :	
- satellite carried telephony ⁹ -----	44%
- satellite distributed television services ¹⁰ -----	46%
- new satellite services ¹¹ -----	10%

¹ All 1990 figures based on August 1990.

² including 7 INTELSAT satellites, 1 PanAmSat, 2 INMARSAT, 2 Arabsat, number of USSR satellites unknown.

³ including an equivalent of 150 telephony transponders and 18 TV transponders. INTELSAT capacity mainly used for trans-Atlantic and trans-continental use.

⁴ according to announced plans (see fig. 2 and 3). Total number of equivalent transponders on European satellites announced for 1993 : about 400. Total increase in transmission capacity will depend on technology and access methods used and will be larger than increase in number of transponders.

⁵ This represents mainly VSAT terminals. The number of VSAT terminals world-wide in 1989 was about 44 000, mainly in the United States.

⁶ About 30 000 world-wide

⁷ About 14 000 world-wide

⁸ This corresponds to 0.45% of total telecommunications revenue in the European Community + EFTA countries (95 billion ECU in 1989)

⁹ out of which 33% INTELSAT carried trans-Atlantic telephony. Within the Community satellite based telephony does not correspond to more than 2 to 3% of international telephone service.

¹⁰ Currently, more than 60 satellite TV channels are available in Europe. Near 75% of current EUTELSAT revenues are derived from television services.

¹¹ Including video conferencing services and point to multi-point one-way and two-way VSAT systems.

IV. SATELLITE COMMUNICATIONS IN A GLOBAL POLICY CONTEXT

Satellite communications will play a major role in Europe's economy of the nineties. The definition of a coherent approach to satellite communications in the Community must take full account of these broader aspects.

1. Satellite Communications in the Context of Community Space Policy

Satellite communications represents by far the largest commercial application of satellite technology.

Europe's cumulated total effort in space up to the year 2000 through ESA will total more than 30 billion ECUs in addition to national space programmes, with a major political commitment to ensure European autonomy in space, including manned spaceflight. Cumulated revenues over this decade related to satellite communications - for satellite operators for the provision of space segment, for the distribution of satellite TV channels, and for satellite terminal sales alone - are forecast to be far in excess of 20 billion ECUs, depending on the lifting of existing restrictions. Satellite communications will therefore determine, to a large extent, the commercial success of Europe's efforts to gain a strategic and future-proof position in space.

The Commission's overall approach to space policy is set out in Communication COM(88) 417 on the proposed Community approach to space policy of July 1988³⁴. After analysing the European space effort in the world context, its current strengths and weaknesses, and identifying the Community's role, this communication proposed major policy goals for European space policy.

³⁴ The European Community and Space - A Coherent Approach, COM(88) 417 of 26.07.1988.

The discussion presented in the Communication led to the identification of six lines of action for a consistent development of the Community's space activities:

- Research and Technological Development - promoting full complementarity and interaction between the Community's R & D strategy and the programmes of the European Space Agency (ESA)³⁵;
- Satellite Communications - the need for a consistent approach to networks, the development of new services and to regulation;
- Earth Observation - stimulation of the applications market for meteorological, earth resources and environmental satellites;
- Industrial Development - full use of the benefits of the single market, above all to improve the competitiveness of relevant European industry;
- Legal Environment - contributing to the establishment of favourable conditions for the development of European space activities;
- Training - promoting the development of high-level European training.

For the particular case of satellite communications, COM(88) 417 foresees four lines of action:

- Ensuring that satellite techniques are taken into consideration in the development of networks and services at European level and optimising the complementarity of satellite and terrestrial systems;

³⁵ The annual budget of ESA amounted to some 2bn ECU in payment authority in 1989. The major development lines up to the year 2000 are the development of the European space shuttle HERMES, the European space station element Columbus, the ARIANE 5 launcher programme, and advanced satellites for science, earth observation and communications. ESA's budget for development of satellite communications is currently between 250 and 300 million ECUs annually.

ESA has played a key-role in the development of the European capability in satellite communications. The Agency develops and launches experimental satellites to test their viability in orbit (the OTS satellite, launched in 1978, OLYMPUS launched in 1989 and ARTEMIS to be launched in 1993). ESA also developed and launched the initial systems for EUTELSAT and INMARSAT, the so-called ECS series used by EUTELSAT from 1983 onwards and the MARECS-A (launched in 1981) and MARECS-B (launched in 1984) satellites for INMARSAT.

The current ESA OLYMPUS programme is intended to develop and experiment in orbit-technologies in order to develop commercial satellite programmes in the 1990s in communications and broadcasting. The satellite is intended for telecommunications (small terminal systems, data and education services, broadband communications and experimental high-frequency transmissions) and broadcasting (High Definition Television, datacasting, encryption, etc.).

With the exception of Greece, Luxembourg and Portugal, all Community Member States are members of ESA.

- Creating the political, regulatory and standardisation conditions necessary for the development of new services and equipment, to ensure maximum exploitation of space systems;
- Promoting the use of satellite communication systems in the implementation of Community policies, such as in the education and training field;
- Undertake Research and Development to promote the development of space system applications.

The Communication has received an initial review by the Council and is now under examination by European Parliament.

In the period since the publication of COM(88) 417, the Commission has promoted the use of satellite communications systems in the implementation of Community policies in particular in the fields of rural and regional development, notably to implement education and training systems in remote and rural areas of the Community, aid to developing countries, education and training, transport and fisheries, and has had a close liaison with the European Space Agency on the technological developments aimed at preparing future European telecommunication satellite systems.

Under the RACE programme, the role of satellite communications in a future European broadband network is currently being analysed³⁶, and these activities are foreseen to be continued within the new Community R & D framework programme for the period 1990 - 1994. Further, the DELTA programme³⁷ on distance learning applications using information and communications technology, has closely examined the use of satellites as a distribution medium as in the main pilot project Channel E³⁸. The COMETT programme, which promotes partnerships for education and training between universities and enterprises, is supporting the EuroPACE³⁹ project.

³⁶ RACE project R1002 investigates the role of satellites in the foreseen broadband communications environment of the following decades. The project members consist of 10 leading European aerospace companies.

³⁷ Developing European Learning through Technological Advance: this 20 MECU Community programme demonstrates how a full range of information and telecommunication technologies for the next decades relates to the delivery of education and training.

³⁸ Channel E : A programme proposed by the European Institute for the Media for development of an education and satellite service using the SES/ASTRA satellite.

³⁹ EuroPACE, an initiative to deliver expertise training material to R&D sites across Europe. Sponsorship

Europe's space policy during the seventies and eighties has successfully promoted the achievement of a strong European position in the launch rocket field. With the different ARIANE generations, Europe now has a market share of more than 60 % of the satellite launcher market, equivalent to annual revenues of 540 MECUs (1989), with a backlog of 37 satellites to be launched.

In the field of the space segment, Europe has developed some of the most sophisticated satellite technologies now existing, in particular in the field of telecommunications satellites - mainly due to the successful research and development of the European Space Agency. Their latest satellite, OLYMPUS, is one of the largest and most powerful communications satellites yet launched, and is now demonstrating a whole range of new services, particularly those using small ground equipment. The users of Olympus in the field of education and training have been associated in EuroSTEP⁴⁰. However, largely due to the lack of development of a commercial satellite communications market in Europe, the European export position in this area has been weak - the only European telecommunications satellites sold on the world market have been two Arabsat satellites whilst a consortium led by British Aerospace is constructing the INMARSAT-2 generation of satellites.

However, the highest price for the current restrictions in the satellite communications market has been paid in the field of the earth segment. Since the European earth segment market was of insufficient size for European industry to develop its competence in this field, less than 15 % of INMARSAT shipborne equipment is of European manufacture and European suppliers of EUTELSAT terminal equipment have also performed poorly. Only in those fields of the market where liberalisation is relatively advanced in Europe, i.e. television receive-only antennas, European manufacturers have scored a major market share in Europe - over 90 % of all equipment sold in 1989 - even though this equipment currently includes many non-European components.

The fact that - for a particular satellite system - the investment in earth station equipment is substantially more than in the satellites themselves, shows the development potential which could be lost in this area. Discussion with relevant European industry has shown that they believe they will be able to improve their competitive performance once current restrictions in the earth segment are lifted.

comes from Europe's leading IT&T undertakings.

⁴⁰ EuroSTEP : the EUROpean association of users of Satellites in Training and Education Programmes ; an independent user association of more than 300 organisations from 16 European countries which utilises OLYMPUS transmission time for the educational channel for Europe.

It is worth noting here that studies undertaken for the Commission indicate a tripling in the size of the small earth station market, should restrictions be eased.

In addition, a number of current initiatives will need to be followed further, in order to improve the position of the European space industry in satellite communications:

- Full use of the technological potential of the European Space Agency, in order to develop satellite technologies further for both private and public applications; steps towards this have been taken with the approval by the ESA Council in July 1990 of the ARTEMIS⁴¹ experimental mission, and a data relay satellite programme;
- Further application of satellite communication systems in the implementation of Community policies.

This concerns in particular the use of advanced telecommunications for regional development. Through its STAR programme, the Community has given financial support for the setting up of major satellite ground stations and business services terminals for transmission links.

It also concerns the Community policies for education and training, transport and fishing and for the developing countries.

- Full attention to the role of satellites in the context of the future development of telecommunications in the Community, in particular as regards pan-European services, as well as for the development of Integrated Broadband Communications (IBC).

2. Satellite Communications in the Context of Community Audio-Visual Policy

Satellites play a key-role in the Community's audio-visual policy, in particular as regards pan-European services. By the end of 1989, more than 60 television channels were distributed via satellite across Europe.

⁴¹ Advanced Relay and TEchnology MISsion, an experimental satellite under development by ESA which carries a laser optical data relay experiment, an S-band relay payload, an advanced L-band land mobile services payload and a number of spacecraft technology experiments.

2.1. Overall Audio-visual Policy

The Commission has set forth the major policy objectives in the audio-visual field in its Communication of 21 February 1990 to the Council and the European Parliament on audio-visual policy⁴². Major regulatory positions have been defined in Directive 89/552/EEC on Television without Frontiers⁴³.

In the Communication COM(90) 78 the Commission proposes a three-pronged approach towards the development of the European audio-visual industry:

- Establishment of an environment conducive to the competitiveness of the audio-visual industry, based on directive 89/552/EEC.

Harmonisation of national legislation on copyright protection (an important issue for satellite broadcasting, discussed below), encouragement of pluralism and diversity in programme production, and promotion in line with Community competition policy are important prerequisites for the establishment of such an environment.

- Promotion of the audio-visual production industries.

For this purpose the Commission has proposed the MEDIA⁴⁴ programme to contribute to the restructuring of the audio-visual industry while ensuring the necessary synergy with EUREKA-Audiovisuel. Both upstream and downstream of production per se, MEDIA aims to develop a set of complementary actions which derive their value from the Community dimension and which are built around four elements: distribution, production, training and financing. The proposal is, inter alia, to encourage the emergence, on a European scale, of new audio-visual programme services using innovative broadcasting technologies, including interactive communication by satellite.

- Promotion of new technologies.

⁴² Communications by the Commission to the Council and to the European Parliament on audio-visual policy, COM(90) 78, 21.02.1990.

⁴³ Council Directive on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities, 89/552/EEC, 03.10.1989, O.J. L 298 of 17.10.1989, p. 23.

⁴⁴ "MEDIA" - Action programme to encourage the development of the European Audiovisual Industry, 1991-1995, COM(90) 132.

The constant innovations in the field of new technologies, particularly concerning the new generation of satellites and the development of high-definition television (HDTV), have important implications for the audio-visual sector. Along with the numerous public and private sector actors in this field, the Commission participates in this process:

- through its standardisation activities. Council Directive 86/529/EEC of 3 November 1986, was a first step towards the adoption of a common standard for direct broadcasting by satellites⁴⁵;
- through its co-ordination role, which is fundamental to the development and promotion of European HDTV;
- through its research programmes (notably ESPRIT, RACE and AIM).

Satellite broadcasting to the general public including both applications in terms of the definition used in the Radio Regulations for the Broadcasting-Satellite Service, as well as broadcasting applications operating in the framework of the Fixed-Satellite Service - will develop into the major component of transnational audio-visual services in Europe. They must therefore be seen in the light of overall Community audio-visual policy.

2.2. The development of High Definition Television (HDTV) in Europe

On 27 April 1989, the Council adopted a decision on a plan of action⁴⁶ on the introduction of HDTV in Europe. It is envisaged that, following the successful completion of research and development, HDTV services will be introduced in two stages. In a pre-operational phase starting in 1990, experimental and pilot transmissions will be made. It is expected that, from about 1992 to 1995, a number of operators will start offering regular services in HDTV with a wide range of programmes, including films.

It is generally accepted that 1995 will see widespread availability of HDTV services throughout Europe.

⁴⁵ Council Directive on the adoption of common technical specifications of the MAC-packet family of standards for direct satellite television broadcasting, 88/529/EEC, O.J. L 311, 03.11.1986, p. 28.

⁴⁶ O.J. L 142 of 25.05.1989, p. 1.

A major objective of the Council Decision mentioned above is to ensure that the European standard for HDTV programme production and exchange is adopted as a world-wide standard. Considerable progress has been made on the standardisation issue. At the CCIR plenary meeting in Dusseldorf in May 1990, 23 out of 34 basic parameters of the production standard were agreed on. The European 1250/50 HDTV standard, so called because it transmits 1250 lines of picture information and operates at 50Hz, is being developed by a consortium of thirty or so European manufacturers and broadcasters (including some from non-Member States) in Eureka Project No. 95. This Eureka 95 group is also developing the hardware which will be used to demonstrate the system. The Commission works to ensure close co-operation between the MEDIA programme and Eureka 95. Furthermore, it has initiated a series of Audio-visual Forums, attended by all those with an interest in HDTV, at which the work of Eureka 95 is discussed.

In July 1990, at the instigation of the Commission and the European Broadcasting Union, a GEIE (Groupement Européen d'Intérêt Economique) was formed, consisting of industry, broadcasters, independent TV and film producers and other interested parties. The objective of the group, which is known as Vision 1250, is to provide a marketing-oriented complement to the technical development work being carried out by Eureka 95. Specifically, it will, with financial support from Member States and the Community, make hardware developed by Eureka 95 available to programme makers; it will set up demonstrations of HDTV at trade fairs; and it will organise the making and display of HDTV programmes, especially coverage of major sporting occasions. The Group's activities will be carried out from 1990 to 1994; it is anticipated that this initiative will result in many high-quality productions using the 1250 system being made and shown around the world during this four-year period.

2.3. The Role of Satellites in HDTV

As mentioned in chapter III., it is generally accepted that satellites will become the foremost initial transmission medium for HDTV. Indeed, the Eureka-95 programme depends on continued expansion of Direct Broadcasting-Satellite capacity for its commercial success, and hence for the establishment of a European lead in TV development, despite the continuous involvement of the United States and Japan in the field of HDTV.

Direct Broadcasting-Satellites covering Europe and Africa are regulated under the agreement reached at the 1977 World Administrative Radio Conference (refer to chapters II. and III.). This agreement, commonly referred to as the WARC 77 plan, allocated the Broadcasting-Satellite Service (BSS) frequency band to national DBS services. Several orbital locations were assigned to Europe; each European country was allotted five channels at one of the orbital locations. The satellite footprints were intended to give national coverage only, though some spill-over into adjacent countries would be unavoidable. It was envisaged that individual household reception would be possible in each country using antennas of diameters less than 90 cm; therefore high power satellites were required.

As explained in chapter III., in a number of important respects, satellite communications has evolved in ways unforeseeable in 1977. In particular, improved receiver technology means that reception with a small antenna no longer necessitates the use of a high-power satellite: television signals transmitted over medium power satellites using the Fixed-Satellite Service frequency bands, where most of the current channels are transmitted - in particular programmes transmitted via the EUTELSAT-I satellites, the Telecom-1 satellites, DFS Kopernikus and ASTRA - can be received with an antenna of around 90 cm in most parts of Europe.

This means that currently the majority of channels in Europe are transmitted via medium-power satellites. While several DBS satellites conforming to the WARC 77 plan have been launched in Europe, most of those currently in operation will become life-expired just as HDTV becomes widely available, around 1995-97.

There are, in fact, three second-generation DBS systems under consideration in Europe: all of these propose sub-regional (mostly language-based zonal) coverage, more channels per spacecraft and less power per channel. While, a priori, these systems will have substantial advantages with regard to existing DBS systems, they face a major obstacle: they are not in agreement with the WARC 77 plan. Each satellite would therefore have to be individually co-ordinated with all the satellites and terrestrial transmission systems with which it could possibly interfere - a process which would be expensive, time-consuming and of doubtful success. It seems inevitable, therefore, that substantial revision of the criteria contained in the WARC 77 plan will be essential to the implementation of future generation DBS satellites in Europe, and hence to the success of European HDTV.

2.4. Conditional Access Systems

The further evolution of satellite television and other point-to-multipoint systems will require the further development of agreements and standardisation in the field of control of channel access. There are three main groups with a right or interest in either limiting or controlling the audience which can have access to a satellite broadcast signal:

- Business TV and/or videoconferencing operators and users. As the use of closed-user-group television and videoconferencing as business tools to create competitive advantage grows, so too does awareness of the issue of confidentiality. Both operators and users are keenly aware of the importance of "scrambling" or disguising a signal in such a way that only authorised entities can receive it in its original format. The issue of security is perceived as being of special importance where satellite transmission is concerned, though terrestrial transmission systems are by no means necessarily secure.
- Authors and producers of material broadcast. As mentioned, the resolution of copyright issues is of vital importance to the development of European television.

Use of a satellite beam which covers all of Western Europe would bring the potential audience into the hundreds of millions. It is clearly in the interests of both broadcasters and copyright holders to have a clear Community position with regard to a regime for copyright issues.

- Satellite broadcasters offering pay-per-view TV. This is a commercial issue for both satellite and terrestrial broadcasters, which may opt for a system whereby customers, rather than paying a once-off or annual fee to receive programmes, are charged "per view", i.e. per programme or per hour's viewing time. Conditional access systems for pay TV must achieve a balance between low cost and the ease with which the encryption system can be broken to allow unauthorised viewing.

As regards the application of copyright to television broadcasting in the Community, the Commission will soon make its proposals in the context of audio-visual policy and its general policy on copyright.

As regards the implementation of conditional access systems, one major obstacle to a successful resolution of the issue has been the lack of a common European (or international) standard for encryption.

In its Resolution 86/C160/01 of 9 June 1986, on the use of videoconference and videophone techniques for intergovernmental applications, the Council invited the Commission to resolve problems specific to the use of videoconference and videophone facilities by Member States governments and Community institutions, including confidentiality. The Community's RACE programme is studying communications integrity for all telecommunications services and has listed basic requirements for encryption devices. It will be important to develop suitable European standards in this area.

With its proposals of July 1990 on data protection and security of information systems⁴⁷, the Commission has submitted a comprehensive approach to this area - including data protection and protection of privacy in the field of public digital telecommunications networks - and proposed a plan of action of the development of information security measures in this field.

3. The larger European dimension

With the growing interrelationships between the Community and its neighbouring countries, the dramatic changes in Central and Eastern Europe, and the emergence of the larger European dimension as a general determinant of Community policy, a Community approach to satellite communications gains its full importance only if seen in the larger European dimension.

The Community has strong common interest in satellite communications with its neighbours via joint membership - in many cases - of the major organisations of most relevance to satellite communications in Europe. Figure 6 shows membership of Community countries, EFTA countries, the countries of central and Eastern Europe and other neighbouring countries in EUTELSAT, ESA, ETSI, CEPT and INTELSAT, INMARSAT and Intersputnik.

⁴⁷ See COM(90) 314 of 24th September 1990, in particular Proposal for a Council Directive concerning the protection of personal data and privacy in the context of public digital telecommunications networks, in particular the Integrated Services Digital Network (ISDN) and public digital mobile networks and Proposal for a Council Decision in the field of information systems security.

3.1 Cooperation with EFTA and other neighbouring countries, and the European Conference of Postal and Telecommunications Administrations (CEPT)

The Community has traditionally strong ties in satellite communications with the member states of the European Free Trade Association, in particular via common membership - in most cases - of both Community and EFTA countries in the relevant organisations (compare Figure 6).

As the Community and the European Free Trade Association further develop their relationship in a global context and move towards a common European Economic Space, common interests in this field will further intensify, particularly as in a number of EFTA member states current trends are pointing clearly towards the review of regulatory conditions in the sector and the liberalisation of both one-way, and - in some cases - two-way satellite communications.

A major framework of consultation on satellite communications in Europe has traditionally been the European Conference of Postal and Telecommunications Administrations (CEPT), which includes all Community and EFTA countries, as well as a number of other countries such as Turkey and Yugoslavia (see Figure 6).

CEPT has various specialised committees which act in the field of satellite communications in Europe. The main committees involved are the CCTS (Coordination Committee for Satellite Telecommunications) and its subordinate bodies and the CAC (Commercial Action Committee) under which a VSAT group has been established. Since these bodies have a function in defining the role of satellite communications within the developing European telecommunications network it is necessary for the Community to have a complete dialogue with them on future satellite communications evolution in Europe.

Within the general review of telecommunications policies currently taking place in Europe, CEPT is currently undergoing major reforms, such as the separation within the organisation of regulatory and operational functions.

The two major reforms achieved to date are also of key importance for satellite communications: the creation, in 1988, in Sophia-Antipolis, Nice, of the European Telecommunications Standards Institute (ETSI) and the transfer of CEPT's telecommunications equipment standardisation activities to this institution; and the creation of the European Radiocommunications Committee (ERC) and the European Radiocommunications Office (ERO) currently under way.

Figure 6

**COMMUNITY, EFTA, CENTRAL AND EASTERN EUROPE AND OTHER NEIGHBOURING
EUROPEAN COUNTRIES
MEMBERSHIP IN ORGANISATIONS OF MOST INTEREST TO SATELLITE COMMUNICATIONS
IN EUROPE**

	EUTEL- SAT	ESA	ETSI	CEPT	INTEL- SAT	INMAR- SAT	INTER- SPUTNIK	ITU
Belgium	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Denmark	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Germany	◄►	◄►	◄►	◄►	◄►	◄►	◄►	◄►
France	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Greece	◄►		◄►	◄►	◄►	◄►		◄►
Ireland	◄►	◄►	◄►	◄►	◄►			◄►
Italy	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Luxembourg	◄►		◄►	◄►	◄►			◄►
The Netherlands	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Portugal	◄►		◄►	◄►	◄►	◄►		◄►
Spain	◄►	◄►	◄►	◄►	◄►	◄►		◄►
United Kingdom	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Austria	◄►	◄►	◄►	◄►	◄►			◄►
Finland	◄►	◄► ⁽¹⁾	◄►	◄►	◄►	◄►		◄►
Iceland	◄►		◄►	◄►	◄►			◄►
Liechtenstein	◄►			◄►	◄►			◄►
Norway	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Sweden	◄►	◄►	◄►	◄►	◄►	◄►		◄►
Switzerland	◄►	◄►	◄►	◄►	◄►	◄►		◄►

◄► Member
 ≤ ≥ .. application to join pending
 ◄►⁽¹⁾..... Associate Member

Figure 6

	EUTEL-SAT	ESA	ETSI	CEPT	INTEL-SAT	INMAR-SAT	INTER-SPUTNIK	ITU
Bulgaria	≤≥			◄►		◄►	◄►	◄►
Czechoslovakia	≤≥			◄►		◄►	◄►	◄►
Hungary	≤≥			◄►			◄►	◄►
Poland	◄►			◄►		◄►	◄►	◄►
Romania	◄►			◄►	◄►	◄►	◄►	◄►
Yugoslavia	◄►			◄►	◄►	◄►		◄►
Cyprus	◄►		◄►	◄►	◄►			◄►
Malta	◄►		◄►	◄►				◄►
Monaco	◄►			◄►	◄►	◄►		◄►
Rep. of San Marino	◄►			◄►				◄►
Turkey	◄►		◄►	◄►	◄►	◄►		◄►
Vatican City	◄►			◄►	◄►			◄►
Japan					◄►	◄►		◄►
United States					◄►	◄►		◄►
USSR						◄►	◄►	◄►

◄► Member
 ≤≥ .. application to join pending
 ◄► (t) Associate Member

While ETSI is called upon to provide the technical basis for many of the necessary measures required in satellite communications (see chapter V.), the new European Radiocommunications Committee and the European Radiocommunications Office - to be located in Copenhagen - offer a new basis for strengthening frequency coordination in Europe. Council Resolution 90/C 166/02⁴⁸ defines as a major policy goal "working in particular towards the timely allocation of sufficient frequency resources to mobile and satellite applications ...", and welcomes the "current reform of radio frequency planning and coordination mechanisms undertaken by the CEPT, and in particular the decision to create a European Radiocommunications Office allowing for the opinion of all interested parties to be taken into account and having an appropriate organisation ...". It invites the Commission and the Member States and the CEPT "to support the further development of the new framework making available all the resources necessary to ensure the efficiency of its operation and the rapidity of its response ...".

3.2. Importance of satellite communications for the developments in Central and Eastern Europe

The dramatic changes in Central and Eastern Europe have given the rapid development of satellite communications in Europe a new political dimension. The rapid build-up of the telecommunications infrastructure of the countries of Central and Eastern Europe is indispensable for the integration of these countries into the larger European dimension and the successful reconstruction of their economies, as emphasised by the Commission in its Communication of 19 June 1990⁴⁹. One of the major advantages of satellite communications - rapid deployment and immediate large area coverage - give it a key-role in this context, in the fields of both telecommunications and broadcasting.

The countries of Central and Eastern Europe are therefore turning to the use of satellite systems to improve their telecommunications links with Western Europe: Poland became the 27th member of EUTELSAT in February 1990, Romania has since joined, and negotiations are underway with Czechoslovakia and Hungary. Further, it is understood that the third flight model of DFS-Kopernikus, a national

⁴⁸ Council Resolution of 28 June 1990 on the strengthening of the Europe-wide cooperation on radio frequencies, in particular with regard to services with a pan-European dimension, O.J. C 166 of 07.07.1990, p. 4.

⁴⁹ Communication from the Commission to the Council and the European Parliament on the Community's relations with the countries of Central and Eastern Europe - the role of telecommunications, COM(90) 258 of 19.06.1990.

German satellite system, will provide telephony, television distribution and data/business communications throughout the geographical regions of the Federal Republic of Germany including its newly integrated eastern part. Several Central and Eastern European countries - Poland, Czechoslovakia, and Bulgaria - are members of INMARSAT, and expect to use this service both for maritime and land mobile use (see Figure 6).

The possibility of using small terminal systems to provide rapid large area coverage is the subject of active consideration by several Eastern European countries. At the same time they are urgently examining the possibility of permitting additional providers in order to stimulate the early provision of improved telecommunications services, both nationally and for cross-border traffic.

Given that in all countries of Central and Eastern Europe the terrestrial network infrastructure is largely underdeveloped, the introduction of VSAT networks will present itself as an obvious and - in many cases - most effective means of communications. Introduction of satellite technology based on large-scale earth stations will often not provide rapid wide-area coverage, without the necessary terrestrial interface for interconnection.

It seems likely that - in the context of the current general economic reforms in these countries and the development towards a market economy - the situation will lead rapidly to a review of the regulatory provisions concerning deployment of satellite systems in the countries of Central and Eastern Europe. If concurrent action is not taken within the Community, this could well lead to liberal availability of satellite networks in Central and Eastern European countries in advance of such availability in the Community - with a consequential dramatically negative effect on the development of Europe-wide systems.

While common satellite terminal networks could develop rapidly between the countries of Central and Eastern Europe and the Community - if the Community adjusts its own regulatory conditions in the sector - the mutual interests in this sector between the Community and the USSR will need further analysis. Based on its major capabilities in space systems, the USSR has a well developed usage of satellite systems. It is understood that more than 95 % of viewers receive television by means of the joint use of satellite television broadcasting systems and terrestrial distribution facilities. In international satellite communications, the USSR has been active with the establishment of the Intersputnik satellite system (see [Figure 6](#)) and in the context of the Interkosmos programme for the study of problems involved in implementing national and regional communications. The USSR is

already a member of INMARSAT, and also renewed efforts to offer USSR membership in INTELSAT recently became public.

4. External Aspects and the International Environment of Satellite Communications

A coherent Community approach to satellite communications must take full account of the international environment of satellite communications in Europe and of the Community's general interests in external relations.

As shown in chapter II., all Community Member States have obligations and existing international commitments which they must respect - but they should also work jointly towards change where required.

The results of the GATT-negotiations in the context of the current Uruguay-Round will fundamentally influence the Community's relations with its major trading partners in this area - the United States and Japan - but could also have an impact on the international environment in which satellite communications exist. With the growing number of non-European satellites used for European coverage, co-ordination with regard to third countries in the area of satellite services will have to be strengthened. Finally, a Community satellite communications policy must be seen in the context of the overall relations of the Community with regard to other parts of the world: developing its relations with Mediterranean countries, where in the field of satellite communications mutual beneficial links have already been established; contributing to the full use of the potential of satellites in the developing countries - in the context of its relations with the African, Caribbean and Pacific (ACP) countries in the framework of the current Lomé convention, as well as assisting satellite-based development projects elsewhere.

4.1. International Telecommunications Union (ITU)

As shown in chapter II., the International Telecommunications Union is central to the development of satellite communications, notably via its key-role in international frequency co-ordination and the allocation of the orbital resource - with the activities of the International Frequency Registration Board (IFRB) and the World and Regional Administrative Radio Conferences (WARCs and RARCs).

Other main committees concerned are the International Radio Consultative Committee (CCIR) and the International Consultative Committee for Telegraph and Telephone (CCITT)⁵⁰.

The working of the IFRB and the role of the WARC's has been discussed in detail in chapter II. The CCIR is responsible for the study of technical and operating questions on radiocommunications and for the issuing of relevant recommendations.

The CCITT issues recommendations related to standards and specifications as well as to the operation and charging of public telecommunications services. It investigates the interworking of telecommunications satellites with the terrestrial network, especially in today's environment of wide and expanding use of FSS and MSS satellites for telecommunications services.

As set out in the Council Resolution of 30 June 1988⁵¹, common positions are to be adopted in international fora. This was the case with regard to the 1988 World Administrative Telegraph and Telephone Conference (WATT-C) where a new set of International Telecommunications Regulations was negotiated. It is the case in the current negotiations in the framework of the CCIR on the future High Definition Television standard. It should be the case in the future, wherever relevant.

Following Council agreement in 1988, the Community applied for, and was granted, observer status at the ITU Committees and Conferences.

Concerning frequency coordination, Council Resolution 90/C166/02⁵² calls for "the working out of common European positions on the use of the frequency spectrum concerning international frequency co-ordination, in particular with regard to the International Telecommunications Union and its conferences on radio frequencies", and based on the current reform of frequency coordination in the CEPT (see above).

⁵⁰ A further body, the Telecommunications Development Bureau - newly created in the context of the reform of ITU activities subsequent to the decisions taken at the ITU plenipotentiary conference held at Nice in 1989 (Art. 14 of the Constitution) - could gain substantial importance in the promotion of satellite communications for the developing countries.

⁵¹ Council Resolution of 30 June 1988 on the development of the Common Market for telecommunications services and equipment up to 1992, O.J. C 257 of 04.10.1988, p. 1.

⁵² Council Resolution of 28th June 1990 on the strengthening of the Europe-wide cooperation on radio frequencies, in particular with regard to services with a pan-European dimension, O.J. C 166 of 7.7.1990, p. 4, (90/C 166/2).

The major immediate challenge for the European Community will be to define a common position with regard to the next World Administrative Radio Conference which will take place in 1992 (WARC 92), and - based on the strengthened co-operation mechanisms of the CEPT - to create the necessary strong political mandate at Community level required for effective co-ordination in this central area.

4.2. General Agreement on Tariffs and Trade (GATT)

Virtually all aspects of the Internal Market for telecommunications are being influenced, directly or indirectly, by the issues discussed in the context of the on-going trade negotiations in the Uruguay Round.

Positions in the Uruguay Round are expressed by the Community in conformity with Article 113 of the Treaty. It is likely that the Community's negotiating position will remain closely linked to progress in the Community's internal regime, and it is important that the Community's internal and external positions should be consistent.

Amongst the current areas of negotiation, two are of immediate relevance to the satellite sector: services and technical barriers to trade.

With regard to trade in *services*, the negotiations in Geneva have focused on the elaboration of a framework of principles, inspired by the General Agreement on Tariffs and Trade (GATT), which would be applicable to all trade in services.

This framework will be modified or complemented by sectoral annotations, or annexes, to various sectors in order to take into account their specific aspects. For telecommunications, the annotations or annex would cover, in particular, appropriate conditions of access to and use of the network. The principles establishing Directive 90/387/EEC⁵³ on Open Network Provision (ONP) form the basis for the Community's position in this sector.

With regard to *technical barriers* to trade, the Community is seeking to establish a better balance under the GATT agreement by extending its provisions, in particular regarding transparency of specifications adopted by sub-national and private standardisation bodies.

⁵³ Council Directive of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision.

Once adopted, the new GATT agreements should provide a mechanism for extending liberalisation of trade in satellite services and equipment - in the context of general telecommunications trade - to third countries in a balanced way.

4.3. Co-ordination of positions with regard to Third Country providers

As shown in Figure 3, with the diversification of the provision of space segment, a growing number of non-European satellites are emerging which can be used for services with European coverage.

As mentioned in chapter III., six US entities hold conditional construction permits by the US Federal Communications Commission for international separate satellite systems. One entity, Pan American Satellite/Alpha-Lyracom has operated since 1988 an international separate satellite system which provides, inter alia, satellite services in a number of Member States of the Community. Final authorisation for the Orion system is pending, with a launch date planned for 1993. Launch dates and coverage for the Gorizant and Reduga satellites are not published, though several are known to be in orbit. They are owned by the USSR and leased to Intersputnik.

Currently, the Community Member States negotiate individually landing rights for - and access to - non-European satellite systems, other than the INTELSAT and INMARSAT space segments. In the future, stronger coordination in this area will be needed, in order to avoid distortion of market conditions within the Community on the one hand, and on the other hand to gain a stronger bargaining position for negotiating equivalent access to Third Countries for equivalent access for European satellite systems.

The above-mentioned GATT principles on telecommunications trade in general, currently being defined, would seem to provide a suitable basis, on which to develop a common coordinated approach and balanced arrangements with Third Countries in this area.

4.4. Relations with the Mediterranean, Africa, Latin America and other parts of the world

The Community Member States have developed relations on a world-wide basis in the field of satellite communications, both via common interests in the context of the international coordination mechanisms of the ITU in the field of frequency spectrum and orbital allocations, and of INTELSAT and INMARSAT, as well as by using satellite communications for assisting regional development.

In respect of industrialised countries, the Commission, in the Green Paper on the development of the common market for telecommunications services and equipment⁵⁴, has emphasised the importance for the Community of cooperation in the international frameworks with the other industrial countries, such as the United States, Japan, Canada, Australia and New Zealand, who have developed advanced satellite communications capabilities. In addition, the Commission has recommended the setting up of a coherent strategy with regard to telecommunications in its relations to the Third World.

In the framework of its relations with the Third World, the Commission has not only emphasised the necessity to adopt in the field of telecommunications a coherent strategy towards developing countries but also stressed the objective of using satellite communications systems. In its Communications on the Community's approach to space policy set out above, it has considered that priority use should be made of satellite communications in the field of rural and regional development and aid to Third World countries.

A special common interest in satellite communications exists among the Community, the Mediterranean and the African countries. On the one hand, the relationship established between the Community and most of these countries is particularly close and will strengthen and grow even more because of the new dynamism resulting from the completion of the internal market. On the other hand, Europe and Africa share frequencies and the orbital resource in the same, so-called, ITU region (Region 1). The geographical proximity at least in the case of Mediterranean countries gives also a possibility in certain cases of common coverage of these countries and of various European regions.

Therefore, this particular situation requires careful consideration and a number of specific solutions in order to best accommodate the needs of all interested parties.

⁵⁴ Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, Document COM(87) 290 final, 30.06.1987.

At present, a close cooperation has been established between European space industry and the Arab nations in the case of the Arabsat system, with the use of European technology and the purchase of two satellites from a European manufacturer. ARABSAT has recently issued a request for tenders for its second generation satellite system for which various European satellite manufacturers are expected to bid.

A special framework of cooperation is offered by the Lomé Convention which links the Community to a large number of developing countries. The Commission conducts financial and technical cooperation projects to assist various African, Caribbean and Pacific (ACP) countries which are signatories to the Convention. This may be expected to be an ongoing requirement for the Community in the satellite communications field, as these techniques become more and more widely used at regional and national level in newly industrialised and developing countries.

Regarding countries in Central and South America in Asian countries, the Community has developed a cooperation since 1976 and considers that it should be reinforced. Because of the very large requirements and the size of the forty developing countries involved, which represent a population of 2300 million inhabitants, the Commission considers that telecommunications satellites systems constitute a privileged means to facilitate their rural and regional development.

At present, the Community undertakes, together with the Andean Pact countries, studies for the establishment of a pan-regional satellite system, CONDOR.

To summarize, major requirements for the Community in this area should be:

- close cooperation, in the most appropriate way, with countries in ITU Region 1, in order to provide for required coordination concerning European satellite systems and systems in other parts of the Region, such as the planned African Satellite Communications System (RASCOM) which is sponsored by a number of African countries and for which the ITU is acting as coordinator;
- continuing emphasis on the use, and where possible, the development of satellite communications in the aid programmes by the Community for the developing countries;

- in a more general context, close international cooperation with both other industrialised countries and the developing world in the framework of the International Telecommunications Union and especially with regard to the forthcoming WARC conferences, as well as with regard to the international telecommunications satellite organisations, in order to promote change where required, taking full account of the special interest of the developing countries in the balanced development of world-wide satellite communications.

5. Summary

The future evolution and regulation of satellite communications in the Community must be seen in a global policy context.

Satellite communications is by far the largest commercial application of space technology.

The European Space Agency's cumulated total effort in space up to the year 2000 will total 30 billion ECUs in addition to national European space programmes. With the different Ariane generations, Europe has developed a market share of more than 50 % of the world satellite launcher market.

In the field of telecommunications satellites, mainly due to the successful research and development of the European Space Agency, Europe has developed some of the most sophisticated satellite technologies. However, due to the lack of development of a commercial satellite communications market in Europe, Europe's market position in this area has remained weak, compared to the booming US and Japanese markets.

An adjustment of the regulatory conditions of satellite communications in Europe therefore will determine, to a large extent, the commercial success of Europe's effort to gain a future-proof position in space.

It will also determine the success of a major component of the Community's audio-visual policy, the early introduction of High Definition Television (HDTV) in Europe - given that it is generally accepted that satellites will become the foremost initial transmission medium for its Europe-wide introduction.

The future development of the Community's satellite communications market only gains its full importance when seen in the larger European dimension - the future European Economic Space and the dramatic changes in Central and Eastern Europe.

The rapid build-up of the communications infrastructure in Central and Eastern Europe is indispensable for the reconstruction of the economies of these countries. Given the lack of an adequate terrestrial infrastructure, the free development of VSAT terminal networks will offer rapid advance to these countries. Given the parallel trends in a number of EFTA countries towards a more liberal environment for these systems, lack of adjustment of the regulatory conditions by the Community for such systems would leave the Community lagging behind the developments in the other parts of Europe, effectively blocking the development of true trans-European systems. At the same time, the reforms undertaken by the European Conference of Postal and Telecommunications Administrations in the fields of standards and frequency coordination and planning - with the creation of ETSI on the one hand, the European Radiocommunications Committee and the European Radiocommunications Office on the other - prepare the ground for the establishment of regulatory conditions which will promote Europe-wide services.

Finally, the current global development in the International Telecommunications Union and the principles to be agreed in the context of the GATT Uruguay Round negotiations will facilitate the future development of satellite communications at a world level but also require the strengthening of coordination between Member States. This concerns both coordination of positions with regard to Third Country providers, as well as the further development of relations in this field with the Mediterranean, Africa, Latin America and other parts of the world.

A special common interest in satellite communications exists between the Community and the Mediterranean and the African countries, both because of the close global relationships which have developed between the Community and many of these countries, as well as because of the fact that Europe and Africa share frequencies and the orbital resource in the same ITU Region.

V. EXTENDING THE PRINCIPLES OF COMMUNITY TELECOMMUNICATIONS POLICY TO SATELLITE COMMUNICATIONS

Satellite communications were set aside for later consideration in the Green Paper on the development of the common market for telecommunications services and equipment⁵⁵. The consensus achieved on the basis of this Green Paper, and the subsequent political decisions on the general future regulatory conditions of the telecommunications sector in the European Community - in particular at the Telecommunications Council on 7th December 1989 - can now be the basis on which to build a common regulatory position in the field of satellite communications.

The obligation to complete the Community's internal market for telecommunications by the end of 1992 cannot be achieved unless agreement is reached on a common set of rules. Failure to do so would amount to maintaining the fragmentation of the Community market and blocking the development of the Community's satellite industry. In particular, a broad consensus is needed with respect to the orientation, scope and timescale of the necessary measures. The Green Paper on Telecommunications aimed at bringing about this consensus, and the Council of Ministers, in its Resolution of 30 June 1988⁵⁶, unanimously approved the main conclusions of the Green Paper. In doing so, the Council identified satellite communications as the following major goal in telecommunications policy:

"working out a common position on satellite communications, so that this new information medium can develop in a favourable environment, taking account of the general rules of operation and exploitation of the network environment, as well as the competition rules of the Treaty and existing international commitments of the Member States".

⁵⁵ Towards a Dynamic Economy - Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, Document COM(87) 290 final, 30.06.1987.

⁵⁶ Council Resolution of 30th June 1988 on the development of the Common Market for telecommunications services and equipment up to 1992, O.J. C 257 of 04.10.1988, p. 1.

1. General principles

Applying the general consensus achieved in telecommunications to satellite communications should build on a number of broad principles:

- the future regulatory conditions for satellite communications must respect those regulatory safeguards which Member States may apply in the telecommunications sector in accordance with the general consensus on telecommunications already achieved, but should not introduce any additional restrictions beyond those related to specific conditions in the field of satellite communications, where these can be justified in accordance with Community law - in particular competition rules - and international commitments;
- they should provide for a dynamic development of earth segments and space segments in the Community, and meet the conditions required by enterprises to operate in the Community-wide 1992 market; allow the full development of the Community's space industry in this area; and support the Community's policy for a common audio-visual space;
- they must fully apply Community law to this sector. The Community cannot admit - or afford - the withdrawal of a sector of such vital importance from the working of the single market, or from the full application of its rules.

The Green Paper on the development of the common market for telecommunications services and equipment has recalled the Articles of the Treaty of most relevance to telecommunications:

- Article 3f requiring the institution of a system ensuring that competition is not distorted,
- Article 5 under which the Member States are bound to fulfil their obligations under the Treaty,
- Article 8a requiring the internal market to be completed by 31 December 1992.
- the provisions concerning the free movement of goods, in particular Articles 30 to 36;

- Article 37 requiring the adjustment of state commercial monopolies and forbidding the creation of new state commercial monopolies,
- the provisions concerning the freedom to provide services and the freedom of establishment, in particular Articles 52 to 66;
- the provisions governing competition, in particular Articles 85, 86 and 90;
- the provisions concerning the common commercial policy, in particular Articles 110 to 116;
- the general provisions for the approximation of provisions laid down by law, regulation, or administrative actions in Member States as directly affecting the establishment or functioning of the common market, in particular Article 100(a).

Beyond these Articles, account should be taken of further work, in particular the principles set out in the Commission's guide-lines on the application of competition rules to the telecommunications sector⁵⁷, and the substantial amount of Community law in the telecommunications sector resulting from the case law and secondary legislation and the implementation of the Green Paper⁵⁸, inter alia:

- Commission Directive of 16th May 1988 on competition in the markets in telecommunications terminal equipment (88/301/EEC)⁵⁹;
- Council Directive of 28th June 1990 on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (90/387/EEC)⁶⁰;
- Commission Directive of 28th June 1990 on competition in the markets for telecommunications services (90/388/EEC)⁶¹;

and proposed Directives on which common positions have already been obtained, in particular :

⁵⁷ To be published

⁵⁸ Towards a competitive Community-wide telecommunications market in 1992 - Implementing the Green Paper on the development of the Common Market for telecommunications services and equipment, COM(88)48, 09/02/1988.

⁵⁹ O.J. L 131, 27/05/1988

⁶⁰ O.J. L 192, 24/07/1990, p. 1

⁶¹ O.J. L 192, 24/07/1990, p. 10

- Proposal for a Council Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity⁶²;

as well as legislation in related fields of direct relevance:

- Council Directive on the procurement procedures of entities operating in the water, energy, transport, and telecommunications sectors (90/531/EEC)⁶³.
- Council Directive on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities (89/552/EEC)⁶⁴;
- Council Directive on the adoption of common technical specifications of the MAC/packet family of standards for direct satellite television broadcasting (86/529/EEC)⁶⁵;
- Council Directive on the approximation of the laws of Member States relating to electromagnetic compatibility (89/336/EEC)⁶⁶.

Where these measures do not apply directly to satellite communications, a Community approach to this sector should take account of the principles underlying this legislation. It should in particular:

- allow the full use of the new technological potential to all market participants, both in the terminal and services markets;
- define, therefore, exclusive or special rights narrowly and replace them by licensing schemes where the continued maintenance of regulatory safeguards is required by public interest;
- provide for the clear separation of regulatory and operational functions, in order to avoid conflicts of interest and distortion of competition and markets.

⁶² Amended proposal, O.J. C 187, 27.7.1990, p. 40

⁶³ O.J.L. 297, 29.10.1990, p. 1.

⁶⁴ O.J. L 298, 17/10/1989, p. 23.

⁶⁵ O.J. L 311, 3/11/1986, p. 28.

⁶⁶ O.J. L 139, 23/5/1989, p.19.

2. Future treatment of the earth segment

Traditionally, the large earth stations used with INTELSAT and EUTELSAT systems for long distance telephony and television programme exchange were owned and operated by the telecommunications organisations. In the future, the bulk of earth stations and hence the biggest market segment will consist of small terminals with antennas of 0.5 to 2.5 meters (see Chapter III). VSAT terminals usually come under this category. However, the term "small terminal" is difficult to quantify and implies defining a limit in antenna diameter so that they can be differentiated from the large earth stations mentioned above. Any such limit would be arbitrary and can change with technological development. It therefore should not - and cannot - be used for the determination of the regulatory regime that should apply to those terminals.

The criterion for distinguishing different kinds of satellite earth stations should therefore not be their size, but the function for which they have been built and which may require different regulatory safeguards:

- entertainment broadcast (TV) reception terminals (Direct Broadcast Satellite and Direct-To-Home-receive only terminals - DBS and DTH terminals);
- receive only satellite telecommunications terminals (including mobile, position fixing, etc.) for other than entertainment broadcasting reception;
- transmit/receive terminals for two-way operations (including mobile, position-fixing, etc.);
- central control earth stations (hub stations) for private terminal systems.

2.1. Entertainment broadcast (TV) reception terminals

The supply, installation, ownership, operation and maintenance of DBS and DTH receive-only terminals for entertainment broadcasting reception is already largely liberalised within most Member States, although in the past the Commission has been confronted with a number of complaints that have led to infringement procedures against certain Member States⁶⁷. Most of these cases have been resolved in the sense that the Member State involved agreed to liberalise the market for receive-only terminals (refer to chapter II.). Such terminals may be considered as consumer goods, fulfilling a function similar to a traditional roof-top antenna for the reception of terrestrial radio and television broadcast services. The Green Paper on the development of the Common Market for telecommunications services and equipment recalled "that the general trend in Europe now seems to be that domestic receive-only installations (TVROs) designed to receive high power DBS (Direct Broadcast Satellite) services will not require a licence".

The problem is of immediate relevance with the newly launched DBS satellites (TDF-1 and 2, TV-SAT-2, BSB-1, TELE-X, OLYMPUS), and the satellites used for services such as Direct to Home ASTRA and the EUTELSAT and TELECOM 2nd generation satellites. Estimates have indicated that a market exists for a potential of 100 million terminal units in Europe, of which between 4 and 20 million DBS and DTH terminals are forecast to be sold by 1996. Obviously, the Community will only be able to reap the benefits of this market potential if this market is freed from restrictive regulations.

2.2. Receive only satellite telecommunications terminals

Unlike a DBS or DTH terminal, a receive-only telecommunications terminal would be optimised for reception of point-to-multipoint data and voice signals, which may include video-transmissions (in analogue or digital format). However, there are strong similarities in overall function between these two classes of earth stations.

Use of such terminals for point-to-multipoint services poses no threats to other earth station users or operators since the terminals do not have transmit capability.

As has been explained (see chapter III.), these are mainly new types of services which are not provided by conventional means.

⁶⁷ See for example Sixth Annual Report to the European Parliament on Commission monitoring of the application of Community law - 1988, O.J. C 330 of 30.12.1989, p. 1, points 90 and 99.

2.3. Transmit/receive terminals

It is established international practice that a licence is normally required to operate a radio transmitter. Thus, the operation of a small terminal, capable of sending - and receiving - signals, may be expected to be subject to a licensing regime in order to ensure correct frequency assignment and coordination, the limitation of potential interference to an acceptable level and, in certain cases, knowledge of the geographical location of the terminal. There is also a public interest in the proper functioning of the transmitter which can justify mandatory type-approval and the requirement to maintain the equipment in a prescribed manner.

2.4. Central control earth stations (hub stations) of satellite terminal networks

Remote terminals in private terminal networks of the current generation ("star networks") generally communicate only via a central nodal earth station, which then provides onward connections as necessary. The remote terminals do not communicate directly with each other. In the next generation of networks ("mesh-networks") this will be possible. However, in both types of network, a central control function will be present. For the purpose of this document, the "hub" earth station is considered the earth station which incorporates the central control function of the network.

A hub earth station is always a two-way (i.e. transmitting and receiving) station and from the equipment point of view a considerably more sophisticated facility than a remote terminal in the network, in the case of star networks the "hub" station has the higher transmit power and greater usable bandwidth necessary to function as a central communications facility. It may therefore require a more comprehensive licence.

2.5. Abolition of exclusive or special rights

After the publication of the Green Paper, the Commission has implemented its objective of opening up the market for terminal equipment by adopting Directive 88/301/EEC⁶⁸ which provides for the withdrawal of all special and exclusive rights for the provision of terminal equipment. A number of transitional periods were foreseen during which the Member States were to formalise and publish technical specifications and type-approval procedures for terminal equipment. The last of these periods expired on 30 June 1990. Thereafter, the provision of terminal equipment which is in conformity with the technical specifications, may no longer be restricted.

The issue to be resolved here is whether the market for satellite earth stations should be treated in the same way as the market for conventional terminal equipment. As mentioned in chapter II., receive-only satellite earth stations not connected to the public network of a Member State are included among the terminal equipment defined in Article 1 of Directive 88/301/EEC so that their provision is already free from restrictions.

Thus, the question remains whether *other* satellite earth stations are to be treated in the same way as receive-only satellite earth stations. The answer to this question will have to be based on Article 30 and 37 of the Treaty. Article 30 prohibits restrictions on imports - and all measures having equivalent effect - of products in free circulation in the Community. To the extent that satellite earth stations have been legally marketed in one of the Member States, they should in principle be able to circulate freely throughout the Community.

Article 37 of the Treaty aims at eliminating all discriminations resulting from state monopolies of a commercial character, with regard to the conditions under which goods are procured and marketed between nationals of Member States. If a Member State establishes or maintains a monopoly for the provision of satellite earth stations, users may be prevented from freely choosing the equipment that best suits their needs in terms of price and quality, regardless of its origin. Moreover, producers of satellite earth stations from other Member States may either be barred from access to this market or at least suffer a competitive disadvantage in marketing their equipment.

⁶⁸ Commission Directive of 16 May 1988 on competition in the markets for telecommunications terminals equipment (88/301/EEC), O.J. L 131 of 27.05.1988, p. 73.

It follows that the provision of satellite earth stations in general may no longer be monopolised by the Member States. Users and service providers should therefore be able to benefit from a Community-wide market for *all* satellite earth stations.

Satellite terminals are technologically and functionally separate from the public terrestrial network infrastructure. To the extent that certain types of satellite earth stations are used for the provision of services which might continue to be the subject of special and exclusive rights, the *use* made of such satellite earth stations may be made subject to certain regulatory safeguards via appropriate licence conditions. However, an outright prohibition on imports and the monopolisation of the marketing for such equipment would be excessive with regard to the objective sought, since all satellite earth stations are able to perform several functions most of which will form part of the liberalised area.

Compared to monopolisation, restrictions on the use of equipment constitute a less restrictive measure. Community law would only permit this kind of restriction to be imposed on owners of satellite earth stations as far as they correspond to legitimate regulatory safeguards, expressed via appropriate licensing conditions. As shown below, only transmit/receive terminals require particular safeguards and therefore qualify for licensing.

Entertainment broadcasting (TV) reception terminals (TVROs) and receive-only telecommunications terminals should not be subject to any restrictions and therefore should not be subject to licensing.

3. Right to use / provide service

A central principle of the Community's policy approach to the telecommunications sector - as set out in the Green Paper on the development of the common market for telecommunications services and equipment⁶⁹ and confirmed by Council⁷⁰ is that exclusive and special rights should be defined narrowly, in order to allow full use of the technological potential to all market participants. The Green Paper recalled that "the European Court of Justice has explicitly recognised the right of network users to benefit fully from new opportunities offered by technological progress (British Telecom Case 41/83; Commission vs. Italy of 20th March 1985)" and it emphasised that "the justification of continued exclusive provision of certain basic

⁶⁹ Towards a Dynamic Economy - Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, Document COM(87) 290 final, 30/06/1987

⁷⁰ Council Resolution of 30th June 1988 on the development of the Common Market for telecommunications

services must therefore be weighed carefully against the restrictions which this may impose on users' applications for their own use, shared use, or provision of services to third parties". The Green Paper made it clear that, in particular, new technologies in adjacent fields such as satellite communications would need special consideration.

3.1. Signal transmission to / reception from satellites (uplink/downlink).

The consensus achieved at the Telecommunications Council of 7th December 1989 on general Community telecommunications policy - and incorporated in Council Directive 90/387/EEC⁷¹ and Commission Directive 90/388/EEC⁷² - has identified the exclusive or special rights and the regulatory safeguards which Member States may implement in the terrestrial telecommunications sector, in conformity with Community law and in particular competition rules.

According to Directive 90/388/EEC, exclusive or special rights may be entrusted to Telecommunications Organisations for the provision and operation of the terrestrial public network infrastructure and the public voice telephony service, and special regulatory safeguards may be established, via appropriate licensing schemes, for public data communications services, in accordance with Community competition rules and the procedures established in Commission Directive 90/388/EEC⁷³.

Licensing schemes implementing regulatory safeguards must be based on non-economic criteria, be transparent and non-discriminatory and must introduce no constraints except those mentioned above or based on "essential requirements"⁷⁴, i.e. network security and integrity and, in justified cases, interoperability and data protection.

In proposing this approach, the Commission relied on Articles 59 and 86 of the

services and equipment up to 1992, O.J. C 257, 04/10/1988, p. 1

⁷¹ Council Directive of 28th June 1990 on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (90/387/EEC)

⁷² Commission Directive of 28th June 1990 on competition in the markets for telecommunications services (90/388/EEC) O.J. L 192, 24/07/1990, p. 10

⁷³ Commission Directive of 28th June 1990 on competition in the markets for telecommunications services (90/388/EEC) O.J. L 192, 24/07/1990, p. 10

⁷⁴ According to Council Directive 90/387/EEC "essential requirements" means the non-economic reasons in the general interest which may cause a Member State to restrict access to the public telecommunications network or public telecommunications services.

Treaty. While Article 59, as interpreted by the Court of Justice, permits certain restrictions on the freedom to provide services that are non-discriminatory and are justified by the general interest, that Article of the Treaty requires the abolition of all other restrictions on the freedom to provide services within the Community. Likewise, Articles 85 and 86 in conjunction with Articles 3f, 5 and 90 of the Treaty prohibit Member States from taking any measure which would enable a telecommunications organisation, either alone or acting in concert, to prevent or restrict access by competitors to the market for telecommunications services, unless such restriction is amenable to exemption under Article 85(3) of the Treaty and such exemption has actually been granted. Abuses of a dominant position may never be exempted whether or not they are induced, encouraged or ordered by Member States.

The objective of the single market and the full application of competition rules require the adjustment of regulatory regimes. Adjustment means, *inter alia*, in addition to a prohibition on discrimination, that any exercise of regulation which is demonstrably restrictive of competition needs justification, by mandatory sector-specific requirements indispensable for the proper functioning of the system, in the general interest and non-economic in nature.

In particular, any restrictions resulting from exclusive or special rights for the provision and operation of the terrestrial public network infrastructure and for the public telephone service, as well as the special regulatory safeguards for the provision of public data services established by Member States in accordance with the procedures defined in Directive 90/388/90, may only extend to satellite communications systems in as far as they can be considered as being equivalent to these two-way public service categories.

Notwithstanding the special provisions applying to broadcasting services to the general public defined in Directive 89/552/EEC⁷⁵, one-way services by definition do not fall into this category.

⁷⁵ Council Directive on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities, 89/552/EEC/.

The public voice telephone service is defined in Directives 90/387/EEC and 90/388/EEC^{76,77} as the commercial provision for the public of direct transport of real-time speech via the public switched network or networks such that any user can use equipment connected to a network termination point to communicate with another user of equipment connected to another termination point.

Even large-scale two-way satellite communications systems - such as extensive VSAT systems - do not fulfil this requirement if not connected to the public switched network. In this light, two-way satellite communications systems should only be considered as equivalent, if connected to the public switched terrestrial network infrastructure and interlinked with the two-way public services mentioned above.

By extension of the consensus and the legal situation achieved for terrestrial telecommunications, the transmissions of signals to/from satellites (uplink/downlink) and the corresponding operation and use of terminal equipment in a system not connected to the public switched network infrastructure, should therefore not be subject to any restrictions except those justified by the avoidance of harmful interference, and, in justified cases, by data protection and the protection of privacy, and standards to the extent required by Community law.

Should a Member State consider that very large satellite communications systems not interlinked to the two-way public services mentioned above obstruct in law or in fact, because of their competition with the telecommunications organisation, the performance of the latter's task of providing public telecommunications services, and that further restrictions would have to be applied to allow the carrying out of the particular tasks entrusted to the telecommunications organisation in accordance with Article 90, they would have to demonstrate that such systems would meet criteria equivalent to those set out in Directive 90/388/EEC with reference to Article 90(2), subject to Commission scrutiny and dependent on the interests of the Community.

⁷⁶ Council Directive of 28th June 1990 on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision (90/387/EEC).

⁷⁷ Commission Directive of 28th June 1990 on competition in the markets for telecommunications services (90/388/EEC) O.J. L 192, 24/07/1990, p. 10.

For the operation of transmit/receive terminals - including hub-stations - in a system connected to the public switched network, Member States may establish additional regulatory safeguards to ensure compliance with the restrictions resulting from exclusive or special rights for the provision of public telephony service, as well as the special conditions and licensing schemes for the provision of public data services established in accordance with Directive 90/388/EEC.

3.2 Licensing conditions

Licensing conditions must be justified, be proportionate to the objective sought, be transparent, and non-discriminatory.

They must not lead to technical restrictions which would unduly impede permitted activities or use of equipment - as would the simple prohibition of interconnection of transmit/receive terminals with the public network infrastructure. Licensing procedures must fully respect the principle of the separation of regulatory and operational functions.

3.2.1. Avoidance of harmful interference and frequency co-ordination

An essential requirement applicable to satellite communications and of equivalent importance to the requirement of network security and network integrity in the terrestrial network, is the need to avoid unacceptable interference with other satellite or radio communications systems, in accordance with Council Directive 89/336/EEC⁷⁸ concerning electromagnetic interference, and in accordance with the coordination procedures agreed on a global basis by all members of the International Telecommunications Union⁷⁹, established in the Radio Regulations

⁷⁸ Council Directive on the approximation of the laws of Member States relating to electromagnetic compatibility, 89/336/EEC, 3/5/1989, O.J. L 139, 23/05/1989, p. 19.

⁷⁹ Article 34 of the ITU Constitution (Nice 1989) stipulates: "All stations, whatever their purpose, must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other Members or of recognised private operating agencies, or of other duly authorised operating agencies which carry on radio services, and which operate in accordance with the provisions of the Radio Regulations....."

Article 33 states: ".....In using frequency bands for radio services, Members shall bear in mind that radio frequencies and the geostationary satellite orbit are limited natural resources and that they must be used rationally, efficiently and economically, in conformity with the provisions of the Radio Regulations, so that countries or groups of countries may have equitable access to both, taking into account the special needs of the developing countries and the geographical situation of particular countries."

and administered by the International Frequency Registration Board of the International Telecommunications Union (reviewed in Chapter II.).

As the antenna size of satellite terminals decreases, their discrimination ability diminishes and their interference potential increases if the necessary precautions are not taken.

European Telecommunications Standards for remote terminals should be guided by the principle of minimising interference and maximising possibilities for co-existence of terminal networks.

Given the significant risk of harmful interference to other services caused by erroneous operation or major antenna pointing errors, licensing and type approval procedures for transmitting terminals may include the requirement that all satellite terminals are installed, supervised and serviced by qualified technical staff - either by the owner demonstrating the required professional level, or by qualified installation and maintenance organisations. This is in line with the principles established in Directive 88/301/EEC⁸⁰ which foresees that "economic operators may be required to possess the technical qualifications needed to connect, bring into service and maintain terminal equipment on the basis of objective, non-discriminatory and publicly available criteria".

Large scale experience - in particular in the United States - with similar satellite terminal equipment installation requirements, has shown that no major difficulties are experienced in this respect in practice.

In order to further facilitate identification of satellite terminals causing harmful interference to other services, it should be investigated whether electronic identification systems should be included in the standards for such equipment.

3.2.2. Data protection and technical standards

The principle that services provided via satellites should be subject to the same regulatory principles as services provided via terrestrial networks, leads to consideration - in equivalence with Directives 90/387/EEC and 90/388/EEC - of the protection of data and interoperability as further essential requirements where appropriate and justified.

⁸⁰ Commission directive of 16th May 1988 on competition in the markets in telecommunications terminal equipment, O.J. L 131, 27/05/1988.

Satellite services should not be allowed to by-pass data protection requirements which may be introduced in terrestrial services and networks as set forth in the Commission's proposals in this area⁸¹.

As regards technical compatibility and standards, Directive 90/387/EEC foresees - for the provision of services via the terrestrial network - "... if the implementation of European standards ... appears inadequate to ensure the interoperability of transfrontier services in one or more Member States, reference to European standards may be made compulsory to the extent strictly necessary to ensure such interoperability and to improve freedom of choice for users". In order to achieve the same objective for services provided via satellites, requirements for technical standards may be foreseen to the extent required by Community law.

3.2.3. Other requirements

Directive 90/388/EEC allows for the provision of public data services via terrestrial networks to be subject to additional requirements resulting from general trade regulation and relating to conditions of permanence, availability and quality of service, subject to verification by the Commission of compatibility with the Treaty rules. Apart from the case where transmit/receive stations - connected to the public network - are used for the provision of such services, additional conditions of this nature should only be considered as far as they are indispensable to ensure ability to comply with the essential requirements set out above, such as avoidance of harmful interference and efficient use of the frequencies allocated in the framework of frequency coordination.

Any other requirements of this kind should be left to the normal contractual relationships between service provider and customer and the general legislation regulating such relationships.

As regards other general regulation of potential impact on the establishment of satellite terminals, such as that relating to environmental considerations, and town planning, aimed at preventing unsightly development, it can be expected that this could only become a factor of some significance in the mass market of DTH reception terminals. In this regard, environment considerations must be carefully balanced against the principle of freedom of information. Standards for such

⁸¹ See COM(90) 314, in particular Draft Proposal for a Council Directive concerning the protection of personal data and privacy in the context of public digital telecommunications networks, in particular the Integrated Services Digital Network (ISDN) and Public Digital Mobile Networks.

terminals should be designed in such a way as to minimise the negative effects on the environment in order to avoid any major restrictions on the deployment of satellite terminals in this regard.

Given the rapid development of technology and in particular of transmission, access and coding techniques, any technical limitations, such as limitations on bit rates transmitted, are intrinsically liable to obsolescence and should not be used in licensing procedures.

This applies also to the implementation of essential requirements, such as requirements concerning data protection. As pointed out, regulatory safeguards should not lead to undue technical restrictions. Systems which require conditional access (see chapter IV.) can in general be implemented by using suitable encryption methods under the responsibility of the sender. Where international obligations require the respect of data protection and confidentiality⁸², such protection can be ensured via the licensing conditions. In the particular case of receive-only terminals operating in non-broadcast bands - for which licensing does not seem required nor practical - a requirement for an indication that such equipment may not legally be used for unauthorised access should be sufficient, as is the practice - in many cases - with regard to other radio receivers.

3.2.4. Mutual recognition of licences

The freedom to provide services under Article 59 of the Treaty implies an extension of an operating licence to the whole Community subject to non-discriminatory requirements that are justified by the general interest. Thus a hub station operator or service provider authorised to transmit via a satellite towards receive-only earth stations, would not have to negotiate "landing rights" in other Member States. However, for a private satellite terminal network consisting of transmit/receive terminals located in a number of Member States, operating licences would be needed. In order to avoid the administrative delays involved in numerous individual licensing procedures, a Community scheme for the mutual recognition of licences for satellite terminals should be established so that the operating licences granted by the authorities of one Member State would be recognised in all other Member States.

⁸² Article 26 of the ITU Constitution foresees that "Members agree to take all possible measures, compatible with the system of telecommunication used, with a view to ensuring the secrecy of international correspondence ...". A similar obligation is contained in Article 23 of the Radio Regulations.

Based on the principles set out, such a scheme should lay down the conditions for the Community-wide operation of terminal networks and possible conditions regulating hub station operators.

It should in particular facilitate the establishment of two-way networks across the Community by, inter alia, providing for class licences for networks operating within frequency bands designated with priority to Community-wide satellite applications. These class licences should give the possibility of operating, e.g., VSAT networks throughout the Community under a single licence, without any need of further licensing or frequency coordination for the individual participating satellite terminals in the Member States. Networks operating within non-designated frequency bands should be licenced with a minimum of obligatory procedures for frequency coordination.

In order to make such a scheme effective, it will have to be accompanied by a number of harmonisation measures:

- Mutual recognition of type approval for satellite terminal equipment (see below);
- Strengthened frequency coordination related to satellite communications, building on the current reform of the European Radiocommunications Committee and the establishment of the European Radiocommunications Office (see chapter IV.), to designate in particular certain bands with priority to Community-wide satellite applications, such as needed for the easy operation of class licences;
- Specific definition of Open Network Provision (ONP), as defined in Directive 90/387/EEC, concerning the connection of satellite terminal networks to the terrestrial public network infrastructure, subject to the constraints and regulatory safeguards set out. This would provide Europe-wide harmonised interfaces between satellite systems and the public network, extending the concept of Open Network Provision to satellite communications.

4. Future treatment of the space segment

Current regulation of the space segment still reflects, in most cases, the situation in the sixties and seventies where the only technically and economically feasible application of satellite communications was their use as an additional transmission path to carry international or national long distance traffic for telecommunications organisations.

As shown in the preceding chapters, this situation has now substantially changed. In Europe, additional to the international satellite organisations, a number of additional providers of space segment have been authorised by Member States - both telecommunications organisations at the national level as well as other organisations (refer to Figure 2).

For the development of a coherent approach to the future access to - and provision of - the space segment, two basic mechanisms which determine the current regulation of the space segment in Europe must be carefully considered:

- the international commitments of Member States concerning frequency co-ordination and the use of the orbital resource in the context of the International Telecommunications Union, its permanent organ, the International Frequency Registration Board, and the respective globally agreed Radio Regulations. This has been discussed in Chapter II. It means that at this stage, only Member States, acting individually, can initiate the necessary procedures for both utilisation of frequencies and orbital resources;
- the international commitments of Member States relating to the international telecommunications satellite organisations INTELSAT and INMARSAT and the European Telecommunications Satellite Organisation EUTELSAT and the respective Conventions and Operating Agreements. Of major consequences for the access to - and use of - the space segment provided by these organisations are the provisions in these arrangements giving the Signatories the exclusive right for allotment of satellite (space segment) capacity to satellite service providers, and the provisions concerning economic and technical coordination of space segment intended to be provided by other organisations (space segment providers).

As mentioned previously, the situation is further complicated by the fact that all Member States have designated their telecommunications organisations to act as signatory to the Operating Agreements of the international telecommunications satellite organisations⁸³ while in a number of Member States these organisations are also mandated to represent the Member States with regard to the ITU procedures.

With the growing diversification of satellite applications and the growing number of actors wanting to provide space segment capacity and/or satellite services via space segment, this now entangles the telecommunications organisations more and more in the delicate situation of being referee and player at the same time. The lack of separation between the regulatory and operational functions now leads to growing conflicts of interest.

In order to bring the regulation of access to - and provision of - space segment in line with general Community telecommunications policy, a number of basic principles will have to be emphasised:

- the principle of open and efficient access, based on objective, transparent and non-discriminatory procedures;
- clear separation of regulatory and operational functions;
- full application of the provisions of the Treaty, in particular competition rules.

The Member States are obligated to exercise their influence in order either to achieve an application of international agreements in conformity with the Treaty or to bring about an amendment of these agreements. The potential for conflict which may result from the current situation with regard to Treaty rules may be demonstrated by quoting from the principles set out in the Commission guide-lines on the application of competition rules in the telecommunications sector⁸⁴, as regards application of articles 85 and 86 to satellites:

⁸³ In the case of EUTELSAT Article II.b) of the Convention states that a signatory of the Operating Agreement is a "designated public or private telecommunications entity" or a Party itself.

In the case of INTELSAT and INMARSAT the equivalent Articles are II.b) respectively 2.3.

The large majority of Member States have designated their national telecommunications organisations (for details see Fig. 1). Italy has established a special organisation (TELESPAZIO). The United Kingdom has established the "Signatory Affairs Office", separated within British Telecom, but BT is still carrying the full financial responsibility.

⁸⁴ To be published.

"... agreements between TOs (Telecommunications Organisations) concerning the operation of satellite systems in the broadest sense are caught by Article 85. As to space segment capacity, the TOs are each other's competitors, whether actual or potential. In pooling together totally or partly their sales of space segment capacity they may restrict competition between themselves.... Restrictions on third parties' ability to compete are likely to exclude the possibility of ... an exemption. It should also be examined whether such agreements strengthen any individual or joint dominant position of the parties, which also would exclude the granting of an exemption. This could be the case in particular if the agreement provides that the parties are exclusive distributors of the space segment capacity provided by the agreement....".

"An exemption is unlikely to be granted also when the agreement has the effect of reducing substantially the supply in an oligopolistic market, and even more clearly when an effect of the agreement is to prevent the only potential competitor of a dominant provider in a given market from offering its services independently. This could amount to a violation of Article 86...".

4.1 Ensuring objective, transparent and non-discriminatory procedures and separation of regulatory and operational functions

Where telecommunications organisations can be both player and referee, because regulatory and operational functions are not clearly separated, there is a clear conflict of interests. This can be the case in particular with regard to the co-ordination of frequencies and use of orbital resources, the granting of operating licences, the resale of space segment of INTELSAT, INMARSAT and EUTELSAT by the telecommunications organisations to other service providers, and the coordination procedures with the international telecommunications satellite organisations which must be undertaken by other space segment providers.

The principle of separation of regulatory and operational functions has been implemented in the context of general Community telecommunications policy in Directive 88/301/EEC⁸⁵ and Directive 90/388/EEC⁸⁶. According to Directive 90/388/EEC "Member States shall ensure that the grant of operating licences, the control of type approval and mandatory specifications, the allocation of frequencies

⁸⁵ Commission Directive of 16th May 1988 on competition in the markets in telecommunications terminal equipment (88/301/EEC)

⁸⁶ Commission Directive of 28th June 1990 on competition in the markets for telecommunications services, O.J. L 192, 24.07.1990, p. 10

and surveillance of usage conditions are carried out by a body independent of the telecommunications organisations".

The Council Resolution of 30th June 1988 on the development of the Common Market for telecommunications services and equipment⁸⁷ underlined the importance of this principle for the telecommunications sector as a whole, and Council Resolution 90/C 166/02⁸⁸ emphasised that the coordination of radio frequencies must respect the principle of the separation of regulatory and operational duties.

In particular, the procedures concerning allocation of frequencies and required co-ordination established within the radio regulations should respect this principle and should be carried out in an objective, transparent, and non-discriminatory way.

Objective, transparent, and non-discriminatory procedures and full separation of regulatory and operational functions should also be ensured as regards access to the orbital resource for the provision of space segment.

4.2 Access to space segment capacity

Both the agreements on the international telecommunications satellite organisations INTELSAT and INMARSAT, and the agreement on the European Telecommunication Satellite Organisation EUTELSAT, give the signatories the sole right to distribute space segment capacity of these organisations to users or service providers⁸⁹.

To the extent that the signatories hold a dominant position in the sense of Article 86, they would have to provide available space segment to all potential users at fair prices and on a non-discriminatory basis in the sense of Article 86(a) and (c). They

⁸⁷ Council Resolution of 30th June 1988 on the development of the Common Market for telecommunications services and equipment up to 1992, O.J. C 257, 04.10.1988, p. 1.

⁸⁸ Council Resolution of 28th June 1990 on the strengthening of the Europe-wide co-operation on radio frequencies, in particular with regard to services with a pan-European dimension, O.J. C 166, 7.7.1990, p. 4

⁸⁹ In the case of EUTELSAT Article 16 a) of the Operating Agreement provides that "applications for allotment of EUTELSAT Space Segment capacity may be submitted to EUTELSAT only by signatories or, for a territory not under the jurisdiction of a Party, by a duly authorised telecommunications entity".

This provision must be read in conjunction with Article II b) of the Convention which provides that "each Party shall designate a public or private telecommunications entity subject to its jurisdiction to sign the Operating Agreement, unless such Party itself signs the Operating Agreement."

In the case of INTELSAT and INMARSAT, the equivalent articles are articles 15.a) and II.b), respectively XV.1 and 2.3.

would also seem not to be entitled to request detailed information about the users' business plans and the (in many cases competing) services they intend to offer, as this may entail an abuse of their dominant position.

The principle of non-discriminatory treatment must apply to all classes of users, irrespective of whether they are public or private service providers. For example, private broadcasters should be offered transmission capacity to provide for services such as news gathering with the same promptness and on the same conditions as public broadcasting organisations.

The best solution to avoid distortion of competition and to allow full use and best allocation of the existing international, national and private space segment would be to ensure that users obtain direct access to space segment capacity, while providers of this space segment should obtain the right to market space segment capacity directly to users.

The fact that EUTELSAT offers space segment directly to the European Broadcasting Union shows likewise that the *direct lease of space segment* without any intervention of national telecommunications organisations is not only feasible, but already practised.

4.3 Co-ordination procedures with the International Telecommunications Satellite Organisations

The agreements setting up the international satellite organisations INTELSAT and INMARSAT, and the European satellite organisation EUTELSAT provide for a co-ordination procedure with regard to other space segment providers, in order to establish whether there is likely to be any significant economic harm to these organisations⁹⁰.

⁹⁰ In the case of EUTELSAT, Articles XVI a) of the Convention provides: "Any Party or Signatory which intends, or becomes aware that any person within the jurisdiction of that Party intends, individually or jointly, to establish, acquire or utilise space segment equipment separate from the EUTELSAT Space Segment in order to meet the requirements of international public telecommunications services within the EUTELSAT space segment service area to provide services as defined in paragraphs a) and b) of Article III of the Convention shall, before such establishment, acquisition or utilisation, furnish all relevant information to the Assembly or Parties through the Board of signatories which shall establish whether there is likely to be any significant economic harm to EUTELSAT. The Board of signatories shall submit its report and conclusions to the Assembly of Parties".

Article XVI b) concerns the "technical compatibility of other space equipment".

In the case of INTELSAT and INMARSAT the equivalent articles are XIV c), d) and e) respectively 8.1 of the Conventions.

As these provisions aim at co-ordination for economic reasons and may therefore limit competition between the satellite organisations and other space segment providers, the question arises whether they are in line with the Member States' obligations under Article 5 in conjunction with Articles 59, 86 and 90 of the Treaty. It is clear that these provisions do not represent an essential requirement in the public interest which could lawfully limit the freedom to provide services under Article 59 of the Treaty, since the provisions in question are of an *economic nature*. On the other hand, they may be able to benefit from the exemption foreseen in Article 90(2) of the Treaty to the extent that they are indispensable for the performance of a service of general economic interest. Whether this is the case, *i.e.* whether the services of general economic interest can only be performed if competition on the part of other providers of space segment is limited or excluded, will have to be determined on a case-by-case basis. However, it is clear that this determination must not be made by the telecommunications organisations whose conflict of interest in this matter is obvious.

At any rate, these provisions will have to be interpreted in conformity with the requirements of Community law and in particular with Articles 59, 85, 86 and 90. This means that the basic decision of the Treaty of Rome to institute a system of undistorted competition and guarantee the freedom to provide services has to be respected by the Member States in applying these provisions. In particular, a *systematic rejection* of competing providers of space segment or a *systematic limitation* of their capability to compete with the satellite organisations would not be in conformity with the Member States' obligations under Articles 5 and 90 in conjunction with Articles 59, 85 and 86 of the Treaty. Article 90(2) allows derogations from Article 59 and the competition rules only in the exceptional case that the application of the Treaty rules obstructs the performance, in law or in fact, of the particular tasks entrusted by Member States to the organisations in question and that the derogation is not contrary to the interests of the Community. Under normal conditions, these organisations may well be expected to offer their services of general economic interest to their customers, even if they are exposed to a certain degree of competition.

The present practice of handling the coordination requirements confirms this. The procedure under Article XVI of the EUTELSAT Convention has never led to the conclusion that a competing provider of space segment would represent significant economic harm to EUTELSAT. Even if this were the case, Article XVI of the Convention does not prevent a party to that Convention from going ahead with its

plans and authorising a competing provider of space segment, although this would not guarantee the provision by other parties of the necessary uplink authorisation.

While the procedure under Article XIV (d) of the INTELSAT Convention has in one case led to the conclusion that a competing space segment provider would indeed represent economic harm to INTELSAT, the organisation did not raise objections to the authorisation of the competing space segment provider in question.

In order to ensure that conflicts of interest do not lead to legal uncertainty, the principle of the separation of regulatory and operational functions requires that the independent regulatory authorities of the Member States rather than the telecommunications organisations decide about the authorisation of competing space segment providers, taking account of Community Law. In cases of doubt, it will be for the Commission to decide whether the conditions of Article 90(2) are fulfilled and competition from a competing space segment provider could be limited.

Once a competing provider of space segment has been authorised by a Member State, such as TELECOM 1-2, ASTRA, DFS Kopernikus, BSB, ITALSAT or HISPASAT, it benefits from the freedom to provide services under Article 59 of the Treaty. It will therefore have the right to offer its services, subject to certain essential requirements in the public interest, throughout the Community.

As regards the future handling of the technical coordination procedures as foreseen in the Conventions, they should be undertaken on a sound technical basis and realistic model assumptions for such coordination. Such coordination must not be used as a technical barrier to entry for other providers.

4.4 Cost-orientation of Tariffs

Council Directive 90/387/EEC states for the access to the terrestrial network infrastructure the principle that "tariffs must be based on objective criteria and must be in principle be cost-oriented".

One of the characteristic features concerning satellite communications is that their costs are distance-independent.

However, their dual role as providers of the terrestrial infrastructure on the one hand, and as signatory on the other, leads telecommunications organisations in many cases to charge for satellite facilities on the same distance-related basis as for terrestrial links. Thus the technological advantage of satellites' wide-area coverage is not passed on to the user or competitive service providers. Moreover, the mark-up added by telecommunications organisations in their role as exclusive re-saler of space capacity - acting as signatory to the international agreements - may in certain cases, increase the price charged to users for use of the space segment very substantially.

This can be explained by the fact that, in many cases, the telecommunications organisations tend to subordinate the pricing of satellite capacity to the specific targets of their own business strategy - one example of the risk of possible abuse of a dominant position to which the current procedures for resale of space segment exposes the Signatories.

This situation will only change fundamentally once the separation of regulatory and operational functions has been fully implemented in the sector, and space segment providers will be able to negotiate directly with customers. It is to be expected that they will then market their transmission capacity at prices more closely related to their cost. This will increase the use of satellite services and the return on the provision of space segment, both for the international telecommunications satellite organisations as well as other providers. It will be fundamental to the full use of the new potential of satellite communications.

4.5 Commercial freedom for EUTELSAT and provision of space segment

A basic principle of telecommunications policy is giving all market participants full opportunity to use the new technological potential.

The separation of regulatory and operational responsibilities and the establishment of more open access to the space segment would give the space segment providers in Europe - and in particular the European Telecommunications Satellite organisation, EUTELSAT - the possibility to develop into a full scale entrepreneurial organisation for marketing space segment directly to service providers and users for new applications.

At the moment, all contact with user parties - i.e. entities wishing to lease space segment capacity - has to be made via Signatories. This has led to a lack of flexibility in system planning since, e.g. TV channels are leased to EUTELSAT Signatories without knowing whether or not they will then be used. It should not be forgotten that a substantial amount of the capacity, although leased to Signatories, is in effect unavailable to end-users as Signatories do not use it or may regard it as part of their commercial policy not to lease it to the end-users or potential service providers.

The satellite organisations and other space segment providers should provide space capacity on equitable and non-discriminatory terms to all classes of users, irrespective of whether they are private or public service providers.

According to the Council Resolution on the development of the Common Market for telecommunications services and equipment⁹¹ one of the major policy goals of general Community telecommunications policy is "developing a common market on which telecommunications administrations and other suppliers can compete on an equal footing", taking account, in particular, of the "application of the relevant rules of the Treaty, notably competition rules, to telecommunications administrations and private providers". This should include in particular that market participants do not take advantage of dominant market positions through undue cross-subsidisation of activities, and respect in this regard the competition rules of the Treaty, using as guidance the principles set out in the Draft Guidelines on Application of Community Competition Rules to the Telecommunications Sector⁹².

Article III of the EUTELSAT Convention defines the scope of EUTELSAT activities. In principle, it would seem to allow EUTELSAT to provide all the services it wishes.

One argument against giving users the right of direct access to the EUTELSAT space segment, and EUTELSAT the right to market space segment directly to service providers and users, has been that utilisation by a Signatory has an impact on its investment shares as provided for in Article 6 of the Operating Agreement. Where a non-Signatory entity accesses the EUTELSAT space segment, such utilisation would not count for the purposes of determination of investment share. The practical problem could arise for example that there could be extensive access by private operators in the territory of a Signatory, while the Signatory itself would

⁹¹ Council Resolution of 30th June 1988 on the development of the Common Market for telecommunications services and equipment up to 1992 (88/C257/EEC), OJ. C 257, 4.10.1988, p. 1.

⁹² To be published.

perhaps scarcely utilise the space segment, or maybe not at all. It is stated, that a resulting low investment share for such a Signatory would not be in the spirit of the original agreements and/or be inconsistent with the assumption and understandings upon which they were based.

However, it would seem that this should not be an argument against allowing EUTELSAT to develop its full potential for providing space segment for Europe-wide services in all areas. It just emphasises the need to review the existing arrangements and to allow, inter alia, for changes in current financing arrangements and the opening of the membership of the EUTELSAT consortium to new parties, if such under-investment should occur.

4.6 A phased approach

Member States must respect existing international commitments taking account of their obligations under Community Law - but they should also work jointly towards the change of such commitments where required, in order to conform with these obligations.

The international telecommunications satellite organisations have grown - over the last three decades - out of a world-wide context and must take account in any adjustment a large spectrum of interest, both of industrialised countries as well as of the developing world. Changes required therefore will take time and will have to depend on the evolving global environment.

However, a number of immediate steps could be undertaken and more flexible procedures established, within the framework of the existing Conventions and Operating Agreements:

- Member States should, as regards their own representation, apply strictly the principle of separation of regulatory and operational functions, in order to avoid obvious conflicts of interest;
- Member States should support proposals - of the type currently being discussed by INTELSAT - aimed at rationalising the economic harm coordination procedures and take full account, as far as their own position in such procedures is concerned, of their obligations under the Treaty, in particular competition rules. They should in particular ensure that in such

procedures the dimension of the Community Single Market as one Europe-wide domestic area is taken into account.

One practical measure to ease current procedures may be to agree that once a satellite system has been cleared through the coordination procedure on the basis of the total amount of capacity which that system can carry, other Member States would associate automatically with the initial consultation undertaken by a Member State with regard to any service provider, when this service provider wants to extend its service to other Community Member States.

- Member States should support actions to render technical coordination procedures less cumbersome;
- Member States should facilitate more open access to the space segment provided by the international telecommunications satellite organisations, via the Signatories and pay special attention to the implementation of the principle of cost-orientation of tariffs.

For example, it would seem possible to develop workable procedures for submission by Signatories of applications for the allotment of space capacity on behalf of users/service providers in their territory, as has been demonstrated by certain Community Member States⁹³.

While these steps could offer some immediate relief, they will not overcome the basic problem of adjustment of the agreements to the new environment, nor the risk of market distortion and conflicts of interest.

While these initiatives may therefore be the only realistic options in the short term in the context of INTELSAT and INMARSAT given their world-wide international constraints, Member States should work, in the European context, towards a full review of the EUTELSAT Agreement.

Given their total investment share of 88 % in the EUTELSAT organisation and the trends towards liberalisation in other European countries it is likely that a broad European base for reform could be found (refer to chapter IV.), Member States should take full account of their obligations under Community Law and should take

⁹³ E.g. the United Kingdom has established the Signatory Affairs Office "walled-off" within the telecommunications organisation (BT).

Also, it would seem that although the official application for allotment needs, under the current agreements, to go via the Signatory, nothing prevents the preceding technical, operational and other arrangements being

the initiative for redirection and adjustment of the EUTELSAT Convention and Operating Agreement, in order to ensure development of the potential of EUTELSAT to the fullest possible extent, in line with the goals and requirements of the Single Market⁹⁴.

Such a review should include, beyond the measures set out above, necessary revision to allow

- direct access to the EUTELSAT space segment, by far the largest one for use by domestic satellite services in Europe;
- full commercial independence and direct marketing of EUTELSAT space segment to users;
- adjustment of provisions for financing and membership, as required;
- adjustment of the agreements to bring them fully in line with the obligations of the Member States under the Treaty, in particular competition rules - concerning notably the future treatment of the economic harm provision as well as the future handling of the technical coordination procedures, and transparency with regard to cross-subsidisation where it occurs.

5. Standardisation and Type-approval

The working out of suitable standards is vital to make the liberalisation of the earth segment and the establishment of trans-European satellite terminal networks a market reality.

The European Telecommunications Standards Institute (ETSI) will have to play a focal role in this. A number of European Telecommunications Standards (ETS) will be needed for the functioning of the mutual recognition of type approval and of licences.

made directly between the international telecommunications satellite organisations and end-users.

⁹⁴ Amendments to the Convention can be decided by two thirds of the Parties and whose Signatories hold at least two-thirds majority in investment shares (Article XIX.b) of Convention) while amendments to the Operating Agreement need to be decided by a majority of at least two-thirds of the Signatories which also represents at least two-thirds investment share (Article 22.d) of Operating Agreement). The Party of the Signatory concerned must confirm the Signatory vote.

The ETSI Technical Committee TC-SES (Satellite Earth Stations), created for this sector, has identified a multi-annual work programme, setting out the priority areas for the production of standards. One-way and two-way small terminals are the immediate priority. The work on European Telecommunications Standards for satellite earth stations is well underway, with the preparation of draft standards for TV receive-only stations, data receive-only stations, two-way terminals and low bit-rate mobile terminals. The standards will seek, inter alia, to minimise the risk of spectrum pollution by receive-only terminals, while for two-way terminals the standards are aimed at interoperability of small terminal networks with sufficient protection against various types of interference. The standards shall allow manufacturers to specify equipment suitable for use on the Community market.

As mentioned, the mutual recognition of type approval for satellite terminal equipment is one of the major pre-conditions for the mutual recognition of licences, and a Community-wide market for satellite terminals. The adoption of a common position on the Draft Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity⁹⁵ at the Telecommunications Council of 28 June 1990, has now provided the basic principles to be respected in the field of type approval. Its coverage will have to be extended to include satellite terminals.

Given the basic approach that type approval procedures should apply only in those cases where this can be seen as indispensable to ensure the conformity with essential requirements, type approval procedures should apply only to satellite terminals connected to the public switched network - where the essential requirements defined in the draft Directive mentioned will apply -, as well as to transmitting terminals where the avoidance of harmful interference is a recognised essential requirement. Receive-only terminals not connected to the public switched network should not be subject to type approval but only to a requirement for an indication of compliance with suitable standards in the field of electromagnetic interference, no more onerous than the procedures applying to other radio receivers.

A basic element of type approval procedures must be the clear separation of regulatory and operational functions, in order to avoid otherwise inevitable conflicts of interest. Directive 88/301/EEC⁹⁶ foresees that the granting of type approval is entrusted to a body independent of public or private undertakings offering goods

⁹⁵ Common Position adopted by Council on 24th July 1990 with a view to the adoption of a Council Directive on the approximation of the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity.

⁹⁶ Commission Directive of 16 May 1988 on competition in the markets in telecommunications terminal

and/or services in the telecommunications sector". This principle has been acknowledged in Community telecommunications policy as basic to any type approval procedure, and therefore must also apply to type approval of satellite terminals.

A special problem in this context is the responsibilities which under the current agreements Signatories have for dealing with applications for the approval of earth stations which access the space segment of the international telecommunications satellite organisations⁹⁷.

The principle of separation of regulatory and operational responsibilities will have to apply also in this case. It would seem that an interpretation of the obligations of Parties and Signatories under the current agreements can be found which would allow for referring type approval to the respective regulatory bodies of each party and thus to fully submit to the principle set out.

6. Mobile and position-fixing satellite services

As set out in chapter III., satellite-based mobile services have developed from maritime mobile services, but aeronautical and especially land mobile services are now at the centre of interest. A number of initiatives have permitted the planning of several systems that may be used within Europe for messaging, voice traffic and position fixing, such as:

- plans by EUTELSAT in cooperation with a U.S. company to offer a position-fixing and messaging service from 1990, called EutelTRACS;
- the development of a service by INMARSAT suitable for both maritime and land-mobile use, using low cost "Standard-C" data-only terminals and, in the future, "Standard-M" digital voice terminals;
- ESA proposes a "European Mobile Satellite" (EMS) service;
- the preparation of the LOCSTAR messaging and position-fixing system, with commercial financing;

equipment, 88/301/EEC, O.J. L 131, 27.05.1988, p. ...

⁹⁷ In the case of EUTELSAT, Article 16.c) of the Operating Agreement provides: "..... Each entity to which an allotment (of space segment) has been made under this Article shall be responsible for compliance with all the terms and conditions set by EUTELSAT for such allotment unless, where a Signatory has submitted the application, its designating Party assumes such responsibility."

- use by civil operators of position-fixing systems such as GPS/NAVSTAR (U.S.), GLONASS (USSR) and complementary civil networks (CNES/ESA; NAVSAT).

The land mobile-satellite services will focus on specific user groups of limited size seeking instantaneous and full European coverage, such as trucking companies and vessel operators. While terrestrially-based public mobile systems will develop during this decade into mass services with many millions of users, the number of mobile-satellite terminals - though offering a vital service to certain parts of European business - is not expected to reach by the year 2000, more than 1-2 % of the number of terminals in the future public cellular (terrestrial) GSM system.

Given that it is therefore highly unlikely that satellite-based mobile systems could obstruct the provision of the terrestrial public mobile systems in any significant way, and that service operators wish to provide fixed and mobile or a combination of both, and satellite-based mobile systems - with the blurring of the distinctions between Mobile-Satellite Service (MSS) and Fixed-Satellite Services (FSS) - do not differ substantially from other two-way point-to-multipoint satellite applications, they should not be subject to regulatory constraints or safeguards other than those for fixed services.

Mobile-satellite terminal systems should therefore be governed by the equivalent rules for fixed services receive-only, or transmit and receive, terminal systems in terms of type-approval of terminals and licensing.

However, in the context of the Community's overall policy on mobile communications and its support for trans-European systems in this field⁹⁸, the interoperability and complementarity of mobile satellite systems and the terrestrial networks should be encouraged.

Given the fact that mobile terminals by nature cross borders, mutual recognition of licences and type approval of equipment are an essential precondition for any Europe-wide operation.

In the harmonisation measures set out above, special provision should therefore be made for the unrestricted movement of mobile terminals throughout the Community and of the mutual recognition of licences for this purpose.

7. Broadcasting-Satellite services

Satellite broadcasting to the general public must be seen in the context of general Community audio-visual policy, as set out in chapter IV. It is subject to specific regulations set up by Member States in conformity with Community law, in particular Directive 89/552/EEC⁹⁹ on "Television without Frontiers".

TV and related distribution services currently account for 44 % of space segment operators' revenue in the Community and for 75 % of EUTELSAT revenues. Satellite television will play a pivotal role in the creation and diffusion of pan-European programmes and in the development of a true European audio-visual

⁹⁸ Refer to:

Council Recommendation of 25 June 1987 on the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/371/EEC), O.J. L 196, 17.07.1987, p. 81 (concerning the introduction of the GSM system).

Council Directive of 25 June 1987 on the frequency bands to be reserved for the coordinated introduction of public pan-European cellular digital land-based mobile communications in the Community (87/372/EEC), O.J. L 196, 17.07.1987, p. 85.

Proposal for a Council Recommendation on the coordinated introduction of pan-European land-based public radio paging in the Community, COM(89) 166, 05.06.1989. (concerning the introduction of the ERMES system).

Proposal for a Council Directive on the frequency bands to be reserved for the coordinated introduction of pan-European land-based public radio paging in the Community, COM(89) 166, 05.06.1989.

Proposal for a Council Recommendation on the coordinated introduction of Digital European Cordless Telecommunications (DECT) in the Community, COM(90) 139, 12.06.1990.

Proposal for a Council Directive on the frequency bands to be designated for the coordinated introduction of Digital European Cordless Telecommunications (DECT) in the Community, COM(90) 139, 12.06.1990.

⁹⁹ Council Directive on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities (89/552/EEC), O.J. L 298, 17.10.1989, p. 23.

dimension.

However, even if some 60 TV-channels are now distributed by satellite in Europe, the revenue base of satellite television is still very limited. Cumulated income of satellite channels from advertising - still the major source of funding for many of these channels - currently corresponds still to no more than 4 % of total TV advertising in Europe.

The further development of satellite television in Europe will largely depend on rapid development of DTH terminals and the number of viewers, and the diversification of the revenue base. Common transmission standards and technical compatibility will be one of the key-factors in achieving large Europe-wide audiences.

As has been explained, television distribution via the EUTELSAT system as well as - more recently - via other systems such as Telecom 1-2, DFS Kopernikus and ASTRA, is furnished via frequency bands reserved for Fixed-Satellite Service (FSS) and not via the frequency bands reserved by the WARC'77 conference for the Broadcasting-Satellite Service (BSS) where the Direct Broadcasting Services (DBS) are located. This has made it extremely difficult to maintain a distinction between BSS services and broadcasting applications operating within the Fixed-Satellite Service.

As new services are explored and service providers operating in the BSS bands also provide point-to-multipoint data services - and service providers operating in the FSS bands move to BSS bands in order to carry HDTV (refer to chapter II.) - the border-line between FSS and BSS services will be further blurred.

The agreement reached at the 1977 World Administrative Radio Conference, commonly referred to as the WARC 77 plan - assigning, on a national basis, a limited number of frequency bands in the BSS allocation - has turned out to be too rigid to take account of the new developments.

While the full liberalisation of the earth segment will open the way for a more rapid penetration of DTH terminals on a European basis and more flexibility of entry for service providers into new business lines, the sector therefore now faces two major additional requirements: preparing for review of the plan criteria established by WARC'77; and promoting the pivotal role which satellites will play in the pan-European introduction of High Definition Television (HDTV).

The effect of the WARC'77 decisions has hindered the implementation and use of Broadcasting-Satellites with the technology available today.

A revision and modernisation of the assumptions and criteria established in the regulatory provisions of the WARC'77 Plan should take into account the present state-of-the-art of satellites and reception equipment technology, as well as the commercial needs in the exploration of new services.

The technology for second generation European Direct Broadcasting-Satellite systems has been developing particularly since 1985, aimed at satellites capable of pan-regional and multi-zone European coverage, and of High Definition Television. It is proposed - in the context of the overall Community audio-visual policy - to try to ensure a much greater cohesion for second generation DBS in Europe. European pan-regional multi-channel satellites of an intermediate power level - such as the EUROPESAT project planned by EUTELSAT - would seem to be an attractive economic and technical option.

Under this perspective, there should be a co-ordinated approach towards a review of the plan criteria established by the World Administrative Radio Conference of 1977 on the provision of Broadcast Satellite Services. The possible result of this review should already be taken fully into account when identifying common European positions for the World Administrative Radio Conference of 1992.

As mentioned with regard to the harmonisation of transmission techniques for satellite broadcasting, the current MAC/packet Directive¹⁰⁰ is based on the definitions of Broadcasting-Satellite Services, as used in the WARC'77 plan. The Directive will expire on 31 December 1991.

Preparation of future action in this area should be aimed at the harmonised introduction of a Europe-wide High Definition Television (HDTV) standard. It will also need to reflect the fact that - as set out - it will be increasingly difficult to distinguish between those services defined as Broadcasting-Satellite Services according to the WARC'77 definitions and broadcasting applications operating in the framework of Fixed-Satellite Services, and that more flexibility in using BSS and FSS frequency bands is needed in Europe.

¹⁰⁰ Council Directive on the adoption of common technical specifications of the MAC/packet family of standards for direct satellite television broadcasting (86/529/EEC), O.J. L 311, 03.11.1986, P. 28.

8. Summary

The extension of Community telecommunications policy to satellite communications can build on the consensus achieved on the basis of the Green Paper on the development of the common market for telecommunications services and equipment, as confirmed by Council Resolution 88/C257/01 of 30 June 1988.

The future regulatory conditions for satellite communications must respect those regulatory safeguards which Member States may apply in the telecommunications sector in accordance with this consensus - and in particular with the agreements on the Community's approach to telecommunications services, achieved at the telecommunications Council of 7 December 1989 -, but should not introduce any additional restrictions beyond those related to specific conditions in the field of satellite communications, where these can be justified in accordance with Community law, in particular the competition rules, and international commitments.

The adjustment of the regulatory conditions must match the market requirements identified. They should in particular: provide for a dynamic development of earth segments and space segments in the Community; meet the conditions required by users to operate in the Community-wide 1992 market; allow the full development of the Community's space industry in this area; and support the Community's policy for a common audio-visual space.

Community law must be fully applied to this sector. The Community cannot admit - or afford - the continued withdrawal of a sector of such vital importance from the working of the single market, or from the full application of its rules.

As elsewhere in the telecommunications sector, a basic element of the adjustment of the regulatory conditions in the satellite communications sector should be the principle of the abolition of exclusive or special rights and their replacement by licensing regimes, wherever legitimate public interest requires the maintenance of regulatory safeguards. Of particular specific importance in this regard for satellite communications is the avoidance of harmful interference, and frequency coordination.

The application of these principles leads to the two major changes which are needed before the potential of the provision of satellite communications services, by both public and private providers, can be fully exploited in the Community: unrestricted provision and use of satellite terminal transmit and receive equipment;

and full, equitable and non-discriminatory access by users to all providers of satellite space capacity.

A fundamental principle of the reform must be the establishment of objective, transparent and non-discriminatory procedures and the clear separation of regulatory and operational functions, both with regard to the provision and use of the earth segment, as well as with regard to access to - and the provision of - space segment.

Account must be taken of the existing international commitments of Member States in this area, but Member States are also obliged to exercise their influence in order to achieve either an application of international agreements in conformity with the Treaty rules, or to bring about an adjustment of these agreements. This applies, inter alia, to the access to space segment capacity of the international telecommunications satellites organisations, as well as to the coordination procedures provided for in the respective agreements.

The best - and in the medium term inevitable - solution to avoid distortion of competition and to allow full use and best allocation of the existing space segment would be to give providers of space segment the right to market space segment capacity directly to users. This is of special relevance in the case of the European Telecommunications Satellite Organisation EUTELSAT which will remain the most important provider of space segment for intra-European satellite communications. With its special importance for Europe-wide satellite communications, its continued development and growth is vital for the future trans-European satellite services which are needed by the European user.

Given that international telecommunications satellite organisations have grown out of a world-wide context, they must take into account, in any adjustment, a large spectrum of interest, both of industrialised countries as well as the developing world. The changes required may therefore have to be undertaken in phases.

However, having in mind the special importance of EUTELSAT for Europe-wide communications, the Member States' total investment share of 88 % in the organisation, and the fact that trends towards liberalisation in other European countries make it feasible that a broad European base for reform could be found, Member States should work towards an early review of the EUTELSAT Convention and its Operating Agreement, in order to ensure the development of EUTELSAT to the fullest possible extent.

Finally, a number of promotion and harmonisation measures will be required, in order to facilitate the emergence of trans-European services and to ensure that liberalisation and harmonisation go hand in hand.

This concerns in particular the measures in the field of mutual recognition of type approval, mutual recognition of licences, frequency coordination, coordination with regard to services to/from third countries, connection of satellite terminals to the terrestrial public network, and harmonisation of future transmission techniques for satellite broadcasting to the general public taking full account of the pivotal role of satellites in the introduction of a Europe-wide High Definition Television (HDTV) standard.

It also concerns the promotion of the development of European standards in this field, as well as continuing emphasis on the full application of satellite communications systems in applications, and in the implementation of Community policies.

The details of the proposals are summarised in the subsequent chapter.

VI. TOWARDS A COMMON APPROACH TO THE FIELD OF SATELLITE COMMUNICATIONS IN THE COMMUNITY : CONCLUSIONS AND PROPOSALS

In the light of the above considerations, a number of general conclusions, drawn from the preceding chapters, should be borne in mind.

1. General Conclusions to be taken into account

1. Developments in satellite technology in recent years have opened up new economic and social opportunities for a large range of new actors reaching far beyond the traditional telecommunications sector.

Dialogue with a broad range of parties is therefore required if a balanced way forward is to be found: private and business users of satellite communications services, telecommunications and broadcasting organisations, new public and private service providers, telecommunications and space industry, government and public interests.

2. Current regulation of earth segment and space segment in the Member States still reflects, in most cases, the situation in the sixties and seventies where the only technically and economically feasible application of satellite communications was their use as an additional transmission path to carry international or national long-distance traffic for Telecommunications Organisations.

The first generation of satellite earth stations were large installations with only one or a very limited number of stations per country, connected to and seen as part of the public telecommunications infrastructure, and giving access to the satellites of the International Telecommunications Satellite Organisation (INTELSAT), and later, also to the satellites of the International Maritime Satellite Organisation (INMARSAT) and the European Telecommunications Satellite Organisation (EUTELSAT).

The management and operation of these large earth stations required considerable resources and technical know-how which was generally considered only to be available in the Telecommunications Organisations.

3. This situation has now changed substantially. In addition to the traditional large earth stations for trunk telephony and TV programme interchange, new earth stations are now available for specific user applications which operate with antenna diameters of 0.5 - 2.5 meters depending on the application, and which can be installed under user control directly on user premises. Technological progress now allows substantially more diversified configurations for purposes other than simple alternative transmission paths to the fixed network. These configurations can be safely operated by service providers other than the Telecommunications Organisations, once appropriate regulatory safeguards have been established.
4. The traditional applications - long-distance trunk telephony and short-term high band-width requirements such as studio-to-studio television transmission - still account for a major, though declining, proportion of international satellite services. Satellite links still account for nearly 60% of transatlantic telephony, though this is expected to fall to 30 - 40% by 1995. Within Europe, satellite-carried voice telephony accounts for only 2 - 3% of intra-European international and national long-distance calls. Nearly 75% of EUTELSAT's revenues are accounted for by television distribution.
5. With the exception of television distribution, the role of satellites over the coming decade will increasingly be characterised by two fundamental usage traits: short term deployment, and distinct specialist niche markets. Forecasts show that while the provision of traditional "Fixed-Satellite Services" in Europe will continue to be dominated by the telecommunications and broadcasting organisations, additional new Europe-wide markets will develop in such fields as direct satellite television broadcasting, private business services, specialised mobile services and satellite news gathering, if current regulatory constraints on the use of the earth segment and the space segment are relaxed and replaced by appropriate regulatory safeguards.
6. It should be noted that while essential for Europe-wide services and Europe-wide coverage of businesses and consumers, forecasts project that the total of satellite services revenue will reach no more than 1.5 - 2.5% of total telecommunications services revenues in Europe by the year 2000. Currently, the total revenue of all satellite carriers in Europe accounts for no more than 0.4% of total telecommunications revenues in the European Community.

These ratios are further borne out by the experience in the United States or more recently in Japan which have substantially liberalised their satellite communications markets. In the United States, after over a decade of domestic "open sky policy", total satellite communications revenues account for no more than 2 - 3% of total telecommunications revenues while liberalisation has in practice led to a substantially higher and more diversified development of the US space sector in this area.

7. The consensus achieved at the Telecommunications Council of 7 December 1989 has identified the regulatory safeguards which Member States may implement in licensing schemes in the telecommunications sector, in conformity with Community law and in particular competition rules. Proposed regulatory positions on satellite communications should build, by extension, on the rationale underlying this consensus, while taking full account of the specifics of the satellite communications sector.

In particular, exclusive or special rights may be entrusted to telecommunications organisations only for the provision and operation of the terrestrial public network infrastructure and the public voice telephony service, and special regulatory safeguards may be established, within licensing schemes, for public data communications services, in accordance with Community competition rules and the procedures established in Commission Directive 90/388/EEC¹⁰¹.

Licensing schemes implementing regulatory safeguards must be based on objective criteria, be transparent and non-discriminatory and must introduce no constraints except those set out above or based on "essential requirements", i.e. network security and integrity and, in justified cases, interoperability and data protection.

8. Future regulatory conditions for satellite communications must respect those regulatory safeguards which Member States may apply in the telecommunications sector in accordance with the procedures mentioned, but should not introduce any restrictions beyond those related to specific conditions in the field of satellite communications, where these can be justified in accordance with Community law - in particular competition rules - and international commitments.

Licensing schemes set up by Member States to implement regulatory safeguards in the satellite communications sector must in particular be based on objective facts, be proportionate to the objective sought, be transparent, and be non-discriminatory.

¹⁰¹ Commission Directive of 28 June 1990 on competition in the markets for telecommunications services, 90/388/EEC, O.J. L 192, 24.07.1990, p. 10.

9. An essential regulatory safeguard applicable to satellite communications and of equivalent importance to the requirement of network security and network integrity in the terrestrial network, is the need to avoid unacceptable interference with other satellite or radio communications systems, in accordance with Council Directive 89/336/EEC¹⁰² concerning electromagnetic interference, and in accordance with the frequency coordination procedures agreed on a global basis by all members of the International Telecommunications Union, established in the Radio Regulations and administered by the International Frequency Registration Board of the International Telecommunications Union.
10. Any restrictions resulting from exclusive or special rights for the provision and operation of the terrestrial public network infrastructure and for the public telephone service, as well as the special regulatory safeguards for the provision of public data services established by Member States in accordance with the procedures mentioned under 7., may relate to satellite communications systems only in as far as they can be considered as being equivalent to these two-way public service categories.

Notwithstanding the special provisions applying to broadcasting services to the general public mentioned under 15., one-way services by definition do not fall into this category.

11. Public voice telephone service is defined in Community legislation^{103,104} as the commercial provision for the public of direct transport of real-time speech via the public switched network or networks such that any user can use equipment connected to a network termination point to communicate with another user of equipment connected to another termination point. Packet- and circuit-switched data services is defined as the commercial provision for the public of direct transport of data via the public switched network or networks such that any equipment connected to a network termination point can communicate with equipment connected to another termination point.

¹⁰² Council Directive on the approximation of the laws of Member States relating to electromagnetic compatibility, 89/336/EEC, 03/05/1989, O.J. L 139, 23/05/1989, p. 19.

¹⁰³ Commission Directive of 28 June 1990 on competition in the markets for telecommunications services, 90/388/EEC, O.J. L 192, 24.07.1990, p. 10.

¹⁰⁴ Council Directive of 28 June 1990 on the establishment of the internal market for telecommunications services through the implementation of Open Network Provision, 90/387/EEC, O.J. L 192, 24.07.1990, p. 1.

Even large-scale two-way satellite communications systems - such as extensive VSAT systems - presently only comprise up to a few thousand terminals. In this light, two-way satellite communications systems should only be considered as public, if connected to the public switched terrestrial network infrastructure and interlinked with the public services mentioned in position 10.

12. If a Member State would consider that very large satellite communications systems not connected with the terrestrial public switched network may obstruct, because of their competition with the telecommunications organisation, the latter's task of providing public telecommunications services, it would have to be demonstrated that such systems would meet definitions and criteria equivalent to those set out in Directive 90/388/EEC¹⁰⁵, subject to Commission scrutiny under Treaty competition rules and always dependent on the Community interest.
13. By analogy with the safeguards mentioned under 7., the only regulatory safeguards which could be included by Member States in licensing arrangements for satellite communications systems not connected to the public switched network are requirements for the avoidance of harmful interference as laid down in the Radio Regulations, requirements concerning data protection and the protection of privacy where applicable, and standards to the extent required by Community law.
14. Given the rapid development of technology and in particular of transmission, access and coding techniques, any technical limitations, such as limitation on bit rates transmitted, are intrinsically liable to obsolescence and should not be used as criteria in licensing procedures.
15. Satellite broadcasting to the general public - including both applications in terms of the definition used in the Radio Regulations for Broadcasting-Satellite Services, as well as broadcasting applications operating in the framework of Fixed-Satellite Services - will continue to be subject to the specific regulations set up by Member States in conformity with Community law, in particular Directive 89/552/EEC¹⁰⁶ on Television without Frontiers.

¹⁰⁵ Commission Directive of 28 June 1990 on competition in the markets for telecommunications services, 90/388/EEC, O.J. L 192, 24.07.1990, p. 10.

¹⁰⁶ Council Directive on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities, 89/552/EEC, 03/10/1989, O.J. L 298, 17/10/1989, p. 23.

As set forth in COM(90)78¹⁰⁷, transmission standards requirements in this area are vital in order to ensure basic interoperability. As regards Direct Broadcasting by Satellite applications, Directive 86/529/EEC¹⁰⁸ has identified the MAC family of transmission techniques as the standard to be used.

16. Preparation of future action concerning transmission techniques in this area should take account of the consideration that a major challenge for the future will be the harmonised introduction of a Europe-wide High Definition Television (HDTV) standard, in which the use of satellites will play a vital role as the initial transmission medium. It will also need to reflect the fact that technological development makes it increasingly difficult to distinguish between those services defined as Broadcasting-Satellite Services according to the definitions used internationally under ITU regulations and broadcasting applications operating in the framework of Fixed-Satellite Services.

There should be a co-ordinated approach towards a review of the criteria established by the World Administrative Radio Conference of 1977 on the provision of Broadcast Satellite Services. The result of this review should also be taken fully into account when identifying common European positions for the World Administrative Radio Conference of 1992.

17. Mobile satellite services which for reasons of technology and cost will focus on specific user segments limited in size, do not differ substantially from other one- or two-way point-to-multipoint satellite communications applications and should therefore not be subject to any additional regulatory constraints or safeguards beyond those applied to Fixed-Satellite Services. In particular, any regulatory constraints should not prevent or hinder transborder operation.
18. With the implementation of the regulatory safeguards regarding satellite communications services set out above, it will be possible to initiate the two major steps which are needed before the potential of the provision of satellite communications services by both public and private providers can be fully exploited in Europe:

- unrestricted provision and use of satellite earth station transmit/receive equipment; and

¹⁰⁷ Communication by the Commission to the Council and to the European Parliament on audio-visual policy, COM(90) 78, 21/02/1990.

¹⁰⁸ Council Directive on the adoption of common technical specifications of the MAC/packet family of standards for direct satellite television broadcasting, 86/529/EEC, 03/11/1986, O.J. L 311, p. 28.

- full, equitable and non-discriminatory access by users to all providers of satellite space segment capacity.

19. As regards satellite earth stations, the Green Paper on the development of the common market for telecommunications services and equipment stated that "given the trend in satellite communications towards point-to-multipoint broadcasting applications for closed user groups, the regulatory regime for receive-only earth stations (ROES) for satellite communications should be assimilated to the regime for telecommunications terminals and TV receive-only satellite antennas and fully opened to competition".

Subsequently, Directive 88/301/EEC¹⁰⁹ implemented this position for "receive-only satellite stations not connected to the public network of a Member State".

Receive-only equipment not connected to the public switched network should be subject only to a requirement for an indication of compliance with suitable standards in the field of electromagnetic interference, no more onerous than the procedures applying to other radio receivers. It should not be subject to a licensing procedure.

20. Transmit/receive stations should be subject to type approval and licensing procedures in order to ascertain conformity with the conditions as stipulated in the proposed draft Council Directive in this area¹¹⁰, and in accordance with the basic regulatory safeguards set out above.
21. As regards access to space segment capacity, given the multiplication of public and private actors in the satellite communications field, and the need to create a level playing field, the principle of separation of operational and regulatory responsibilities should be fully implemented. In particular, all matters with regard to the international frequency coordination procedures including equitable access to frequencies and the geostationary orbit, should be regarded as a regulatory responsibility.

¹⁰⁹ Commission Directive of 16 May 1988 on competition in the markets in telecommunications terminal equipment (88/301/EEC), O.J. L 131, 27/05/1988, p. 73.

¹¹⁰ (Proposal for a Council Directive on the approximation on the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity, COM(89)289.)

This separation should also apply to all intergovernmental and related operating agreements in the field. With regard to the coordination procedures concerning "economic harm" potentially caused by other providers of satellite capacity, as cited in the intergovernmental conventions underlying the international satellite organisations, INTELSAT and INMARSAT, and the European telecommunications satellite organisation, EUTELSAT, they are unlikely, in the framework of a review of these procedures by the Commission, to withstand the test of Community competition rules on the basis of the principles set out in the Commission guide-lines on the application of these rules to the telecommunications sector.¹¹¹

22. The best solution - and the only one which would seem suitable to avoid distortion of competition and to allow full use and best allocation of the existing international, national and private space segment - would be for Member States to take the necessary steps to ensure that users obtain direct access to space segment capacity, and for providers of this space segment to obtain the right to market space segment capacity directly to users.

Member States should eliminate existing restrictions in order to ensure that the principle of direct access by all users on equitable and non-discriminatory terms to all providers of space segment capacity be fully implemented.

23. The European Telecommunications Satellite Organisation, EUTELSAT, should obtain full commercial freedom to market its services in Europe, in order to give it equal opportunity with other space segment providers and to avoid undue market sharing agreements which may result from exclusive resale of space segment capacity via its signatories.
24. Tariffs charged to users for making space segment capacity available should follow the overall principle of cost orientation and be in compliance with competition rules according to the principles set out in the Commission guide-lines mentioned above.

2. Proposed positions

Taking account of these conclusions and the preceding analysis, four major changes of the regulatory environment seem necessary, in order to exploit fully the potential of satellite communications for Europe:

¹¹¹ To be published

- FULL LIBERALISATION OF THE EARTH SEGMENT, INCLUDING THE ABOLITION OF ALL EXCLUSIVE OR SPECIAL RIGHTS IN THIS AREA, including both
 - receive-only terminals, subject to appropriate type approval procedures when connected to the public switched network; and
 - transmit/receive terminals, subject to appropriate type approval and licensing procedures where justified to implement necessary regulatory safeguards;

- FREE (UNRESTRICTED) ACCESS TO SPACE SEGMENT CAPACITY, subject to licensing procedures, in order to safeguard exclusive or special rights or regulatory provisions set up by Member States in conformity with Community law and based on the consensus achieved in Community telecommunications policy.
Access should be on an equitable, non-discriminatory and cost-oriented basis.

- FULL COMMERCIAL FREEDOM FOR SPACE SEGMENT PROVIDERS, including direct marketing of satellite capacity to service providers and users, subject to compliance with the licensing procedures mentioned above and in conformity with Community law, in particular competition rules.

- HARMONISATION MEASURES AS FAR AS REQUIRED TO FACILITATE THE PROVISION AND USE OF EUROPE-WIDE SERVICES
This concerns in particular the mutual recognition of licensing and type approval procedures, frequency coordination and matters related to coordination of services provided to and from countries outside the Community.

The proposed positions resulting from these considerations, are summarised in **Box 1**. The Commission also proposes the measures set out under sections 3. and 4. in order to create a harmonised environment for the implementation of the proposals.

SUMMARY OF PROPOSED POSITIONS

The positions set out below aim at creating an optimal environment for the full use of satellite communications for Europe-wide systems and services, to the benefit of the European user, European industry and the European economy in general, while recognising necessary regulatory safeguards established in accordance with the consensus achieved in the framework of Community telecommunications policy at the Council meeting of 7 December 1989 - especially with regard to keeping the balance between harmonisation and liberalisation - in conformity with Community law, and in the light of the international commitments of the Member States.

Earth Segment

1. Entertainment broadcast (TV) satellite reception terminals should not be subject to licensing or restrictions on their supply, installation, ownership, operation and maintenance.

Receive-only satellite telecommunications terminals should not be subject to licensing or restrictions on their supply, installation, ownership, operation and maintenance.

All transmit/receive terminals may be subject only to type approval and their operation subject to licensing.

2. Network control earth stations (hub stations) of satellite terminal networks may be operated under a licence. Interconnection with the public network should be allowed by this licence, subject to the conditions set out under 4. Connection to the public network must be equitable, non-discriminatory and cost-oriented.

A hub station operator or service provider licenced by a Member State should not have to negotiate landing rights in other Member States since the reception of his or her services would automatically be authorised throughout the Community under Article 59 of the Treaty, subject only to non-discriminatory requirements that are justified by the general interest, as defined in point 4, in conformity with Community law.

3. A European Telecommunications Standard, geared to ensuring the limitation of potential interference to an acceptable level should be prepared to facilitate mutual recognition of type approval of transmit/receive terminals. Equipment constructed in accordance with such a standard should automatically be considered to fulfil the requirements concerning the avoidance of harmful interference, subject to the completion of the appropriate frequency coordination procedures.

A Directive for the mutual recognition of type approval procedures should be proposed for transmit/receive terminals, including the conditions for their installation, maintenance and operation.

This Directive would also apply to receive-only terminals connected to the public switched network.

Receive-only terminals not connected to the public switched network should not be subject to type approval, but may be subject to a requirement for an indication of compliance with suitable standards in the field of electromagnetic interference; possible measures aimed at avoiding the risk of fraud or of traffic interception shall not be more onerous than the procedures applying to other radio-receivers.

- 4. Licensing conditions must be justified, be proportionate to the objective sought, be transparent and non-discriminatory, and must fully respect the principle of the separation of regulatory and operational functions.**

Licensing conditions for the operation of transmit/receive terminals not connected to the public switched network may include no other regulatory safeguards than those needed in order to guarantee the avoidance of harmful interference; requirements concerning data protection and the protection of privacy in justified cases; and standards to the extent required by Community law.

Licensing conditions for the operation of hub stations and other terminals connected to the public switched network may include, in addition, regulatory safeguards to ensure compliance with restrictions resulting from exclusive or special rights for the provision of the public telephony service, as well as the special conditions and licensing schemes for the provision of public data services established by Member States in accordance with the principles set out in Directive 90/388/EEC on competition in the markets for telecommunications services.

Where very large satellite communication systems not connected with the terrestrial public switched network may obstruct the operation of services of general economic interest with which telecommunications organisations are entrusted, the regulatory safeguards described in the former paragraph may be applied to these systems subject to Commission scrutiny under Treaty competition rules.

No other restrictions than those provided for by the licensing conditions should apply.

A Directive for a Community scheme for the mutual recognition of licences should be proposed, laying down, *inter alia*, the conditions for the issuing of operating licences for terminal networks, installation and maintenance organisations, and hub-stations operators, including the Community-wide operation of such systems under a single class licence in the case of operation in exclusive frequency bands.

For hub-stations, operation should be subject to the signature of an operating agreement with the relevant space segment operator. This agreement should only include provisions aimed at ensuring the proper functioning of the satellite system and should be based on objective, transparent and non-discriminatory criteria.

Space Segment

- 5. The principle of the separation of regulatory and operational functions should be fully implemented with regard to access to and control of the space segment.**

All matters concerning equitable access to frequencies and the orbital resource should be treated in a similar fashion.

In addressing these aspects, and in the framework of this Green Paper, Member States should ensure objective, transparent and non-discriminatory procedures, in particular with regard to the procedures concerning required co-ordination established within the radio regulations and administered by the International Frequency Registration Board of the International Telecommunications Union.

- 6. Coordination procedures concerning "economic harm" by other providers of space segment capacity currently foreseen in the intergovernmental conventions underlying the international satellite organisations, INTELSAT and INMARSAT, and the European Telecommunications Satellite Organisation, EUTELSAT, should be reviewed in order to avoid discrimination between economic operators offering space segment, taking full account of the obligations of Member States and operators under Community competition rules.**

Such a review should take account of the international obligations of the Community and the Member States in the light of Community law and the requirement to safeguard a balanced development of satellite communications world-wide, in particular with regard to the developing countries.

Member States should support actions to render the "technical coordination" procedures foreseen by the intergovernmental conventions less cumbersome;

- 7. Users should be able to obtain better access to space segment capacity. For this purpose, it will be necessary to determine how to attain rapidly an open access, taking into account the international commitments of the Member States and Community law.**

At this stage of the analyses, the Commission considers that the solution which seems most suitable to avoid distortions of competition and to allow full use and best allocation of the existing space segment could be to give users direct access to space segment capacity, including signal transmission towards the satellite, subject to compliance with the licensing conditions defined under 4. above ;

and then to give space segment providers the right to market space segment capacity directly to users.

This should concern, inter alia, the following services:

- private networks not connected to the public switched telephone network for services including interactive voice;
- private networks for data transmission services and specialised business communications;
- the provision of direct-to-home satellite television services.

In respect of the European Telecommunications Satellite organisation EUTELSAT, the objective to be attained is to allow it to obtain full commercial freedom to market its services across the Community.

In the pursuit of this objective Member States - for both the space segment providers registered under their own national responsibility and for those systems established in accordance with the relevant international intergovernmental conventions - should ensure that the principle of direct access by users to all providers of space segment on equitable and non-discriminatory terms be fully implemented.

A first solution, already experienced in the Community, has been that signatories of this organisation have opened, under control of the competent regulatory authorities, an office for access to its capacity by operators of the earth segment in the Community.

8. Tariffs charged to users for making space segment capacity available should follow the overall principle of cost-orientation.
9. The procedures concerning the implementation of the objectives set out in 5., 6., 7. and 8. must be carried out by Member States in compliance with their obligations under Community law, in particular competition rules.

Mobile and position-fixing satellite services

10. Mobile and position-fixing satellite services do not differ substantially from other two-way point-to-multipoint satellite communications applications and should therefore not be subject to regulatory constraints or safeguards other than those set out under 4.
11. Mobile terminal systems should be governed by the equivalent rules for fixed service receive-only, or transmit and receive, terminal systems in terms of type-approval of terminals and licensing.

BOX 1

12. **The Directive for a Community scheme for the mutual recognition of licensing mentioned under 4. should make special provision for the unrestricted movement of mobile terminals throughout the Community and of the mutual recognition of licences for this purpose.**

Broadcasting-Satellite services

13. **Satellite broadcasting to the general public - including both applications in terms of the definition used in the Radio Regulations for Broadcasting-Satellite Services, as well as broadcasting applications operating in the framework of the Fixed-Satellite Services - will continue to be subject to the specific regulations set up by Member States in conformity with Community law, as defined in particular in Directive 89/552/EEC on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the pursuit of television broadcasting activities.**

14. **Transmission standards requirements in this area are vital to ensure basic interoperability. As regards direct broadcasting applications, Directive 86/529/EEC has identified the MAC family of transmission techniques as the standard to be used.**

The development of concepts for the next generation direct Broadcasting-Satellites should ensure compatibility with ongoing activities in the field of High Definition Television (HDTV) and its Europe-wide harmonised introduction. This should be taken into account in future actions regarding transmission techniques in this area, particularly in the actions succeeding the current MAC-packet Directive mentioned above, which expires on 31 December 1991.

In pursuing the implementation of these proposals, and the lifting of existing restrictions, the Commission will apply the competition rules of the Treaty to their full extent.

3. Measures for Facilitating Trans-European Services

In order to implement the above proposed positions in a harmonised way, the Commission foresees that a number of Community measures will be required:

- MUTUAL RECOGNITION OF TYPE APPROVAL FOR SATELLITE COMMUNICATIONS TERMINAL EQUIPMENT,

extending the coverage of the Directive on the approximation on the laws of the Member States concerning telecommunications terminal equipment, including the mutual recognition of their conformity, currently under discussion, to include all transmit/receive satellite earth stations, and to include receive-only satellite earth stations connected to the public switched network as far as required.

- A COMMUNITY SCHEME CONCERNING THE MUTUAL RECOGNITION OF LICENCES FOR SATELLITE TERMINAL NETWORKS,

laying down, inter alia, the conditions for the Community-wide operation of terminal networks and possible conditions regulating hub station operations.

A Directive in this area would be based on the positions set out and should facilitate the establishment of two-way networks across the Community by, inter alia, providing for class licences for networks operating within frequency bands designated with priority to Community-wide satellite applications. These class licences should give the possibility of operating, e.g., VSAT networks throughout the Community under a single licence, without any need of further licensing or frequency coordination for the individual participating satellite terminals in the Member States. Networks operating within non-exclusive frequency bands should be licenced with a minimum of obligatory procedures for frequency coordination.

- STRENGTHENED FREQUENCY COORDINATION RELATED TO SATELLITE COMMUNICATIONS,

in order to support Community-wide licensing, building on the current reform of the European Radiocommunications Committee and the establishment of the European Radiocommunications Office, set up by the European Conference of Postal and Telecommunications Administrations, and taking full account of the coordination procedures for frequencies and procedures for equitable access to the geostationary orbit globally agreed and established within the Radio Regulations and administered by the International Frequency Registration Board of the International Telecommunications Union.

A Decision in this area should

- facilitate frequency coordination in this field between Member States in all cases where this becomes necessary, taking account of international coordination procedures, and development of the Community satellite services environment;
- coordinate Community positions with regard to the World Administrative Radio Conferences on frequencies and orbital allocation matters;
- create the mechanism for designating, based on the international Radio Regulations and the recommendations of the European Radiocommunications Committee, certain bands with priority to Community-wide satellite applications, such as needed for the easy operation of class licences as set out above, subject to the completion of the international frequency coordination procedures;

STRENGTHENED COORDINATION OF MEMBER STATES WITH REGARD TO SERVICES TO/FROM NON-COMMUNITY COUNTRIES,

in order to develop common procedures with regard to these services, building on the general principles which are in the course of being defined within the framework of the overall GATT services agreement currently under negotiation.

SPECIFIC DEFINITION OF OPEN NETWORK PROVISION (ONP) CONCERNING THE CONNECTION OF SATELLITE TERMINAL NETWORKS

to the terrestrial public network infrastructure, subject to the constraints and regulatory safeguards set out in the proposed positions, in order to provide Europe-wide harmonised interfaces between satellite systems and the public network infrastructure, based on the principles of equitable, non-discriminatory and cost-oriented access.

This would extend the coverage of Open Network Provision to satellite communications networks and would therefore substantially facilitate the effective operation of the Community-wide licensing scheme set out above.

HARMONISATION OF IDENTIFIED FUTURE TRANSMISSION TECHNIQUES FOR SATELLITE BROADCASTING TO THE GENERAL PUBLIC,

to succeed Directive 86/529/EEC, as referred to in the Commission's communication on audio-visual policy of 21 February 1990.

Preparation of future action concerning transmission techniques in this area should take into account that a major immediate challenge is the harmonised introduction of a Europe-wide High Definition Television (HDTV) standard, in which the use of satellites will play a vital role as the initial transmission medium. It will also need to reflect the fact that technological development makes it increasingly difficult to distinguish between those services defined as Broadcasting-Satellite Services according to the definitions used internationally under ITU regulations, and broadcasting applications operating in the framework of the Fixed-Satellite Service.

There should be a co-ordinated approach towards a review of the plan criteria established by the World Administrative Radio Conference of 1977 on the provision of the Broadcasting-Satellite Service. The result of this review should also be taken fully into account when identifying common European positions for the World Administrative Radio Conference of 1992.

4. Lines of Action for Creating a Favourable Environment

A number of longer term action lines will have to be initiated, in order to create the environment for the full implementation of the proposed positions set out.

This concerns in particular changes which may be needed in the international environment of satellite communications; the production of standards; and the promotion of the full use of satellite technology by providers and Telecommunications Organisations, in order to create a strong European position in this area.

It is proposed to initiate the following lines of action:

1. **WORKING TOWARDS A REVIEW OF THE EUTELSAT CONVENTION AND ITS OPERATING AGREEMENT,**

as far as required to implement the proposed positions set out above.

Major issues in this context are:

- necessary modifications to ensure direct access for users to EUTELSAT satellite capacity;
- future handling of the coordination procedure concerning the "economic harm" provision of the EUTELSAT convention;
- future handling of the technical coordination procedures as foreseen in the EUTELSAT convention;
- necessary measures for implementing future commercial independence of EUTELSAT;
- mechanisms for ensuring cost-orientation of tariffs charged to users;
- implementation of the separation of regulatory and operational interests and opening of membership of the EUTELSAT consortium to new parties.

Their total investment share of 88% in the EUTELSAT organisation means that Member States must share the responsibility for redirection and adjustment of the EUTELSAT Convention and operating agreement in order to ensure development of the potential of EUTELSAT to the fullest possible extent, in line with the goals of the Single Market.

2. DEFINING A COMMON POSITION IN THE INTERNATIONAL FORA RELATED TO SATELLITE COMMUNICATIONS, IN PARTICULAR WITH REGARD TO INTELSAT AND INMARSAT

The INTELSAT and INMARSAT conventions imply substantial international commitments for the Member States. With 28% and 34% investment shares in INTELSAT and INMARSAT respectively, Member States play an influential role in these global satellite organisations.

While changes as far as required by the proposed positions set out may therefore take time and have to depend on the evolving global environment, a number of steps could be taken:

- Member States must, as regards their own representation, apply strictly the principle of separation of regulatory and operational functions;
- Member States should support INTELSAT proposals underway and aimed at rationalising the economic harm coordination procedures;
- Member States should also support actions to render technical coordination procedures less cumbersome;
- Member States should facilitate access to both organisations via the signatories and pay special attention to the implementation of the principle of the cost-orientation of tariffs;
- Member States should work jointly within the two organisations with regard to any further changes required by the proposed positions, taking account of the need for a balanced world-wide development of satellite communications and the special requirements of the developing countries.

3. ACCELERATING STANDARDISATION WORK IN THE EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE WITH REGARD TO SATELLITE COMMUNICATIONS EQUIPMENT

ETSI has allocated with the creation of a special technical committee (TC-SES - Satellite Earth Stations) and the definition of a multi-annual work programme high priority to this area.

In particular for the earth station equipment sector, standards are indispensable for the effective implementation of the mutual recognition of type approval and licensing of one-way and two-way satellite systems. The Commission intends to give high priority to this area in its working relations with ETSI.

4. PROMOTING THE FULL USE OF SATELLITE TECHNOLOGY IN APPLICATIONS, BY SERVICE PROVIDERS AND BY TELECOMMUNICATIONS ORGANISATIONS,

in particular with regard to services for the less-favoured regions and the countries of Central and Eastern Europe which are now integrating themselves into the European telecommunications area.

Satellites will retain their basic advantages with regard to terrestrial telecommunications: thin-route service and rapid deployment, as well as immediate large-area coverage for one-way applications.

The Commission proposes as major objectives:

- Full use of the technological potential of the European Space Agency, in order to develop satellite technologies further for both private and public applications;
- Full application of satellite communication systems in the implementation of Community policies.

This concerns in particular the use of advanced telecommunications for regional development. Through its STAR programme, the Commission has given financial support for the setting up of major satellite ground stations and business services terminals for transmission links.

It also concerns the Community policies for education and training, transport and fishing and for the developing countries.

- Full attention to the role of satellites in the context of the future development of telecommunications in the Community, in particular as regards Europe-wide services, as well as for the development of Integrated Broadband Communications (IBC).

GLOSSARY

<i>Antenna:</i>	a device for transmitting and/or receiving radio signals. In earth station terminals, it usually takes the form of a parabolic reflector. Antenna diameters of television reception are typically in the order of 60-120 cm, while for transmit and/or receive private business terminals the diameters range from 60-250 cm. Antennas for satellite earth stations for trunk telephony and TV uplinking typically have diameters of 8-20 meters.
<i>Assignment:</i>	of a radio frequency or radio frequency channel: authorisation given by an administration for use of a particular radio frequency or radio frequency channel and under specified conditions. See Article 1. of the <i>Radio Regulations</i> for the definitive terminology.
<i>Broadcasting-Satellite Service(BSS):</i>	the transmission and reception via satellite of signals which are intended for direct reception by the general public.
<i>Community Access Television (CATV) or "cable TV":</i>	the distribution of television signals from a central antenna or "head-end", to subscribers' homes over a coaxial cable network. The "head-end" may receive signals from either a satellite or a terrestrial radio transmission system. Satellite signals received at a cable head-end would normally use the Fixed-Satellite Service frequency bands.
<i>C-band:</i>	frequency bands around 4 Gigahertz and 6 Gigahertz (GHz) used for the Fixed-Satellite service. The higher frequencies, around 6 GHz, are used for the "uplink" (from earth to space) and the lower frequencies, around 4 GHz, are used for the "downlink" (from space to earth).
<i>CCIR:</i>	<i>International Radio Consultative Committee</i> , one of the two main consultative committees of the <i>International Telecommunications Union</i> (ITU). The CCIR is responsible for the study of technical and operating questions on radio communications and for the issue of relevant recommendations.
<i>CCITT:</i>	<i>International Telegraph and Telephone Consultative Committee</i> , one of the two main consultative committees of the <i>International Telecommunications Union</i> . The CCITT provides a forum where telecommunications authorities can agree <u>inter alia</u> on world-wide technical and operational recommendations.
<i>CEPT:</i>	<i>European Conference of Postal and Telecommunications Administrations</i> .
<i>DBS:</i>	<i>Direct Broadcasting by Satellite</i> . The distribution of signals, usually television but possibly also sound and data, directly to a satellite receiver at the customer's premises (rather than, for example, to a CATV system) via a satellite using the Broadcasting-Satellite Service frequency bands. The same service can also be carried out via a satellite using the Fixed-Satellite Service frequency bands, in which case it is referred to as the Direct To Home (DTH) service.

<i>Downlink:</i>	the space-to-earth transmission path, i.e. the radio link from the transmitting satellite to the receiving satellite earth station. The downlink originates from the transmitting antenna on board the satellite, from which the beam spreads out to cover a certain zone on the earth's surface (see "footprint"). While the coverage zone can be shaped to a certain extent, it cannot follow a country's border exactly and so there is inevitably a certain amount of unwanted coverage or "overspill".
<i>Earth Segment:</i>	the part of a satellite communications network formed by the satellite earth stations.
<i>Earth Station:</i>	Refer to <i>Satellite Terminal</i> .
<i>ESA:</i>	<i>European Space Agency</i> , the major European organisation to carry out research and technological development on space-related subjects, including satellite telecommunications.
<i>EUTELSAT:</i>	<i>European Telecommunications Satellite Organisation</i> . The terms of the agreement are defined in the EUTELSAT Convention and a complementary agreement called the EUTELSAT Operating Agreement. The combined investment share of Community Member States is 88 %.
<i>Fixed-Satellite Service (FSS):</i>	a radiocommunication service between satellite terminals at specific fixed points using one or more satellites. This service may include satellite-to-satellite links or feeder links for other space radiocommunications services such as the <i>mobile-satellite service</i> or the <i>Broadcasting-Satellite service</i> .
<i>Footprint:</i>	the area within which the power received on earth from a satellite downlink beam equals or exceeds a certain level. A satellite may carry several different downlink antennas and therefore have several different footprints. The aim of the satellite designers is generally to concentrate the satellite's power where it will be most useful, i.e. in the desired coverage zone, but this can only be done approximately so inevitably some power will be misdirected and may overspill into neighbouring areas.
<i>Geostationary satellite:</i>	a satellite whose period of revolution is equal to the period of rotation of the earth about its axis and whose orbit lies in the plane of the earth's equator. Such a satellite will be in orbit about 36,000 km above the equator but will appear approximately fixed relative to the earth. The ability to place satellites in geostationary orbit was crucial to the development of satellite communications as it enabled large, fixed earth stations to be used with minimal "tracking" or repointing of the antenna to follow the satellite on its apparent path through the sky. Most communications satellites are in geostationary orbit.
<i>GigaHertz (GHz):</i>	a frequency equal to one thousand million Hertz or cycles per second. The Hertz is the basic unit of frequency, which is used to measure how many times in a second an electromagnetic wave completes its full cycle from its positive to its negative pole and back again.

- HDTV:** *High Definition Television*, the transmission and reception of a higher-quality television picture than is currently available. Normal television pictures have an "aspect ratio" (the ratio of picture width to picture height) of 4:3, and a maximum of 625 lines of picture information. High definition television will have a wider aspect ratio (16:9) and 1250 lines of information, giving a picture quality closer to cinema standards.
- High-power satellite:** usually a satellite operating in the Broadcasting-Satellite service (BSS) frequency bands, providing direct broadcasting services to user receiving antennas of small size (down to 50-60 cm). The high power in each individual channel transmitted tends to limit the number of channels which can be provided over a high-power satellite, in some cases to as low as five.
- IFRB:** *International Frequency Registration Board*. A permanent organ of the *International Telecommunications Union* effecting orderly recording of frequency assignments and orbital positions assigned to geo-stationary satellites.
- The duties of the IFRB are enumerated in Article 10(5) of the ITU Constitution and concern in particular "to furnish advice to Members with a view to the operation of the maximum practicable number of radio channels in those portions of the spectrum where harmful interference may occur", as well as "to perform any additional duties, concerned with the assignment and utilisation of frequencies and with the equitable utilisation of the geostationary-satellite orbit ...".
- INMARSAT:** *The International Maritime Satellite Organisation*. The terms of the agreement are defined in the INMARSAT Convention. The Community Member States have a total investment share of 34 %.
- INTELSAT:** *The International Telecommunications Satellite Organisation*. The terms of the agreement are defined in the INTELSAT Convention, supplemented by an Operating Agreement. The Community Member States have a total investment share of 28 %.
- ITU:** *International Telecommunications Union*, the United Nations' specialised agency for telecommunications. The ITU holds periodic conferences at which telecommunications issues of global importance are discussed; the main conferences are the World Administrative Radio Conference (WARC) and the World Administrative Telephone and Telegraph Conference (WATTC). The ITU also has a number of permanent organs including the *IFRB*, *CCIR* and *CCITT*.
- K-band:** the generic name for all frequencies in the range 10 to 36 GHz. Under the Radio Regulations (see ITU) this range is divided into many sub-ranges which are variously allocated to both terrestrial and satellite services.
- Ka-band:** the upper portion of the K-band, from approximately 17 to 31 GHz. This band is not yet used commercially. Some frequencies in this range are being examined for future satellite use.

<i>Ku-band:</i>	the lower portion of the K-band, from approximately 10 GHz to 19GHz. Where satellite communications are concerned, Ku-band generally refers to the frequencies around 11GHz (for "downlink" or space-to-earth transmissions) and 14GHz (for "uplink" or earth-to-space transmissions) allocated to the fixed and Broadcasting-Satellite services.
<i>Land mobile-satellite service:</i>	A radiocommunication service between mobile earth stations located on land and one or more satellites, or between mobile earth stations based on land by means of one or more satellites.
<i>MAC:</i>	<i>Multiplexed Analogue Components</i> , a method of transmitting television images whereby the separate components of a TV picture (sound, chrominance and luminance) are transmitted in analogue form but in different time-slots of a "time-division multiplexed" signal. The MAC family of standards is referred to in Council Directive 86/529/EEC.
<i>Maritime mobile-satellite service:</i>	A radiocommunication service between coast earth stations and earth stations located on board ships, or between earth stations located on board ships; survival craft stations and emergency position-indicating radio beacon stations may also participate in this service.
<i>MATV:</i>	<i>Master Antenna Television</i> , a system in which a single, central antenna is used to receive television signals, either from a terrestrial radiocommunication system or from a satellite. The television signals are then distributed via coaxial cable to a closed group of users, for example, to individual apartments in an apartment block or to rooms in a hotel.
<i>Medium-power satellite:</i>	generally a satellite with a large number (25 - 30) channels, but which transmits less power in each channel than a high-power satellite. Medium-power satellites were originally intended for point-to-point telephony and television distribution to the head-ends of cable TV systems, but with improved antenna technology and receiver sensitivity it has also proved possible to use them for television distribution direct-to-home with antennas of reasonable size (0.8 - 1.2m) throughout much of Europe.
<i>MSS:</i>	<i>Mobile-Satellite Service</i> . A radiocommunications service between mobile-satellite earth stations and one or more satellites.
<i>Point-to-point:</i>	one-way or two-way communications between two points only. The services which use satellites for point-to-point communications include voice transmission, high-speed data links and television distribution to cable head-ends.
<i>Point-to-multipoint:</i>	one-way or two-way communications from a central point to a number of subsidiary points, and vice versa. One-way point-to-multipoint applications for satellites include data broadcasting and television transmission direct to users' premises; two-way point-to-multipoint applications include data networks with a return path and interactive distance learning methods. In two-way point-to-multipoint networks there is frequently an asymmetry in the data flow, in that more information flows from the central station to the peripheral stations than in the opposite direction.

Radio Regulations:

The Radio Regulations are agreed by the ITU World Administrative Radio Conferences.

Article 11 of the Radio Regulations deals with the proposed establishment of a satellite system, Articles 12 and 13 with the notification procedures (and Article 15 with coordination of BSS band use and Article 15A with FSS band use); Chapter V. deals with interference.

Article 1 of the Radio Regulations also provide definitions such as allocation, allotment and *assignment* of a radio frequency or a radio frequency channel.

Satellite services provider:

Provider of a radiocommunications service via space segment capacity.

Satellite terminal:

Also referred to as earth station. A station located on the earth's surface and intended for communication with one or more terminals of the same kind by means of a satellite; the terminal consists of one or more transmitters or receivers or a combination of transmitters and receivers, including the accessory equipment, necessary at one location for carrying on a radiocommunication service.

Space segment:

The part of a satellite system formed by the satellite or satellites.

Space segment capacity:

Transmission capacity available in a satellite system normally relating to the power and number of satellites.

Space segment provider:

Operator providing space segment.

Space segment providers are the international telecommunications satellite organisations as well as national and private operators.

Telecommunications Organisations:

Defined according to Council Directive 90/388/EEC as the public or private bodies, to which a Member State grants special or exclusive rights for the provision of a public telecommunications network and, where applicable, public telecommunications services. Also referred to as "Telecommunications Administrations".

Transponder:

the part of a communications satellite which receives a signal from an earth station, shifts it from the uplink frequency to the downlink frequency, amplifies it and retransmits it to another earth station or stations. The signal is redirected back to earth in a broad wide-area coverage. Medium-power satellites generally can have up to 30 transponders; high-power satellites have fewer. The new generation of INTELSAT satellites, said to be the largest and most complex ever built, have a total of 48 transponders; the first of these satellites was launched in October 1989. A single transponder can normally carry one television channel, or up to about 1700 telephone bearer circuits.

Uplink:

the earth-to-space transmission path, i.e. transmitting a signal from a satellite terminal to a satellite.

Videoconferencing:

a service which links two or more locations through live video and audio transmissions. Its main users are the business community, since it can to some extent replace face-to-face meetings and reduce company travel costs. Some companies install private videoconferencing studios in their own premises, while others use "public" videoconferencing rooms rented out by the telecommunications organisations. Besides live images (which are generally below television standard), the videoconferencing link can also provide data, facsimile and graphics transmission.

VSAT:

Very Small Aperture Terminal. Refers to small earth stations, usually with antenna diameter below 2.5m, which can be installed at a user's own premises and used for one-way or two-way private communications. Also known as microstations.

WARC:

the World Administrative Radio Conference. WARC is one of the main conferences of the ITU (q.v.). It meets to determine international radio communications standards and policy. WARC meetings are of particular importance to satellite communications because it is there that the Radio Regulations, which determine which frequency bands may be used for a particular service (e.g. Fixed-Satellite service, broadcast satellite service, mobile satellite service, etc.) are agreed upon. Special WARC meetings also agree upon the international allocation of positions in the geostationary orbit, which, like the frequency spectrum, is regarded as a shared global resource.