REPORT FOR CEC DGXIII

The Impact of Non-European Competitors on a Deregulated European Satellite Telecommunications Market

Analysys

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REPORT

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0/ Executive Summary

In recent years there have been significant advances in the capability and affordability of satellite solutions to telecommunications needs. However, satellite telecommunications in Europe do not yet make a significant contribution to the level of European telecommunications infrastructure.[1] A major constraint on the application of satellite solutions to telecommunications has been restrictive regulation at national level.

The CEC is considering a range of de-regulation measures to open up and harmonise the European satellite telecommunications market. This proposed liberalisation of satellite telecommunications in the EC is seen by some industry observers as a threat to European players. Their concern is that key sections[2] of the European satellite telecommunications market will become, or remain, dominated by US and Japanese players. This study has been commissioned to examine the likely impact of non-European competitors on a de-regulated European satellite telecommunications market.

Non-European competitors are already dominant in certain key sectors of the European satellite telecommunications market. Whatever regulatory environment is in existence, their impact will continue to be significant. We attempt to discover whether their impact in a de-regulated environment will be more harmful, or less harmful, to European players.

The European satellite telecommunications market is currently small and under-developed; its current state of development will favour large, integrated players with existing satellite telecommunications track records. No European organisation matches this profile, whereas several US organisations are well placed to dominate a small European market. Market development is necessary if European players are to do well.

Market development requires regulatory change and an increase in commercial activity from satellite telecommunications suppliers. De-regulation will encourage investment

1 European satellite telecommunications revenues are less than 1% of total telecommunications revenues.

2 Concern is generally focused on the manufacturing of satellites and ground equipment, but some see the entire industry as under threat.

by existing and new suppliers, leading to increased awareness amongst potential users and growing opportunities for new products and services.

Because immediate de-regulation of European satellite telecommunications will accelerate the development of the market, we believe that it will not harm the overall prospects of European satellite telecommunications players, although their prospects in certain sections of the market are not good under any regulatory régime. For some sectors, immediate de-regulation will be beneficial to European players.

- In the **service provision and network operation** business, European players should be well placed to retain a large share of the European market. European players should be able to offer well tailored services at lower cost than non-Europeans, because of their advantage of proximity and awareness of individual customer requirements. Converting this advantage into a dominant market position will still be a significant challenge for European entrepreneurs. Europe's TOs have many of the resources necessary to succeed in this market, but for strategic reasons have little interest in developing widely-used domestic or international satellite telecoms services. An under-developed market will increase the competitive strength of vertically integrated US service providers.

  De-regulation will be beneficial to European service providers, increasing their opportunities and accelerating the development of the satellite telecommunications market.

- The USA and Japan have a significant technological and commercial lead in the **manufacture and sale of satellite ground equipment**, which will be difficult to overcome. The European ground-equipment industry is fragmented, small and strategically unfocused. The most promising opportunity to transform this picture is rapid growth of the **European satellite telecommunications services market**, which depends on early de-regulation. An enlarged services market will provide a domestic market for European products. Thus we have concluded that a delay in market development will only widen the gap between European and non-European capabilities. European manufacturers do not seem willing to invest in major product-development programmes until they are convinced that a significant European market will emerge. Even in the most favourable circumstances for European equipment manufacturers their future position appears to be weak.

  De-regulation will increase the imports of US and Japanese ground equipment. However, the opportunities for European ground equipment manufacturers will be increased, and their confidence should improve. Some will choose to exploit the new opportunities in partnership with US or Japanese manufacturers. In absolute terms, sales of European ground equipment will be greater in a de-regulated environment than under current regulatory conditions.

- The **manufacture of telecommunications satellites** in Europe should be seen as an integral part of the global satellite manufacturing business, covering broadcasting, defence, remote sensing and research as well as telecommunications. Eutelsat is the major customer for European satellites, and its major application is TV broadcasting. De-regulation would increase the competitive pressures on Eutelsat, and focus attention on Eutelsat's cost base. If this caused Eutelsat to purchase its next generation of satellites from non-European sources on cost grounds, it would place the European satellite building industry in jeopardy. Because of the relative importance of **broadcasting**, the rate of growth of the European satellite **telecommunications** market can have only a secondary effect on the market for satellites, and hence on the potential competitive position of the European satellite builders. Problems with costs issues (such as economies of scale, lean manufacturing and technology change), and uncertainties about future demand for broadcasting capacity mean that European satellite builders will continue to confronted with extremely difficult market conditions and competitive shortcomings, even if Eutelsat remains as a major customer.

  With or without de-regulation, the European satellite manufacturers face major uncertainties in their future business projections. The impact of de-regulation on their current order books will be negligible. The long-term impact of de-regulation will be less significant than other pressures such as those described above.

For each sector, we outline supporting measures that could be taken to strengthen the competitive position of European industry.

Most of the measures that could restrict the activities of non-European players (such as postponed de-regulation or restrictions on equipment imports) would also harm the prospects for European players. For the parts of European industry that will be unable to compete with non-European players, there are supporting measures that can be targeted to improve their performance as far as is possible:

- encouraging consolidation and co-operation in the European space industry. This is necessary for the health of the satellite manufacturers and the ground equipment manufacturers

- stimulating small and medium-sized enterprises to become active in satellite telecommunications products and services. This will improve the performance of the European ground equipment manufacturing sector

- encouraging a re-focusing of European space and telecommunications research and development resources towards satellite telecommunications products and services. This should be of specific benefit to European ground equipment manufacturing.

- increasing awareness of satellite telecommunications amongst potential business users, through demonstrators, training and publicity.

- establishing basic standards for satellite telecommunications ground equipment, interfaces and systems. This is required urgently to increase the confidence of equipment buyers and users.

These measures cannot make all sectors of the European satellite telecommunications industry competitive, but will strengthen important areas and increase the ability of European players to take advantage of the opportunities offered by de-regulation.

1/ Introduction and Scope

1.1 Context of the Study

Satellites have been used for public telecommunications since 1965, when the first international satellite trunking links were established. Since then, the range of applications for which satellite solutions are feasible has grown to cover a wide range of telecommunications services, with the balance shifting towards business applications rather than residential telephony. However, although the range of applications has grown, satellite telecoms still only accounts for a fraction of a percentage point of global telecoms traffic.

At present, satellite telecoms does not make a significant contribution to the level of European infrastructure; but changes in technology, user requirements and regulation mean that satellite telecoms traffic and revenues in Europe may grow quickly over the coming years (even though the earliest application, international telephony, is transferring to terrestrial fibre solutions). Many industry observers believe that the European satellite telecoms industry is not well placed to benefit from these changes.[1] They anticipate significant market shares being taken by non-European suppliers, primarily US and Japanese corporations.

This study has been commissioned to examine the impact of non-European competitors on the European satellite telecoms market. The brief for the study emphasises the requirement to understand the effects of regulatory changes on the competitive position of European players.

1.2 Structure of the Report

Exhibit 1.1 outlines the structure of the report.

1 See, e.g., CEC (1990c). Full details of all references are provided in the bibliography.

EXHIBIT 1.1: The Structure of the Report

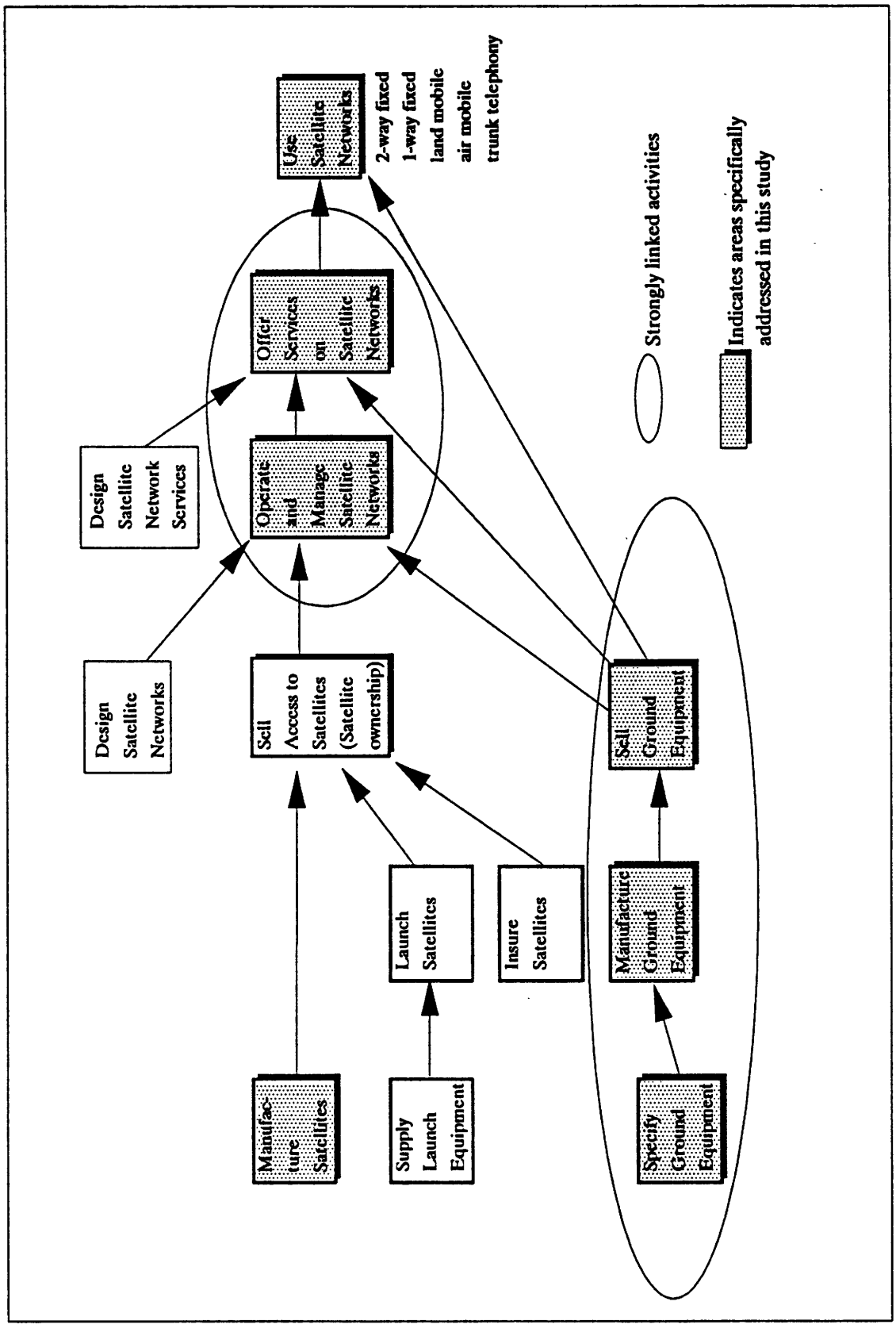
Chapter 1	introduces the subject of satellite telecoms, and defines the scope of the study in terms of which areas are and are not covered.
Chapter 2	surveys the position of satellite telecoms in Europe today, indicating the current standing of European players in each area of the market.
Chapter 3	examines the factors that will determine the size and form of the market in the coming years. The demand for services, the availability of well-matched supply, the constraints of regulation, and competition with terrestrial telecoms are all considered.
Chapter 4	outlines the success factors for competitors in each of the market areas under study (service providers, network operators, and ground-equipment and satellite manufacturers). The performance of different classes of European and non-European players against these success factors is examined. The key issues for each class of European player are identified; the large and vertically-integrated nature of US entrants is identified as being a particular advantage in a small and underdeveloped market.
Chapter 5	introduces three market scenarios, drawing together the outputs of Chapters 3 and 4. The first scenario describes the development of satellite telecoms with no regulatory changes. This highlights the problems that will be faced by European industry if de-regulation does not occur. The purpose of the other scenarios is to examine the relative positions of European players in a rapidly de-regulated satellite telecoms market, and in a market where de-regulation is postponed for a set time.
Chapter 6	surveys the various approaches that can be taken at EC and national level to support the European satellite telecoms industry. Attention is given to the delay of de-regulation to provide a 'breathing space' for European players to prepare themselves to meet open competition. The conclusion is that delay of de-regulation will be counter-productive for the overall competitive strength of European players in service provision, network operation and ground-equipment manufacture. The main beneficiaries of delay would be some of the European telecoms operators (TOs). Other support measures are assessed, and recommendations are made to pursue those that could be effective.

1.3 SCOPE OF THE STUDY

1.3.1 Areas Included and Excluded

The work has focused on certain areas of the satellite telecoms value chain (as shown in Exhibit 1.2). Below we discuss the various areas in the value chain, and indicate which are included in the scope of this study, and why.

EXHIBIT 1.2: The Value Chain for Satellite Telecommunications



Manufacturing communications satellites

The 'European telecommunications satellite building industry' is not a particularly useful or meaningful term – it is necessary to view all satellite building together to understand the competitive situation, cost bases and strategy. With broad industry groupings (such as Loral / Alenia / Alcatel / Aerospatiale / DASA) emerging, and widespread sub-contracting and collaboration between firms, even the 'European' classification becomes blurred. This study examines the impact of satellite telecoms de-regulation on the European satellite builders, and assesses various supporting measures for the industry.

Launching satellites

The activity of launching satellites is becoming quite separate from the activities of building or operating satellites. This is because the business is maturing, and also because new entrants into the commercial market (China and Russia) have concentrated their capabilities on launch technology. The CEC has participated in studies in respect of the launching business as part of its scrutiny of the European space industry sector, and this activity is not included in the present study.

Selling access to satellites

The cost and accessibility of satellite capacity is of great importance to those in later stages of the value chain. Our picture of likely developments in the satellite access business has been taken from other studies and confirmed during interviews. The CEC has commissioned a number of studies into satellite access,[2] and this activity is not included in the present study.

Operating and managing satellite networks

At present, because of the immature condition of the satellite telecoms marketplace, network operation and management is almost invariably integrated with the provision of services to users (see below). In time, as with terrestrial telecoms, network operation and management will become a distinct activity in the value chain. In this report the term 'service provision' is often used to cover network operation as well, though the activities are discussed separately wherever necessary. The design of satellite networks (shown as separate in Exhibit 1.2) is at present largely integrated with network operation.

Offering services on satellite networks

The European service providers can be divided into two types:

2 See CEC (1992b, c).

- **telecoms operators (TOs)**, who offer satellite services as part of their product portfolio in their home territory and abroad
- **specialist satellite service providers**, who offer a specific range of services, almost exclusively to corporate and public sector users. Some of these are subsidiaries of TOs and some are independent of TO involvement.

This study includes in its scope a wide range of services offered by satellite – two-way fixed, one-way fixed, point-to-point, point-to-multipoint, land mobile (vehicular and portable), and air mobile. Although it is an important source of revenue for satellite systems, international telephony trunking by satellite has not been analysed in detail in this study, because it will not be affected directly by the regulatory changes that are proposed in the CEC Green Paper.[3]

Manufacturing and selling ground equipment

Ground-equipment manufacturers either sell direct to end users, or to service providers who then sell on or lease equipment to users. Fixed transmit/receive equipment, business receive-only equipment, mobile equipment and satellite-specific network management hardware and software are covered in this study. Residential and TV Receive-Only (TVRO) terminals are not covered.

Using satellite networks

The requirements and behaviour patterns of potential users of satellite solutions are included in the scope of this study because this area is of vital importance to understanding the development of the satellite telecoms market, and the outcome for European players. We have not conducted original research into user requirements or behaviour, but have consolidated the conclusions of others and tested these in the process of interviews.[4]

In summary, the scope of this study is satellite manufacturing, ground equipment manufacture, the operation of satellite networks and the provision of satellite services. Exhibit 1.3 lists the areas which are included and those which are excluded.

3 This would still be regulated under the 'reserved services' regulations as defined in EC Services Directive.

4 See CEC (1992d).

EXHIBIT 1.3: The Scope of the Study

Activity	*Included in this study*
Manufacturing communications satellites	Yes
Operating and managing satellite networks	Yes
Offering services on satellite networks	Yes
Manufacturing and selling ground equipment	Yes
Using satellite networks	Yes
Launching satellites	No
Selling access to satellites	No
Using satellites for trunked international telephony	No
Other satellite applications *(public broadcasting, remote sensing, positioning systems or other applications)*[5]	No

1.3.2 Industrial Policy Issues

Our objective in this study is to explore what will happen to the different parts of the European satellite telecoms industry given various assumptions about demand, supply, regulation and technology. We do not attempt to establish the national or regional strategic importance of different satellite-related activities. We do not address industrial policy issues concerning the desirability of maintaining high-technology capabilities or employment.

Our conclusions in each case are stated in the following terms: Will European players have a strong or weak competitive position? Will their revenues and profits be high or low? Will their market share be large or small? We also consider (in Chapter 6 of this report) the options for policy makers to alter the outcomes for European players, by introducing supporting measures. However, while we assess the likely impact of each supporting measure, we do not propose any programme of measures. It falls to policy makers to attempt to achieve their industrial policy objectives through the selection and application of supporting measures.

1.3.3 Forecasting

This study has not concentrated on producing quantified market forecasts. Where appropriate, the forecasts of others are quoted and acknowledged. Where we use

5 The boundary between satellite broadcasting and satellite telecommunications has been defined in this study to include all corporate applications (using two-way VSAT, one-way VSAT, business TV, etc.), and to exclude broadcasting to residential receivers and CATV receivers (a distinction that will, in reality, become increasingly blurred, but which serves for the purposes of this work).

quantified forecasts it is only to illustrate qualitative arguments concerning relative market sizes.

As with many new services, the level of demand for satellite telecoms at any particular point in the future is sensitive to assumptions about many variables. Confidence in any numerical forecast must be low. It is more productive to attempt to understand what the mechanisms for growth may be and which external influences may prove to be important. This study refers to factors in terms of their influence: for example, which developments may increase market size? which would decrease the performance or revenues of European players? A judgement is taken as to the likely net effect of different factors, in terms of strong growth, growth, stasis, decline, and so forth.

1.3.4 The Role of Interviews in the Study

In the course of this study we have interviewed about 40 participants in the satellite telecoms business, either face-to-face or through telephone interviews. This has been largely separate from the process of gathering information for analysis. The interviews have had a 'hypothesis testing' format – asking interviewees to discuss a series of hypotheses concerning, for example, the state of the European marketplace, customer behaviour, competitive strengths of key players, etc. The hypotheses have been wide-ranging and deliberately controversial in places. Where requested, responses have been 'off the record'. Annex B gives more detail concerning the interviews.

The interviews have enabled us to understand where opinion is divided, and to hear the factual and subjective arguments used to support various positions. Some of those interviewed disagree with some of the conclusions of this study. We have attempted to give space to views that argue against the conclusions reached.

2/ The Satellite Telecommunications Market Today

This Chapter surveys the position of satellite telecommunications in Europe today, looking at each of the activities in the value chain which is relevant to the scope of the study:

- users of satellite networks (Section 2.1)
- service providers (Section 2.2)
- network operators (Section 2.3)
- satellite owners (Section 2.4)
- ground-equipment manufacturers (Section 2.5)
- satellite manufacturers (Section 2.6).

2.1 USERS OF SATELLITE NETWORKS

In the past, European satellite telecoms has been the exclusive domain of national TOs and their international treaty organisations, who have used satellites for international telephony trunking. End users have had almost no direct involvement with satellite links. This picture has been changing in recent years, as satellites have become used for other telecoms applications and broadcasting.

Apart from international telephony trunking, the current applications of satellite telecoms in Europe are predominantly one-way data and video distribution, and TO-managed links (SMS - Satellite Multi-Services). Several users are non-European organisations who have gained experience of satellite telecoms in the USA. Most of the installed networks can be described as small and relatively unambitious.

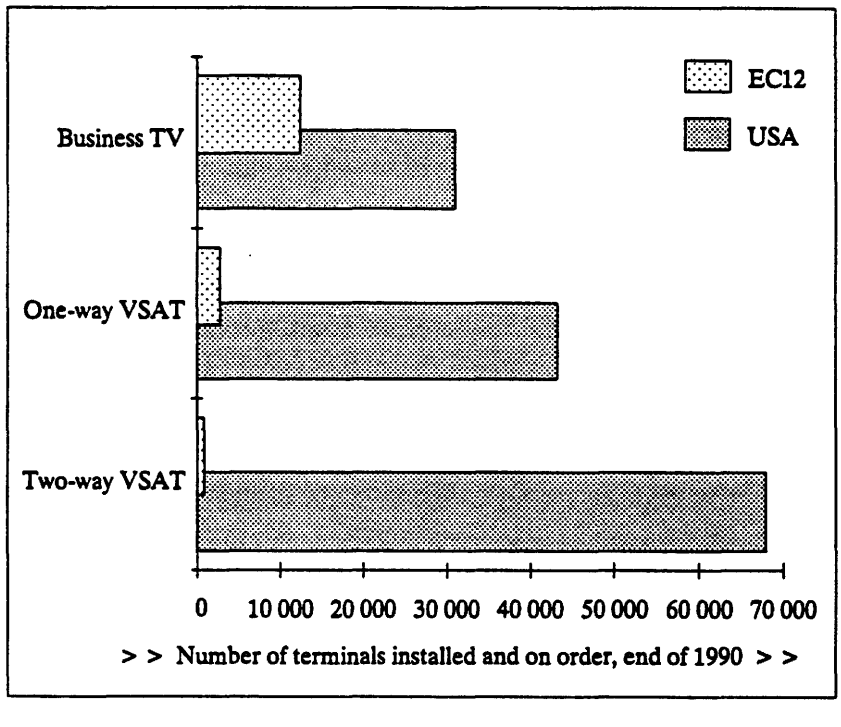
The new users of satellite telecoms are primarily corporations and public sector bodies with existing telecoms requirements. At present, however, only a small number of corporations and public-sector organisations in Europe make use of satellite telecoms (see Exhibit 2.1). The small size of the European user base relative to the USA is illustrated in Exhibit 2.2.

EXHIBIT 2.1: Corporate Users of Satellite Telecoms in Europe (1991) [Source: CEC (1992d)]

VSAT end-users		Business TV users
ABB	Italian Civil Aviation Agency	Amdahl
Agence France Press	Italian Civil Protection Department	Betting Shops (via SIS)
AGIP	Italian Driving Licences Agency	BMW
American Airlines	Italian National Pension Fund	DEC
Associated Press	Italian Railways	Ford
Banca Nazionale del Lavoro	Knight Ridder	ICL
Banca Nazionale dell'Agricoltura	McGraw Hill	Norwich Union
Berliner Bank	Meteo	Renault
BP	National Westminster Bank	Texas Instruments
Campsa	NTB (Norway)	EuroPACE
Canal INFO	Paris Stock Exchange	Federal Express
Conoco	Point Research	
Daimler Benz	Press Association (UK)	
Deutsche Bank	Renault	
Dornier	Reuters	
Dresdner Bank	Societa Interbancaria per l'Automazione	
EFE (Spain)	Statoil	
Ericsson	Stockholm Stock Exchange	
ESA	Telekurs	
French Foreign Ministry	Texaco	
Groupe Bull	UK Ministry of Defence	
Hypo Bank	Volvo	
HH Saudi Research		

Note: This is not a completely comprehensive listing, and does not include SMS/IBS users.

EXHIBIT 2.2: The Relative Sizes of the European and US Satellite Telecommunications Installed Base [Source: CEC (1992d)]



The smaller European user base can be attributed to the late start in Europe, and to a number of mismatches between the available services and the users' requirements:

- **Problems with suppliers.** The marketing and selling of satellite solutions by European suppliers has been very low key and market positioning of the service has often been inappropriate. Many potential users are too risk-averse to rely on small, young suppliers for their corporate networks.
- **Coverage.** Many potential users have pan-European requirements, and few suppliers can offer credible, fully supported pan-European service. Regulatory constraints further restrict users' coverage.
- **Price.** Prices have not been set to give the significant savings that would cause corporations to shift from their existing terrestrial solutions.
- **Applications.** Satellites are particularly suited to point-to-multipoint applications (such as data distribution). These applications are not yet well developed in Europe. Most current corporate applications rely on point-to-point terrestrial links, but no supplier has specifically offered a satellite telecoms service to meet this market in Europe.

To win business from individual corporate telecoms managers, satellite telecoms players have to match a demanding set of cost and risk criteria (see Annex A). In general they are competing against entrenched terrestrial operators with offerings that are seen as 'safe' by the customers. So far, on the evidence of sales, the users have not been impressed with the available satellite telecoms offerings.

The European user base is currently too small for clear conclusions to be drawn about the likely sectoral breakdown of European satellite users. In the USA, the retailing, distribution and financial sectors have been the major users. The geographical spread of businesses in these sectors in Europe is much more restricted; there are, for example, no European equivalents to pan-US retailers such as K-Mart, and most pan-European organisations still have strong national identities. Patterns of use may, therefore, develop very differently in Europe.

2.2 SERVICE PROVIDERS

The service provider is the organisation that interfaces directly with the end user. Satellite telecoms service providers have a wide variety of backgrounds:

- telecoms operators (TOs) – both monopoly-holders and competitors, some owning their own satellites, some with a purely domestic focus, some operating away from their home base
- terrestrial value-added network operators (e.g. Reuters, GEIS, EDS)
- fully integrated space equipment manufacturers (e.g. Hughes)

- partially integrated players (e.g. Alpha Lyracom/Panamsat)
- international treaty organisations (Inmarsat, Eutelsat)[1]
- pure satellite service providers (e.g. SIS, Teleport Europe).

With such a diversity of backgrounds, sizes and strategies, the dynamics of the service provision market are complex. Even in the USA, where the market is more mature and several rounds of consolidation have occurred, the market is still in flux.

As with many markets that are changing rapidly and have a significant technological content, the strongest players tend to be vertically integrated, for a variety of reasons (discussed in Section 4.2.1 below). In the USA the most common form of integration is for service providers also to be ground-equipment manufacturers and satellite owners.

In Europe the dominant form of integration for indigenous service providers is satellite ownership and terrestrial telecoms. The TOs - through their own satellites (e.g. France, Germany, Italy, Spain), or through Eutelsat - are integrated players. New entrants are generally not formally integrated players, although they often have strong links with others that bring some of the benefits of vertical integration (e.g. Teleport Europe's close relationship with AT&T Tridom). The current service provider marketplace is dominated by the TOs:

One-way VSAT services	Polycom (France Telecom), BT, DBP, Unisource (owned by the Swedish, Dutch and Swiss TOs), Telespazio (Italian TO owned), and Mecom (Polycom part-owned) are currently the key service providers in Europe. TOs are involved in almost all of the installed base.
Business TV services	SIS (independent and dominant), Teleport Europe, SIP (Service Information aux Parieurs - France Telecom), Bishopsgate (British Aerospace) and EuroPACE (independent) are currently the main service providers in Europe. TOs are involved in only 2% of the installed base.
Two-way VSAT	DBP, Telespazio, ANT (Bosch), Teleport Europe, Telefónica and Unisource are the major two-way service providers at present. TOs are involved in 75% of the installed base.
Other services	Mobile services (e.g. truck systems), marine services and SMS services are all dominated by the TOs and the treaty organisa-

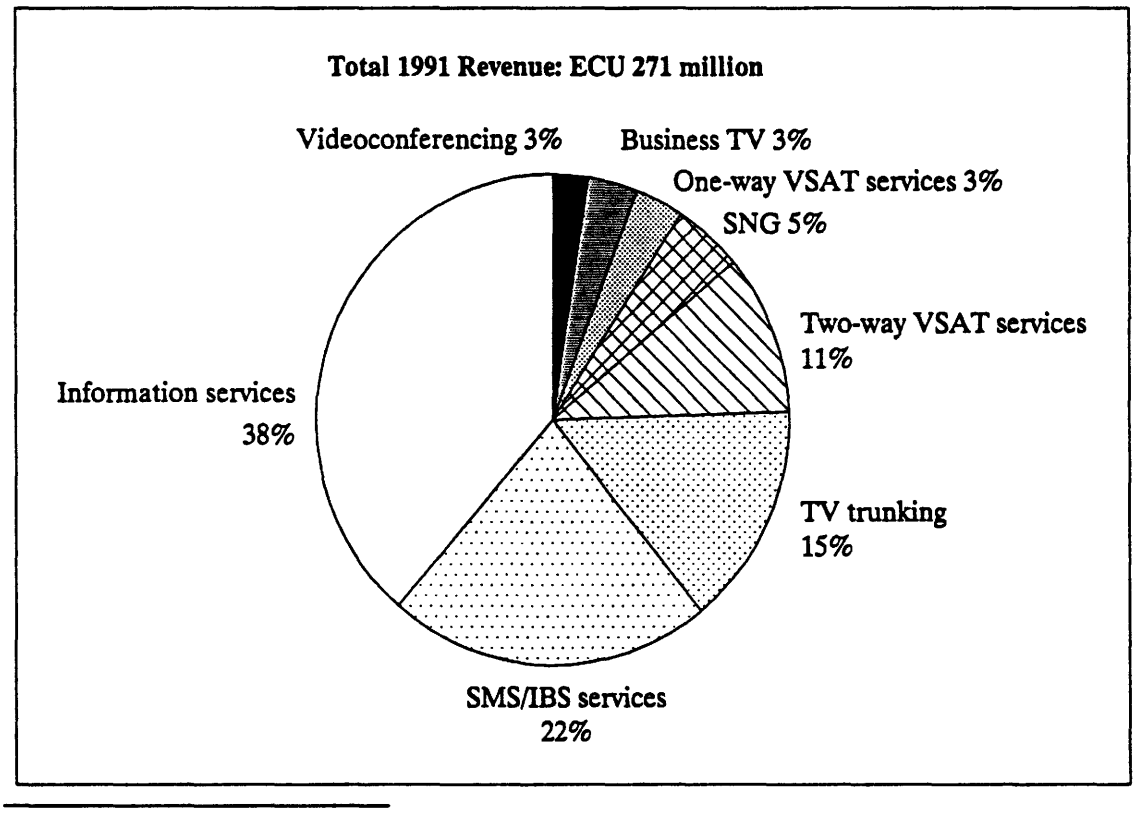
1 Although Eutelsat has end-user services such as Euteltracs, it does not see service provision as its major activity, and has deliberately minimised its service-provision activities.

tions. Satellite News Gathering services have a significant level of independent activity.

The European industry structure has been a major impediment to market development. Neither of the main categories of European service providers (the TOs or the smaller entrants) have both the rationale and the resources to develop the market quickly. The TOs position and price their satellite offerings as niche solutions, appropriate only where terrestrial links are very difficult; they have not been pro-active in developing point-to-multipoint business, and prices have not been allowed to undercut terrestrial tariffs. The new entrants do not have the resources to grow quickly on a broad front; they have aimed for incremental development of their businesses to reduce the risk, and their prices are set to maximise margins rather than to maximise revenues (as part of the generally risk-averse approach).[2]

Exhibit 2.3 shows the approximate split of revenues for satellite telecoms services (as defined for this study in Section 1.3.1) in Europe in 1991.

EXHIBIT 2.3: Satellite Telecommunications Service Revenues in 1991 [Source: CIT (1992)]



2 A specific feature of satellite telecoms service provision is the expense of providing ground equipment to users, particularly in the early years. Experience in the USA and Europe indicates that many early users are reluctant to buy ground equipment outright, so the service provider will often need to carry these assets itself - a considerable burden for small new entrants.

As this Exhibit shows, the largest categories in 1991 were Information Services (dominated by the SIS racing information service) and the Eutelsat SMS service (offered through TOs).

The growth of the US market indicates that a key sector for the development of satellite telecoms is interactive VSAT-based services. Interactive VSAT installations are able to support a range of satellite telecommunications services, providing flexibility and relatively low equipment costs. Expensive functionality is concentrated in hub stations, which can support many hundreds of terminals (depending on traffic patterns). A striking feature of the current European VSAT service providers is the high number of hub stations that they have deployed (about 16) relative to the number of revenue generating VSATs (about 3000). In the USA the number of terminals per hub is about four times as high. The consequent low utilisation of many expensive hub stations in Europe can only be borne in the long run by large organisations such as the TOs. Smaller service providers have expressed their concern about the substantial overhang of hub capacity in the hands of the TOs, and maintain that this has a deterrent effect on potential new entrants.

De-regulation in the USA (the 'Open Skies' policy) stimulated the North American satellite telecoms market in the early 1980s, but European de-regulation has been slow, incremental and patchy in comparison. Even in the most liberal European countries there are limitations to PSTN interconnection, complicated fees to be paid and other obstacles. Access to transponder capacity is often difficult to arrange and local planning laws can restrict dish installations. Many European countries maintain a TO monopoly for service provision (see Exhibit 2.4 below).

EXHIBIT 2.4: *Satellite Telecoms Regulation in the EC12 (Example – VSAT Provision)*

TO monopoly	*Licences granted or not required*
Italy	Germany
Spain	France
Portugal	UK
Belgium	Netherlands
Luxembourg	Denmark
Greece	
Ireland	

Regulation has been a significant constraint to service providers, including those TOs wishing to operate away from their home bases. Satellite solutions are particularly advantageous for long links, but the patchwork of complex and restrictive regulation has prevented any service provider from properly achieving this goal.

However, whilst it is true to say that regulation has significantly delayed the development of the satellite telecoms market, the current state of regulation in four major national markets (Germany, France, the UK and the Netherlands) is considerably improved. Many demands for services can now be met by service providers. Regulation alone is not enough to explain the current slow growth of satellite telecoms in these markets; other supply-side constraints, as discussed above, are holding back the rate of growth.

2.3 NETWORK OPERATORS

Network operation is defined to include the following activities:

- installation and setting up of ground equipment
- administration of contractual arrangements for access to space segment capacity
- operation of control and management systems (with current systems this is usually centred on a network hub station)
- fault identification, diagnosis and repair
- technical support for users with network-related problems.

In terrestrial telecoms, network operation and service provision are increasingly distinct elements in the value chain. In satellite telecoms the two activities are still inextricably linked. Furthermore, because of the lack of formal industry standards and the rapid pace of technology development, network management is also closely tied to ground-equipment design. This brings advantages to players who are vertically integrated in service provision and equipment manufacture.

Terrestrial network management suppliers have, to date, made little impact on the satellite market – there is still a technical gulf between the two areas, and the relatively small size of the satellite marketplace makes it less attractive to terrestrial suppliers for major investments in new products.

Network management is identified by many service providers, users, equipment builders and others as the major technical problem remaining with VSAT systems.[3] The ability of satellite links to fit within broader networks and cope with various protocols is also

3 Sources: Study interviews, industry submissions to ESA, press comments.

problematic (e.g. ISDN, FDDI, frame relay, ATM/SDH). However, work on the application of the newer protocols, signalling systems and overall network architectures to satellite links is proceeding steadily (with most of the trials and experiments being conducted in the USA).

2.4 SATELLITE OWNERS

There are three distinct groups of communications satellites with European coverage:

- **Eutelsat-owned.** These are used primarily for TV broadcasting, TV programme movements ('backhaul'), telecoms and other applications (such as vehicle tracking). Access is via the TO of each signatory nation.
- **Publicly-owned.** France, Germany, Spain, Italy and Turkey all own satellites. They have a variety of applications driven by different national requirements. All have more than national coverage. Access to these satellites is via the national TO.
- **Privately-owned.** Individual licences have been granted to a small number of private satellites. These are almost exclusively used for TV broadcasting and backhaul, although it is intended that the forthcoming Orion satellites will carry primarily telecoms traffic. Access to these satellites is obtained by direct contact with the owners.

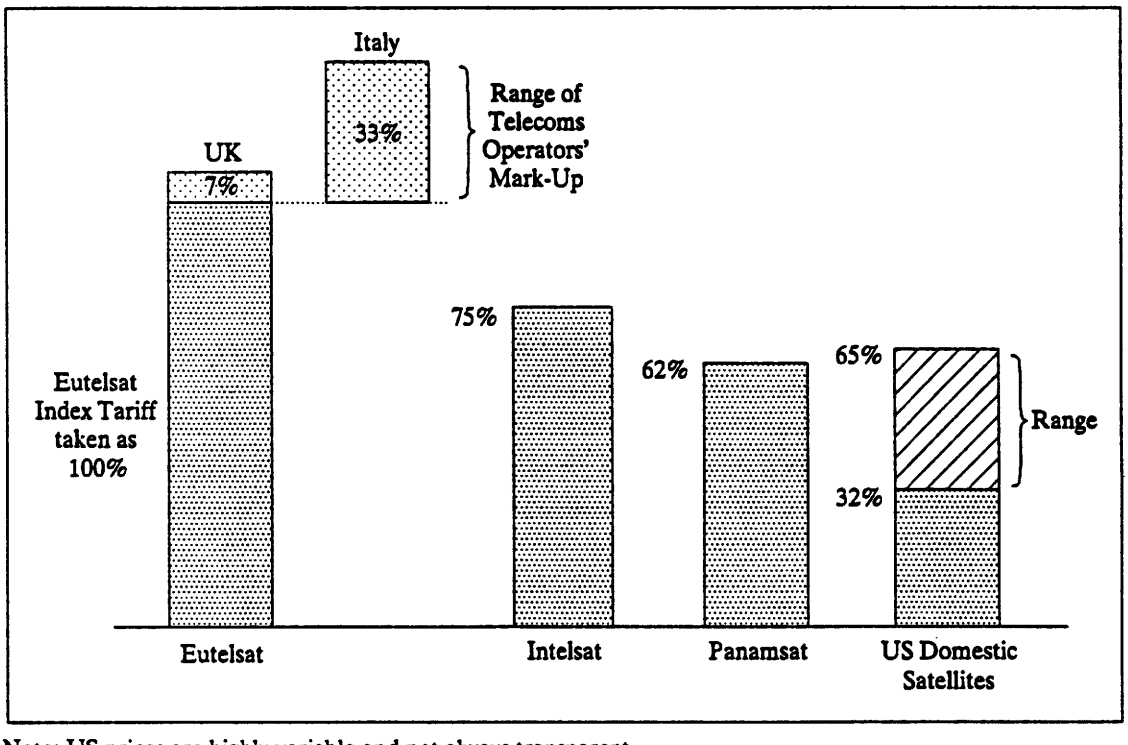
There are other satellites with European coverage, owned by Intelsat and Inmarsat. The European coverage of these systems is not as complete as that of Eutelsat. The use of these systems by telecoms service providers other than the TOs in Europe has been relatively low, restrained by their European signatories in the interests of protecting Eutelsat's position; to date, there has been little motivation for the treaty organisations to duplicate coverage.

Inmarsat, however, has shown increasing willingness to test this constraint, and there are signs that some Intelsat signatories are in favour of a change. The Intelsat K satellite will provide the first significant broadcasting opportunities for Intelsat in Europe.

European satellite ownership contrasts sharply with the situation in the USA, where the FCC's 'Open Skies' policy has led to a proliferation of privately-owned satellites, and substantial falls in transponder access prices. Europe has the highest access prices of any region; moreover the TOs add a premium to these prices when selling on capacity to third parties (see Exhibit 2.5 opposite). (When comparing transponder prices, it is important to note that there are often differences in the age, power and footprint of transponders that can account for price differences. Many of the Eutelsat transponders have a higher specification than those serving the USA.)

The main source of revenue for Eutelsat is TV broadcasting (around 60%). Satellite telecoms for business users represents only around 10% of revenues, although this contribution is growing. Eutelsat's financial position is very sensitive to the level of demand for broadcasting bandwidth, and to competition from other systems.

EXHIBIT 2.5: Relative Transponder Tariffs [Source: Via Satellite and CIT]



Note: US prices are highly variable and not always transparent.
Many integrated US domestic players account for their own transponders at cost plus around 20%.
Tariff structures are complex, making meaningful comparisons difficult. This chart is based on one-year 36MHz Ku-band prices.

Technical developments in video compression are expected to present a serious threat to the revenues from leasing transponders for satellite broadcasting. It is not clear how soon video compression will make its impact, but technical progress in 1992 has been remarkably rapid; observers say that systems that can make use of existing transponders could be operational as early as 1994. The advent of video compression will affect the revenues of all satellite owners, including Eutelsat.

As well as preserving its revenues, Eutelsat must satisfy the interests of its signatory TOs and governments. These interests have diverged in recent years as the strategies of different TOs have developed and competition between TOs has become more common. National governments' telecoms policies have become strikingly different, and it is increasingly difficult for Eutelsat to keep all parties content. Eutelsat has to satisfy conflicting demands:

- to provide a reasonable return to its capital providers (banks, TOs and governments)
- to act to protect the terrestrial telecommunications revenues of the TOs (i.e. not offering cheap bypass)
- to be the mainstay customer for European satellite builders.

2.5 GROUND-EQUIPMENT MANUFACTURERS

Until the 1980s, satellite ground equipment consisted solely of large earth stations. The revenue from supplying large earth station installations is currently stable at about ECU 10 million p.a. for around 300 new installations.

Military and specialist small terminals were first developed in the USA in the 1970s. A manufacturing industry for small commercial terminals grew up in the USA in the 1980s following the de-regulation of the telecoms sector. A large number of start-up businesses developed products to meet domestic demand for bypass telephony, and the VSAT segment emerged as a distinct business area.

Although revenues in this new market grew rapidly, the cost of developing new products and the proliferation of players kept profitability low and led to an industry consolidation in the late 1980s. The market leaders were acquired by outsiders such as Hughes (a large aerospace/defence corporation) and AT&T, leading to the formation of large, vertically integrated players. The consolidation strengthened the industry by reinforcing emerging standards. This enabled a large number of smaller players to remain active by developing products that complemented or substituted elements in the industry-standard configurations.

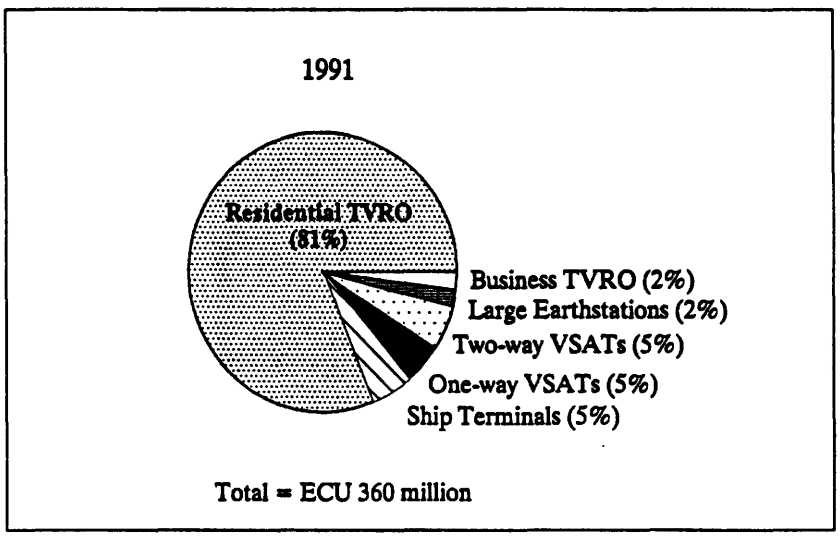
As a Japanese corporation active in the US market, NEC was well placed to participate in the growth of the commercial ground-equipment industry, and the company has achieved a significant market share. The success of NEC came in spite of the absence of a domestic Japanese market for small satellite terminals.

No European manufacturer participated in the early development of the US market, and European market share in the USA is nil. Moreover, there was no commercially significant market for small satellite telecoms terminals in Europe until the end of the 1980s. Most of the potential European manufacturers either ignored the sector entirely or initiated only low-level product-development activities. Today, there are no European products in key parts of the ground-equipment market (such as two-way VSAT).

Exhibit 2.6 shows the sales of satellite ground equipment in Europe in 1991. Although residential TV receive-only equipment is not covered by this study, it is included in the chart to show the current and projected relative sizes of the residential and business equipment markets.

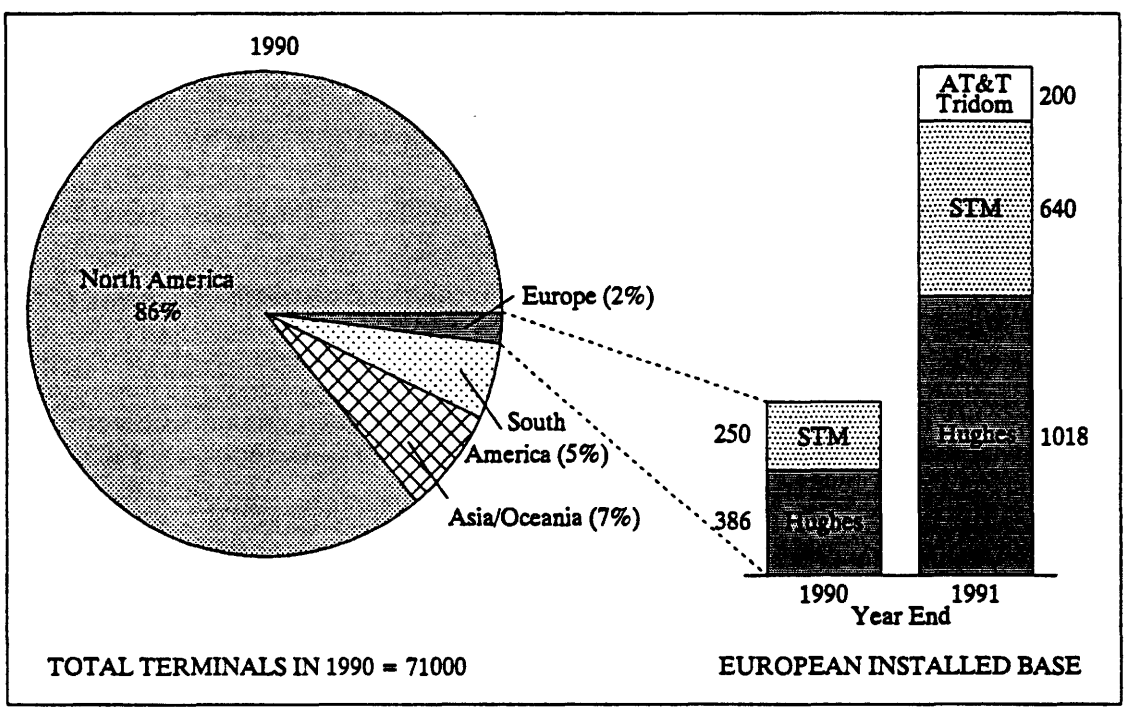
A number of points emerge from these figures:

EXHIBIT 2.6: Satellite Ground-Equipment Sales in Europe [Source: CIT]



- A key market segment is commercial **two-way small terminals (interactive VSATs).** As Exhibit 2.7 shows, Europe accounts for only 2%-3% of the installed base of interactive VSATs worldwide, but is growing very rapidly from these low levels. The market is dominated by US equipment (currently 100% of sales).[4]

EXHIBIT 2.7: The World and European Two-Way VSAT Installed Base [Source: Booz Allen, Comsys, CIT]



4 Some value is added in Europe - for example, ANT manufactures STM X.Star equipment in Europe under licence.

- The European market for **one-way VSATs** is currently equal in value to that for interactive VSATs, but will not grow at the same rate. European suppliers (Matra and OTE) have a good share of the current market; US and Japanese suppliers have not focused significant resources on this segment in Europe.

- The market for **business TVRO** terminals is not predicted to rise above about 2% of the total ground-equipment market. Various European manufacturers have the capability to produce business TVRO terminals, and can expect about half of the European market.

- European manufacturers have been relatively successful in establishing their market position in the supply of **large earth-station equipment**, but this market is relatively small and has very little growth potential.

- European manufacturers have a strong position in the market for **ship terminals**, where the market for installations on European registered vessels is currently about ECU 18 million p.a. (about one third of the world market). This market, however, will not grow dramatically. European manufacturers hold about 30% of the world market for ship terminals.

- The current European market for satellite **mobile terminals** (vehicle-based and aircraft portable terminals) is worth about ECU 9 million p.a.. European manufacturers have a healthy position in this market, but this will not necessarily translate into an advantage in producing personal satellite mobile terminals or terminals for the other mobile applications that are forecast to appear. It is too early to say whether Europe's relatively strong position in *terrestrial* personal mobile equipment will translate into an advantage in satellite-based systems.

Ground-equipment technology has advanced rapidly. Terminals have become increasingly powerful, sensitive, robust and more easily integrated with other systems components. Two technology areas are notable for their demands (in terms of high fixed costs and skill levels):

- **Software production.** Software is an increasingly important component, both in the functionality of individual items of equipment and in the integration of equipment into robust systems. Software development is entirely a fixed cost.
- **Component integration of high-frequency electronics.** The increasing levels of integration of specialised high-frequency electronics drives up fixed costs (research, design and production), and increases the economies of scale available to large suppliers.

Both of these technologies require high up-front investments. Potential European manufacturers, with small domestic markets and little market experience, have not had

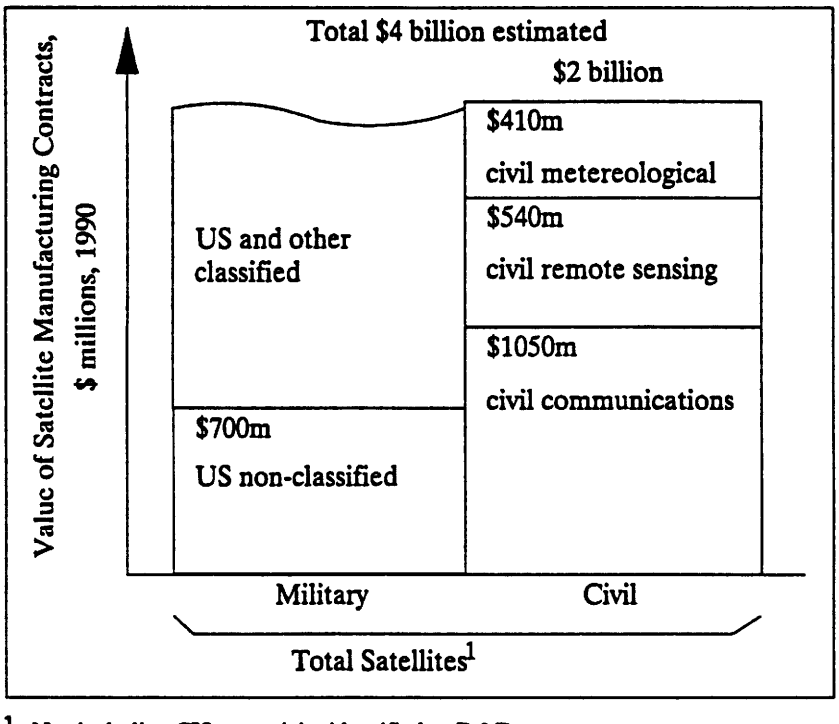
the confidence to make these investments. The economies of scale that are achieved by the dominant manufacturers (Hughes, GTE Spacenet, AT&T, NEC etc.), with their high worldwide market shares, form a significant deterrent to new entrants.

The revenues obtained from the sale of ground equipment are related to the size of the service provision market. In the longer run we estimate that equipment sales revenues will be about 20 - 30% of service provision revenues.

2.6 SATELLITE MANUFACTURERS

In world terms, building satellites for **civil communications** accounts for about a quarter of total satellite building activity (the rest having military, government, remote sensing, positioning, research or other applications – see Exhibit 2.8).

EXHIBIT 2.8: *Estimated Total World Satellite Manufacturing Activity [Source: CIT, FI/DMS, Euroconsult]*



[1] Not including CIS, or activity identified as R&D

Individual civil communications satellites are built to serve a mixture of telecommunications and TV broadcasting needs. Based on the respective revenues from broadcasting and telecommunications, it is estimated that revenues for satellite

manufacturing for telecommunications were about $560m in 1990 (including international trunked telephony).

A European satellite building industry developed in the 1970s and 1980s to compete with the US satellite builders. It has depended on civil communications satellites to a much greater extent than US industry, where military applications have been more significant.

European satellite manufacturers have established an impressive record of progress and achievement in the past 15 years. From a base of zero in the 1970s, the European industry achieved a 20% share by value of the world civil communications satellite market in the 1980s. In the period 1990-95, according to Euroconsult, its share is projected at 30% by value. Civil satellites for broadcasting and telecoms have been a key driver of growth for the entire European space industry; this contrasts with the USA, where military contracts have been the major driver.

The main applications of European communications satellites are TV broadcasting (over half of the capacity in orbit) and international telephony (over one quarter of capacity in orbit). Business telecoms has not been an important application, but has been growing quickly since 1989, and now accounts for approximately 16% of European revenues to satellite owners. Payloads are now designed to give the owner considerable flexibility to serve broadcasting, telephony or business telecoms, so satellites can meet a range of possible demand patterns.

European production has largely been for European domestic coverage; no European satellites have been sold for domestic US use. When competing for business in the rest of the world, Europeans have had more success as subcontractors to US firms than as prime contractors.

European manufacturers have not had the opportunity to produce long runs of similar satellites because this has not been required by the domestic European market. US experience with long runs for their domestic market, however, has demonstrated that there are substantial economies of scale in satellite manufacture. This is an important factor in the 'cost disadvantage' of European manufacturers identified by many commentators.[5]

Exhibit 2.9 shows the major players in satellite manufacturing in Europe. Most are also active in other areas of the space industry (launchers and vehicles), the aerospace industry, and the defence industry (missiles and other systems). Unlike some of their US competitors (Hughes, TRW), they are not integrated into satellite operation and service provision.

5 See Euroconsult (1991b, 1992), Vega/Eurospace, press reports and Analysys interviews.

The industry has developed along national lines, integrated with the national defence and aerospace industries. Although there is significant and growing co-operation and consolidation across national boundaries, the national dimension is still significant as a driver of strategy and has a major bearing on costs. As the European industry has known for many years, the fragmentation of the satellite manufacturers is a significant weakness.

EXHIBIT 2.9: *Players in the European Satellite Manufacturing Industry [Source: Euroconsult]*

	Germany	*France*	*UK*	*Italy*	*Others*
Prime contractors:					
Platforms	DASA (MBB, Dornier)	Aerospatiale Matra	BAe	Alenia	
Payloads	ANT	Alcatel	Marconi	Alenia	
Propulsion	MAN	SEP, SNPE		BPD	
Sub-contractors	Telefunken Siemens Teldix Nord Micro SEL	Sextant Sodern Sagem Saft	Logica Thorn EMI	Laben Galileo Fiar Fiat Spazio	Fokker ETCA CASA Sener Saab Ericsson

The world satellite manufacturing business is now in a period of overcapacity. Trading conditions will be very difficult for all players, whether US or European, in the next few years:

- In the USA, the volume of military business is falling, leading to particularly fierce competition between US manufacturers for commercial contracts.
- Manufacturers are very keen to exploit economies of scale by achieving longer runs of similar satellites. This encourages low bidding and increases competitive pressures.
- Demand for satellites for TV broadcasting is not continuing to grow at the rate expected by some forecasters. The number of unused transponders in the USA is increasing. Similarly reduced expectations are apparent in Europe.[6]

6 Source: Study interviews.

- Demand outside the European or US markets is growing, but competition is intense and many national governments are keen to link the award of contracts to other trade or political issues.
- Compression technology, which promises to increase the efficiency of exploitation of satellite capacity, is threatening to affect the number of satellites required in future.

This difficult period is exposing the structural problems of European manufacturers – particularly fragmentation and low economies of scale – and they are struggling to fill their order books. Industry consolidation, however, is continuing, and this will reduce national divisions of the industry within Europe and even across the Atlantic. The future European market will be less able to support a European satellite manufacturing base on its own; business must be won in the rest of the world market against US competition, and in new market areas (such as Low Earth Orbit communications satellites).

In the long run, the revenues that can be derived from satellite manufacturing will be considerably smaller than the revenues that are achieved from offering services that make use of satellites. We estimate that they will also be smaller than the revenues from the sale of ground equipment to support these services. The perceived importance of satellite manufacturing (in industrial policy terms) does not derive from its revenue contribution to the economy, but rather from its strategic significance as a high technology business.

7 See Annex B for the assumptions behind these figures.

8 Analysys interviews.

3/ Drivers of Change in the Market

The future growth and development of the satellite telecoms market depends partly upon de-regulation, but also upon the evolution of demand and the behaviour of the supply base. De-regulation alone will not lead to healthy growth. There are serious weaknesses in the current service provision supply base that will constrain the rate of development, and it will be some time before Europe has a sufficient number of capable, well resourced and well motivated suppliers. Early de-regulation will encourage the required development of the supply base but will not guarantee success.

Moreover, developments in European terrestrial telecoms will eventually limit the addressable market for certain applications of satellite telecoms in Western Europe. If the satellite telecoms service providers do not join the mainstream of the telecoms sector before this window of opportunity is closed, then satellite solutions will remain marginalised and little used in Europe.

The key drivers for change will lie in the field of service provision; the success of other sectors of the market will be determined by what happens in this sector. This Chapter looks at the determinants of the future service provision market under three headings – regulation (Section 3.1), the evolution of demand (Section 3.2), and the behaviour of service providers (Section 3.3). We then consider more briefly the determinants of the future ground equipment and satellite manufacturing businesses (Section 3.4 and 3.5).

3.1 The Impact of 'Green Paper' De-Regulation on Service Provision

Regulation will continue to be an important determinant of the size and nature of the satellite telecoms market in Europe. At present, regulations differ widely between European states, but it is proposed that EC Member States' regulations should be harmonised within a common EC framework; several non-EC European states could also be expected to align their national regulation with such a common framework.

Exhibit 3.1 summarises the terms of the common regulatory environment proposed in the European Commission's Green Paper of 1990.[1]

EXHIBIT 3.1: Summary of the 'Green Paper' De-Regulation Proposals

Earth Segment	**Position: 1**	▸ Full liberalisation of receive-only equipment ▸ Transmit/receiver terminals subject to type approval only
	2	▸ Uplinks should be permitted under licence ▸ Licences should permit non-discriminatory PSTN interconnection
	3	▸ Type approvals should be based on European EM emissions standards ▸ National type approvals should be recognised in all EC states ▸ No special type approvals for receive-only equipment not connected to PSTN
	4	▸ Small non-interconnected network licences should be granted ▸ Large and PSTN-connected networks should be granted licences, subject to Directive 90/388/EEC (the Services Directive) ▸ A Directive should be issued on the mutual recognition of licences
Space Segment	5	▸ Operation and regulation of the space segment should be separated ▸ Equitable access should be given to those seeking frequencies or orbital slots
	6	▸ EC competition rules should apply to the owners of space segment capacity as far as possible ▸ Technical co-ordination procedures should not restrict access to the space segment (subject to Community and Member State commitments under international law)
	7	▸ Improved access to space segment for telecoms and broadcasting ▸ Direct access to Eutelsat capacity should be permitted by signatory states ▸ Full commercial freedom for Eutelsat within Member States
	8	▸ Space segment prices should follow the principles of cost-orientation
	9	▸ Positions 5 to 8 should be carried out by Member States under Community law
Mobile Systems	10	▸ Mobile/position-fixing systems should not be treated differently from fixed services
	11	▸ Mobile terminals should be subject to the same rules as fixed terminals
	12	▸ Mobile licences should be mutually recognised across the EC to allow roaming
Broad-casting	13	▸ Broadcasting remains subject to Directive 89/552/EEC (TV broadcasting activities)
	14	▸ MAC transmissions should be used as stated in Directive 86/529/EEC (updated in December 1991) ▸ Broadcasting satellites should be compatible with emerging HDTV standards

1 CEC (1990b).

The impact of the proposed new regulatory environment will be to facilitate and stimulate accelerated growth in the European satellite telecoms market, particularly for business applications using VSAT solutions. The new regulations are expected[2] to bring the following benefits:

Removal of prohibitions

Satellite telecoms will be available in all EC countries from a number of licensed service providers. Interconnection with private networks will be permitted. PSTN interconnection will be permitted in some cases.

Simplification of operations

Licensing and registration procedures for equipment, installation, transmission and reception will be more straightforward, and differences between national procedures will be reduced. This will benefit service providers and users.

Increasing confidence

Users, operators and investors will have grounds for increased confidence in satellite solutions. Today's substantial perceived uncertainties about the future of satellite telecoms will be reduced, although US experience indicates that satellite telecoms carries inherently high commercial risks (due to the technology, market uncertainty and investment characteristics).

Enabling of pan-European networks

A harmonised regulatory environment will facilitate the establishment of truly pan-European satellite networks – which has frequently been identified (by interviewees and industry commentators) as a key requirement for market growth. The mutual recognition of service provider licences by Member States will further increase the rate of growth.

Reduction of costs

The costs of deploying and operating satellite telecoms networks would be reduced in the new regulatory environment:

- Licensing charges and other cost obstacles will not be used to restrict activity.
- EC terminal type approvals will become 'one-stop', reducing costs.
- Initial and annual terminal registration charges will disappear.
- The premiums charged by TOs for space segment resale will not be sustainable. Over time, the other space segment

2 Analysys expectations tested in interviews.

proposals will result in falling prices for space segment access. However, regulatory change alone will not lead to transponder prices falling to US levels.

The timing of these benefits will vary. The announcement of a firm timetable for change would yield immediate benefits in terms of confidence. However, the actual implementation of individual proposals in each Member State will spread over a period of time, with some proposals, such as mutual recognition of licences, requiring considerable multilateral liaison.

Liberalisation of the space segment will not bring about a significant increase in the availability of satellite capacity over Europe for several years, due to the lead-time for new satellite deployments. Indeed, it is not clear that the Green Paper proposals will ever lead directly to a substantial number of new satellites that would not otherwise have been deployed. The commercial prospects for new capacity over Europe (over and above current planned launches) are not generally regarded as attractive.

Even if all regulatory changes could be fully implemented overnight, it would take the industry many months to absorb and respond to the new opportunities. For new entrants, it can take six months to two years to develop a business plan, raise finance and effect entry into new markets. US experience indicates that users will often wish to conduct limited trials for 12-18 months before investing significantly in satellite systems.

In summary, the full stimulant effect of the Green Paper de-regulation will not be apparent immediately. The impact of regulatory change on the development of the market will be spread over several years by a number of inherent delays and lags in the marketplace.

3.2 The Evolution of Demand for Satellite Telecoms Services

As discussed in Chapter 2 (Section 2.1), current realised demand for satellite telecoms services in Europe is small. The breakdown of users and applications may not yet be a good guide to the nature of any wider potential demand. The way in which end-user demand for satellite telecoms evolves will clearly be a key determinant of the form of the future market.

A fully detailed characterisation of the likely demand for satellite telecoms is beyond the scope of this study. Our understanding of the likely nature and level of demand is broadly in line with CEC study *Prospects and Policy for Europe-wide Specialised Satellite*

Services.[3] In this section we consider the likely evolution of demand under four main headings:

- the evidence for potential demand (Section 3.2.1)
- the relative advantages of satellite and terrestrial options (Section 3.2.2)
- the characteristics of demand for point-to-point, point-to-multipoint and mobile applications (Section 3.2.3)
- possible constraints on demand (Section 3.2.4).

3.2.1 Evidence for Potential Demand

There is considerable evidence that potential demand (i.e. unmet or unidentified demand) exists for satellite telecoms services. This potential demand is generally agreed to be predominantly for corporate telecoms. The evidence comes from the following sources:

- **Extrapolation from the experience of existing European satellite telecoms users.** Some current European users can be seen as 'pioneers', in that they have similar business profiles to large numbers of corporations who have exclusively terrestrial networks. Many of the 'pioneer' users claim that significant benefits have come from satellite usage.[4] These benefits should apply to similar but more conservative users, indicating that, in a developed market, significant real demand would exist.

- **Extrapolation to Europe of US experience with satellite telecoms.** In the USA, satellite solutions have grown rapidly, and now account for about 2% of total telecoms revenue. A simple extrapolation of US experience to Europe is not justified, because the geographical contexts and terrestrial telecoms environments are very different; however, comparison of US and European circumstances supports the view that potential demand exists in Europe.

- **Market research and case studies of potential European users.** A wide range of sources have produced forecasts and research reports indicating that demand from users can support annualised growth of up to 25%. While forecasters differ in their assumptions and methods, there is consensus that potential demand for satellite telecoms exists.

3 CEC (1992d).

4 See CEC (1992d) and Annex B, study interviews.

- **Cost/benefit analysis of satellite solutions compared to terrestrial alternatives.** Objective analyses of fully costed satellite and terrestrial options for a wide range of applications indicate that European users would benefit from satellite applications.[5]

3.2.2 Satellite vs Terrestrial Options

Most of the specific user requirements that make up potential demand – whether for point-to-point applications, point-to-multipoint, one-way or two-way – could theoretically be met by terrestrial solutions. The opportunity for satellite telecoms arises when the terrestrial solution is more expensive or inconvenient, as well as when no terrestrial solution is available (as in shipboard communications and rapid deployment systems, such as those required by the emergency services).

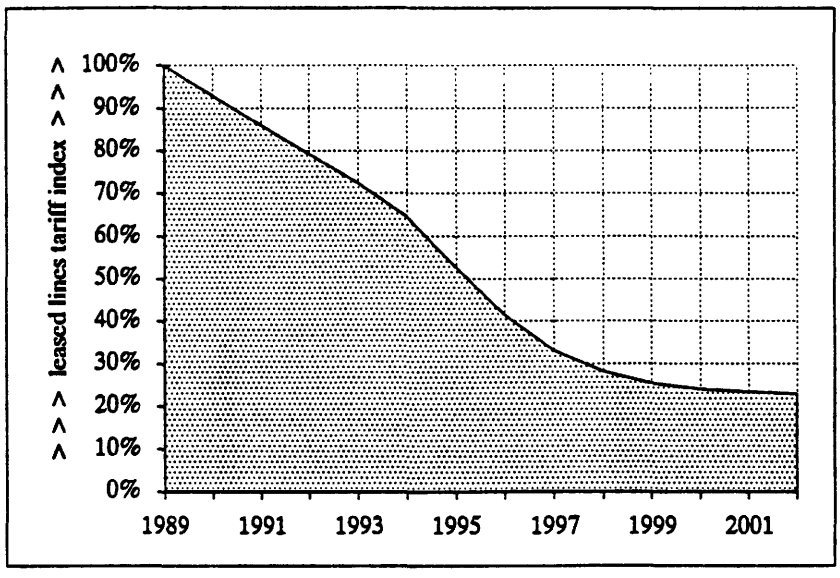
The advantage or disadvantage of satellite solutions relative to terrestrial solutions will change over time, as technology, infrastructure and user requirements change. Developments in terrestrial telecoms will therefore be an important determinant of the demand for satellite solutions.

The following points summarise the relevant developments expected in European terrestrial telecoms in the next few years:

- Terrestrial corporate telecoms links will become substantially cheaper than they are today. Price falls will be particularly marked for international telecoms and for private circuits. Exhibit 3.2 below illustrates our expectation of price falls for a basket of European international private circuits. Regulatory pressures and falling transmission costs are the main drivers of price reductions.
- The availability of higher-bandwidth links with advanced protocols will increase.
- Corporate users will develop applications that rely on the cheap availability of high-bandwidth connections.
- A number of TOs will become effective international operators, with the capability to offer pan-European corporate telecoms on a 'one-stop' basis.
- Corporate users will be increasingly powerful in their relationships with telecoms suppliers, demanding high levels of service and substantial discounts on tariffs.
- Increasingly significant differences will emerge in the level of telecoms infrastructure in different regions of Europe. The eastern nations, together with rural and remote areas, will continue to be poorly provisioned. Major conurbations and business centres, on the other hand, will see dramatic progress in their telecoms infrastructure.

5 See Section 3.3.4 below, and CEC (1992d).

EXHIBIT 3.2: Expected Future Tariffs for a Basket of European International 64bit/s Leased Lines



The relative advantages of satellite and terrestrial options vary widely between different kinds of applications (e.g. point-to-multipoint, point-to-point and mobile). Exhibit 3.3 illustrates where satellite solutions are likely to be advantaged:

EXHIBIT 3.3: Applications Suitable for Satellite and Terrestrial Solutions, Today and in 2000

Satellite telecoms advantaged	*Varies case by case*	*Terrestrial telecoms (fibre & radio) advantaged*
Current position		
► Point-to-multipoint ► News gathering ► Remote and poorly served areas ► Volatile networks [6] ► Vehicle location (RDSS)	► Pan-European point-to-point ► International trunked telephony	► Domestic point-to-point ► Personal mobile ► PSTN provision
Likely position in 2000		
► Point-to-multipoint ► News gathering ► Remote and poorly served areas ► Volatile networks	► Personal mobile ► Vehicle location	► Domestic point-to-point ► International trunked telephony ► Pan-European point-to-point ► PSTN provision

[6] i.e. networks where the sites are frequently changing.

There has been considerable debate in the telecoms industry concerning the extent to which satellite telecoms will take traffic away from terrestrial networks. Some claim that in the US market the majority of satellite traffic is 'incremental', that is to say that if the satellite solution were not available, then the individual corporate application would not have been developed.[7] Others disagree, interpreting many US applications as pure bypass exercises.

Our view is that whether or not satellite telecoms demand in Europe is truly incremental, it does not represent one of the major threats to *existing* TO revenues. The satellite paths that are added to international corporate networks will be overwhelmingly new links, part of the current strong growth in international networks. It is difficult to envisage satellite links being set up by resellers as major bypass channels for international PSTN traffic - if European international PSTN regulation changes to permit bypass services then terrestrial circuits are likely to be used to provide most of the bypass trunking links in Europe.

3.2.3 Characteristics of Demand

The characteristics of demand are different for each of the three main categories of application – point-to-multipoint, point-to-point and mobile applications:

Point-to-multipoint applications

Point-to-multipoint networks are the most commonly cited category of applications where satellite solutions can be cost-advantaged. Such networks need not be limited to centrally broadcast traffic only; US experience illustrates that on a point-to-multipoint network implemented with interactive (two-way) VSATs, traffic patterns can develop that are broadly similar to the traffic on terrestrial private-circuit data networks. Once an interactive network is installed, point-to-point traffic can easily be accommodated.

In the USA it has taken many years for corporate IT and telecoms managers to recognise fully the opportunities that such applications offer to their organisations. Implementing point-to-multipoint applications has often entailed major redesign of corporate information flows and organisational structure. Such significant changes within a corporation take time and commitment if they are to be successful, and there are many examples of satellite telecoms contracts that have foundered on

7 This is not the same as saying that if the satellite solution was removed, the user would let the application lapse – it is difficult to imagine K-Mart or General Motors doing without their key business information systems which are currently VSAT-based.

these problems – for example the Federal Express M/A-Com VSAT contract terminated in 1986. European corporate telecoms is around five to ten years behind US developments, and most European corporations have not yet started to climb the point-to-multipoint learning curve.

Point-to-point applications

There will be demand for point-to-point links provided by satellite where:

- terrestrial infrastructure is not adequate (e.g. Eastern Europe)
- the lead-time for terrestrial links is too long for the needs of the user (e.g. satellite news gathering, or countries with very slow TO provision)
- the distance to be covered is very great, and terrestrial tariffs are distance-related
- the terrestrial solution is more expensive due to tariffs not being cost-based (e.g. international private circuits).

Pure point-to-point links are common in the USA over long distances – for example the AT&T Skynet™ service. The extent to which point-to-point satellite links develop in Europe depends not on the fundamental relative merits of terrestrial and satellite solutions, but on the pricing of each. This is discussed in Section 3.3.4 below.

The key point with point-to-point links is their conceptual similarity to terrestrial telecoms. In contrast to point-to-multipoint networks, corporate telecoms managers can contemplate point-to-point satellite links without needing to worry about the implications for their corporate MIS or IT strategy. The obstacles to use are therefore much reduced.

The market for point-to-point private circuits in Europe is currently worth about ECU 5 billion per annum, and growth is healthy. Because of its size and maturity, it is a potentially attractive market for new entrants, whether terrestrial service providers or satellite service providers[8]. The point-to-multipoint market is small and immature in comparison to the point-to-point market.

8 Notably the Orion venture, which appears to be planning to concentrate on this area.

Mobile applications Mobile applications form a third category of potential demand for satellite telecoms. Some industry observers predict a substantial market for personal mobile communications using satellites, but this is an area of great uncertainty and speculation. If satellite systems do materialise, their share of the market will be determined by their merits relative to terrestrial systems (in terms of price, weight, battery life, coverage etc.).

3.2.4 Constraints on Demand

The following points are commonly cited as potential constraints on the growth of demand for satellite telecoms:

Diffusion rates Studies of the diffusion rates for the uptake of new telecoms services by corporate users confirm that migration to satellite solutions will not be an overnight process, even where clear and compelling benefits are available to users.[9] The slow growth of VSAT usage in the USA since 1983 (well below many expectations) supports the view that diffusion rates may significantly limit the rate of uptake in Europe, with the diffusion process perhaps being much slower than was observed for other telecommunications innovations (such as mobile telecoms, facsimile or packet-switched services). Annex A discusses the factors that can combine to slow the rate of diffusion for satellite telecoms.

Mix of demand An important determinant of the shape of the future market will be the mix of demand for large and small networks, particularly for two-way systems. At present, two-way VSATs in Europe average about 50 terminals per network, compared with around 100 per network in the USA. There are no 'large' networks in Europe, whereas there are several US networks of over 1000 terminals and some of over 5000. The division of the European corporate sector along national lines reduces the potential demand for large networks, and this will persist for many years.

The effects of European demand being skewed towards smaller networks will be significant:

9 See RACE work (EPF [1992]) and other work on diffusion rates for new telecoms services, Fontenay (1990) and Muller (1988).

- The utilisation of expensive fixed assets (uplinks and hub stations) will tend to be lower, which will reduce the profitability of service providers.
- The service providers will have to build a customer base of smaller accounts, and will not be able to rely on the benefits of large contracts such as those that have been awarded in the USA (e.g. General Motors, Chevron, Chrysler, Rite-Aid).
- The demand mix will favour shared-uplink and shared-hub solutions.
- The benefits of satellite solutions vs terrestrial solutions will be reduced, since the level of benefit is directly linked to the size of the network.

Niche orientation

It is often maintained, by conference speakers and in the telecoms press, that satellite telecoms demand is different from mainstream telecoms demand because it is strongly divided into 'niche' applications (such as business TV, SNG, rapid deployment for emergency services etc.). Because of this, it is maintained, the level of potential demand will be restricted.

Whilst it is possible to identify many highly specific applications for satellite telecoms, there is little evidence to suggest that satellite telecoms *per se* is any more niche-oriented than many other means of serving the emerging corporate networking market. In order to sell modern telecoms services successfully, it is important for the provider to understand highly specific customer requirements and to ensure that they are well matched to the features of the product. This is as true for services such as frame relay, SMDS, videoconferencing or IN services as it is for VSATs or business TV. The demand for satellite telecoms will be made up of highly individual implementations, and will require close collaboration between users and service providers to make these implementations effective; but this does not mean that level of potential demand is low.

3.3 THE BEHAVIOUR OF SATELLITE TELECOMS SERVICE PROVIDERS

For potential demand to become realised demand, the requirement must be matched against a supplier who is able to convert the opportunity into reality. The third determinant of the nature and size of the future market is therefore the behaviour of the supplier (the service provider), which we analyse under the following headings:

- service provider credibility and resources (Section 3.3.1)
- the strategic goals of the service providers (Section 3.3.2)
- the geographic coverage of service providers (Section 3.3.3)
- service provider pricing policies (Section 3.3.4).

Where relevant, we consider the TO and non-TO service providers separately under each of these headings.

3.3.1 Service Provider Credibility and Resources

The health of the satellite telecoms business in Europe depends on the existence of a sufficient number of service providers who have the credibility and resources to supply services. Credibility with customers is a key requirement for selling any telecoms service, particularly to corporate telecommunications managers, who will continue to be inherently prudent and risk-averse.[10]

The typical perception of service provider credibility varies between TO and non-TO providers:

The market's perception of non-TO service providers

At present, there are fewer than 20 non-TO satellite telecoms service providers in Europe. Many are not yet active, or have only a small number of pilot installations. No service provider has yet had time to establish a track record that could be completely reassuring to the average corporate telecoms manager, and the small number that do have some credibility and adequate resources do not constitute a sufficiently large supply base for rapid development of the market. All the non-TO service providers are adversely affected by the image of the sector as immature, unstable, risky, and under-resourced.

This perception will change as some of the existing players develop and new entrants appear. The rate of increase in the number and size of the non-TO service providers will be an important determinant of how quickly satellite telecoms can establish credibility with potential customers.

10 See Analysys (1991)

The market's perception of TO service providers

The TOs have most of the attributes that are necessary for credibility with potential satellite customers. They are perceived as being well resourced, stable, and technically capable (though their credibility tends to be confined to their domestic marketplace).

Most of the TOs, however, seem unlikely to exploit their positions in their home markets (discussed in Section 3.3.2 below), and will not use satellite telecoms as a major competitive weapon away from their home markets. It is not likely, therefore, that the existence of this group of credible and well resourced suppliers will be a source of substantial growth and development in the future market.

Overall, satellite telecoms providers have a poor image in the European telecoms industry. One reason is that because of both regulatory and technological factors, it is still difficult to embed satellite links into corporate networks in a transparent way. The technological difficulties apply equally in the USA, but there they are cited as an inconvenience rather than a restriction. If satellite links could be made transparent to users through more advanced network management techniques, an obstacle to selling satellite telecoms in Europe would be removed, and the overall credibility of satellite telecoms with customers would improve.

A major application of satellite telecoms in Europe has been the provision of services to eastern European states and the eastern part of Germany. As a result satellite telecoms have been associated with peripheral regions and exceptional requirements. This has been identified by interviewees as an obstacle to selling satellites for mainstream applications in regions with good terrestrial infrastructure. Perceptions will improve if there is an increase in the number of installations for mainstream corporate customers in major commercial centres.

3.3.2 The Strategic Goals of the Service Providers

Another major determinant of the future satellite telecoms business in Europe is the energy and ambition of the supply base. A set of suppliers with the strategic goal of high growth can bring a range of stimulants to market development. A passive supply base will not take the actions necessary to generate growth.

The strategic goals of the non-TO service providers

A significant proportion of current service providers have niche strategies that will not lead to broad or rapid overall market development. For smaller, younger players, a niche strategy can be more appropriate, bringing higher margins and lower risks; it is likely that many of the new entrants in the coming years will also pursue niche strategies for these reasons. However, this approach can be interpreted differently by some potential customers, who see it as confirmation of the limited scope of applications for satellite telecoms.[11]

There are a small number of potential service providers who have plans for strong growth on a broad front. It remains to be seen whether these plans can lead to potential entrants obtaining access to the financial resources necessary for implementation.

The strategic goals of the TO service providers

The current TO service providers have a variety of strategic interests in pursuing satellite telecoms, but none of them has a strategy that will lead to the evolution of a major service provision business. The current TO service provision businesses are either:

- offering only services that do not compete directly with terrestrial services (e.g. Polycom)
- offering satellite service away from their domestic territories as a limited part of a broader terrestrial portfolio (e.g. Unisource)
- offering satellite services to a small subset of users with exceptional requirements (e.g. Telespazio and Deutsche Telekom)
- providing no services to any users or serving a very small selected userbase (e.g. Telefónica).

There is, at present, no strategic rationale for any of the major European TOs to develop a significant satellite service provision business offering services that overlap with terrestrial telecoms. It is therefore not surprising that they have adopted their current modest strategies.

It appears that few or none of the current service providers will implement strategies that aim for significant growth in the broad marketplace. This will be a major constraint on the rate of growth and development of the market. The cumulative level of

11 Source: Study interviews.

marketing and sales will be low, and will remain largely niche-oriented; this will slow down the rate at which awareness, interest and active involvement will diffuse through the potential customer base. At the same time, the cumulative financial and human resources committed to the provision of satellite telecoms will remain low, and the rate at which the overall service provision business gains credibility will be retarded.

3.3.3 The Geographic Coverage of Service Providers

Users, service providers and industry observers are agreed that much of the potential demand for satellite telecoms will be for pan-European requirements. But although all of the current service providers could, in principle (and if regulation permitted), support pan-European networks, none are actually resourced or organised to do so. Even if de-regulation were to occur tomorrow, the pan-European capabilities of service providers would take several years to develop to an acceptable level. No existing service provider would currently be able to justify the cost of providing for installations, maintenance, repair and technical support across more than a small subset of the 40-plus European states.

The lack of any truly pan-European service providers will be a significant constraint on market development, one which will extend long after de-regulation. Some potential users will be satisfied with limited coverage, supplemented by special arrangements in countries where no support is available; but many will regard this an extra risk, and will postpone any involvement in satellite telecoms.

3.3.4 Service Provider Pricing Policies

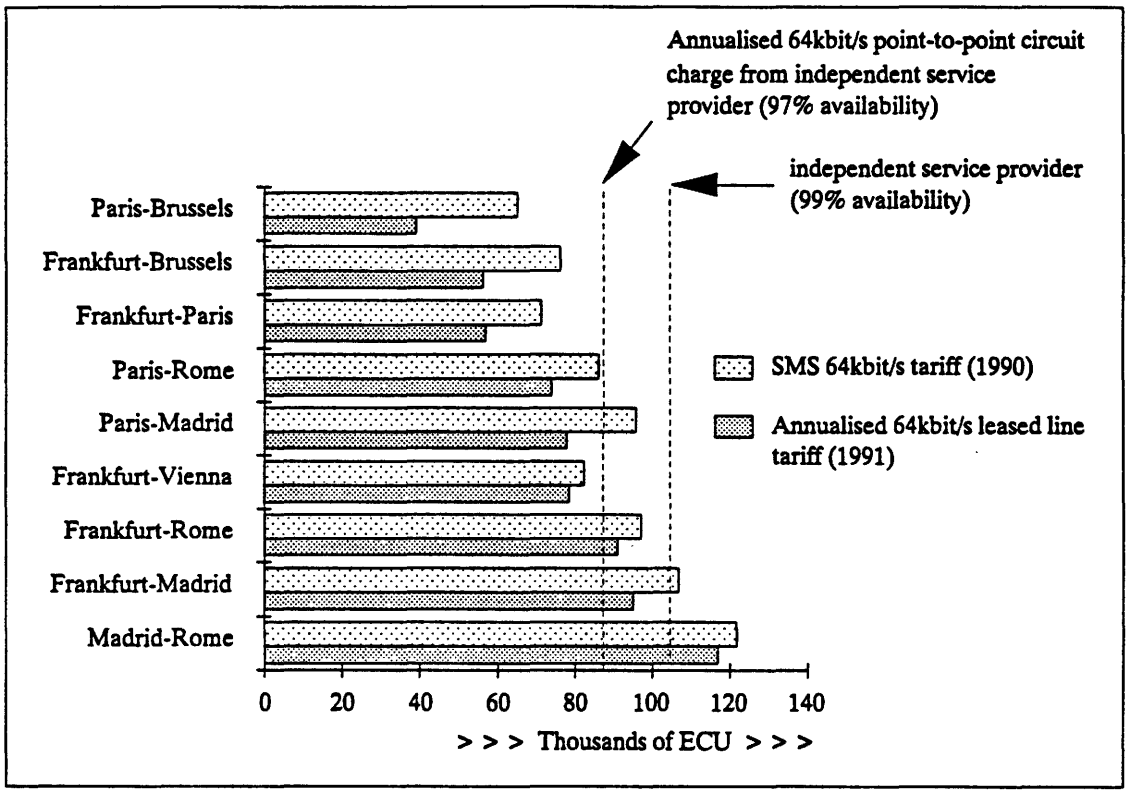
The prices charged by service providers will continue to have a major influence on the growth in usage of satellite telecoms. Few customers will switch from terrestrial solutions to satellite solutions unless there is a net cost saving. High satellite service tariffs will prevent the implementation of many satellite solutions for which terrestrial solutions are not feasible (as discussed in Section 3.2).

The pricing policies of the TO service providers

TO service providers currently price satellite links to match or exceed the price of terrestrial equivalents. Exhibit 3.4 below illustrates this for SMS, the Eutelsat-based business telecoms service offered through European TOs. Although the cost of a satellite link is quite independent of the distance covered, SMS tariffs are effectively variable with distance, in order to track terrestrial equivalents.

Understandably, the TOs do not offer cheap satellite links as a means of bypassing their terrestrial links. For point-to-multipoint links (such as the Polycom and Mecom services), savings can be made, depending on the number of receive-only terminals and the nature of the traffic, but these networks would not be implemented to the same extent on terrestrial links if there were no satellite option.

EXHIBIT 3.4: *Point-to-Point Tariff Comparison for International 64kbit/s Private Circuits [Sources: Tarifica™, OECD, service providers]*



The pricing policies of the non-TO service providers

The non-TO service providers' tariffs do not offer significant savings compared to terrestrial tariffs until the network reaches a certain size. Exhibit 3.4 shows how the point-to-point tariff for a leading non-TO service provider compares with various TO links.

We believe that this conservative approach to tariffing is motivated by a desire to maximise margins, rather than to maximise revenues. By behaving this way, a small and resource-constrained service provider maintains a stronger cash position

and is less exposed to risks, although the rate of growth of the business is retarded.

This may not continue to be the case; there are indications that the disappointing growth and poor hub utilisation achieved by some service providers will lead to price cuts. It is probable that non-TO service providers would be prepared to discount their published tariffs if a sufficiently attractive contract were at stake, but no such contracts have yet been awarded in Europe.

The pricing policies of several non-TO service providers are determined by the value-added aspects of their operations (rather then being closely linked to the telecoms market). The value added by a niche service provider is strongly dependent on the identification and exploitation of end-user demands, and in meeting these demands many will incur significant costs that are not directly related to satellite communications. For example:

- **SIS Link**, the racing information service, operates over 11,000 receive-only terminals. The costs of gathering and processing the racing information, and their other running costs, are significantly higher than the expense of the satellite network used to provide the service.[12]

- **Reuters** use satellite distribution to serve some of their clients with information on financial markets. The cost of the satellite network is estimated to be only a small proportion of their total cost of sales, and their tariffs are related to the value of the information provided, rather than the telecoms aspects of the business.[13]

However, as discussed in Section 3.2.4 above, the overall growth of satellite telecoms will be slow and patchy if it is based solely on the identification and exploitation of specific high-value-added niche services. Growth depends on the development of a broad range of services, many of which must be priced with regard to terrestrial telecoms alternatives.

12 IBC Technical Services (1992).

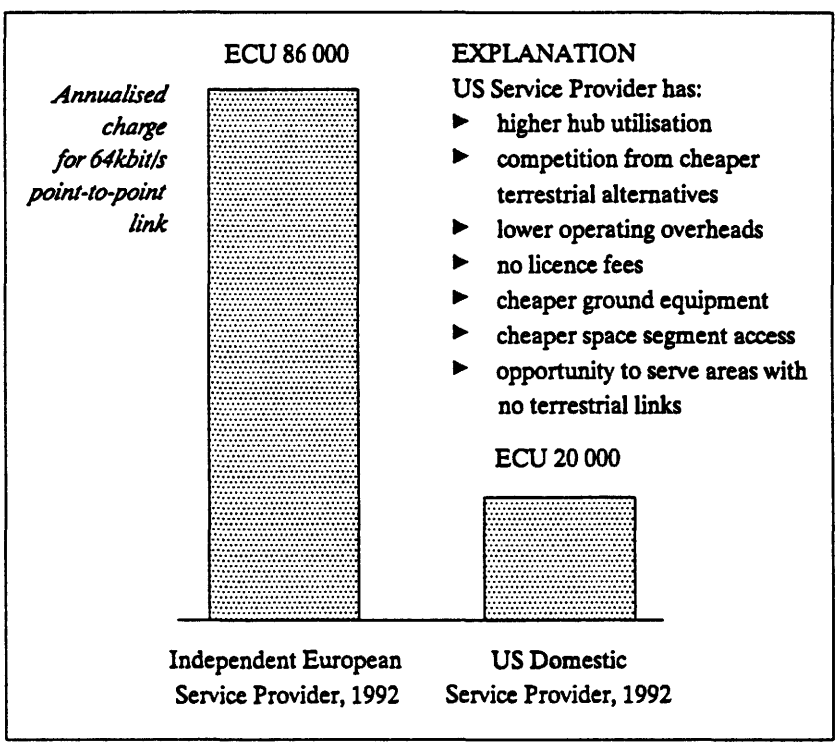
13 IBC Technical Services (1992).

At current prices, major savings for users (relative to terrestrial solutions) are only available for medium and large networks. For two-way networks with fewer than 20 to 30 terminals, the existence of savings depends on the mix of traffic and sites. The evidence of sales to date indicates that the level of savings is too small to attract many customers who have a terrestrial alternative.

As discussed in Section 3.2.4 above, the mix of network requirements in Europe will be skewed towards smaller networks than the average in the USA, both because of the strong division of European business into national units and because of the immature state of point-to-multipoint applications. When this is combined with the current high price levels and limited opportunity to achieve savings, it is clear that demand and supply are mismatched - supply is priced to suit large networks and broadcast applications, but current demand is for smaller networks and point-to-point links. Prices for these services must fall if the market is to grow more quickly.

There is certainly scope for satellite prices to fall. European links are priced substantially higher than US domestic links of similar performance. Exhibit 3.5 shows the differential, and lists the factors that explain why US prices are so much lower. In summary, European service providers require a higher contribution from each link to meet higher fixed and variable unit costs, and they are able to charge higher prices because the European terrestrial alternatives (both domestically and internationally) are significantly more expensive than their US equivalents.

EXHIBIT 3.5: US and European Satellite Link Prices [Source: Service Providers]



NOTE: $1 @ ECU 0.83
US price includes ground equipment valued at ECU 26 000 amortised over 5 years

As discussed in Section 3.2.2, terrestrial tariffs – particularly international tariffs – are projected to fall in the coming years. Satellite tariffs will have to fall faster if they are to increase the level of benefit that a customer perceives for implementing a satellite solution. This will only be possible if service providers can increase their asset utilisation and reduce their unit costs.

TO service providers are unlikely to drop their prices more rapidly than the rate at which terrestrial tariffs fall. Some existing non-TO service providers with high fixed costs will gradually drop their tariffs in order to increase their customer base, accepting the risks and lower unit margins that this causes. Some will be unable to stand reducing their margins, and so will be unable to grow their business, remaining small and weak. New entrants should already be preparing their business plans on the basis that tariffs will need to be below today's levels.

In summary, prices must fall if there is to be growth of satellite telecoms networks. Demand for larger networks, that *would* be economic at today's prices, will not be significant for several years; demand for smaller networks will not be captured at today's tariffs. Price cuts will come from the non-TO service providers, but will be constrained by their cost and risk positions.

In the longer run, both satellite and terrestrial prices will tend to fall to levels close to their relative costs. It is difficult to predict where the boundary between terrestrial and satellite solutions will lie, but it is very unlikely that satellite links will be cheaper than terrestrial links for any significant fixed point-to-point applications in Western Europe after about 2000.[14] By that time, terrestrial links are also likely to be cheaper for many small point-to-multipoint applications – those with around 20 receivers or fewer. If satellite telecoms has not firmly established itself in certain areas of the telecoms marketplace (such as point-to-multipoint or mobile), before this situation occurs, then its role is likely to be permanently marginalised.

We believe that the early opportunity mainly lies in meeting demand for point-to-point and small point-to-multipoint requirements, by setting prices to serve this market. From this we maintain that there is a *window of opportunity* for satellite telecoms in Europe to break out of its current marginal position. This window of opportunity is likely to close before the end of the decade. This conclusion is important when considering the overall development of the marketplace (discussed in Chapter 5 below).

14 This conclusion is not the unanimous view of all industry observers. It is contested by those who anticipate major technological breakthroughs in satellite systems and by those who predict the continuing power of TOs to keep terrestrial tariffs high.

3.4 DETERMINANTS OF THE FUTURE GROUND-EQUIPMENT MARKET

Clearly, the main determinant of the future European ground-equipment market is the size of the European service provision market. All of the issues raised in Sections 3.1 to 3.3 have relevance to the scale and shape of the ground-equipment supply business. In our opinion, the linkage between service revenues and equipment expenditure is such that the value of the ground-equipment market will be approximately 20 to 30% of the value of the service provision market throughout the remainder of the decade.

The following factors will have an important bearing on the development of the ground-equipment market:

- The mix of demand will reflect the level of regulatory restriction (as well as the real requirements of customers and the mix of service providers). For example, the market share of one-way VSATs in Europe has been much higher than in the USA because regulations have restricted the use of two-way systems;[15] in future, de-regulation will lead to the sales and market share of two-way terminals increasing as 'pent-up' demand for interactive services can be met.

- The weaknesses in the European service provision industry (discussed in Section 3.3) may lead to distortions in the ground-equipment market – good products may have poor sales because of difficulties in the provision of services that make use of these products.

- Europe is well provided with shared hubs for VSAT networks (see Section 2.2), and there is currently sufficient hub capacity to serve the projected growth in terminals for several years to come. This may result in the mix of sales being skewed towards terminals for the coming period.

- The cost of ground equipment is a major factor in determining the suitability of satellite telecoms solutions for customer requirements. If the steady falls in satellite terminal prices seen in the USA in recent years continue, and if they show through in European equipment prices, this will be a stimulus to the service provision market, and increase equipment volumes.

In summary, a healthy European ground-equipment market depends on a healthy service provision sector.

15 In Europe in 1991, one-way terminal sales revenues were about the same as two-way sales revenues. In the USA in 1991, one-way represented less than 20% of total sales revenues.(Sources Comsys and Via Satellite)

3.5 DETERMINANTS OF THE FUTURE SATELLITE MANUFACTURING MARKET

This section considers the determinants of world demand for the manufacture of communications satellites. Although the scope of the study is limited to European satellite telecoms, this section looks at the market beyond Europe (and includes broadcasting), in order to emphasise that the future of the European satellite manufacturing industry rests on many variables that are not connected with the de-regulation of European satellite telecoms.

It is relatively straightforward to forecast satellite manufacturing activity in the next three to five years. Firm orders have been placed for most of the satellites that will be built in this period and manufacturers have been finally or provisionally selected. We anticipate a 20% annual growth in the transponder capacity serving Europe until 1995, based on analysis of the payloads of about 14 launches in the period.[16] The manufacturers already have a reasonably clear idea of their build schedules and revenues for this period, except in unfamiliar areas of the market such as LEO satellites.

There is, however, considerable uncertainty surrounding activities beyond this horizon. It is difficult to forecast so far into the future what the mix of satellite applications will be, and how much capacity will be required for each application in each geographical zone. The number of new satellites required to serve this global mix of demand depends on the technological solutions that are selected (e.g. large or small satellites, GEO, HEO or LEO, etc), and on the match of demand with the capabilities of satellites already in orbit (i.e. whether existing transponders/beams can carry the traffic, and whether there is spare capacity for this traffic).

Any forecast of satellite numbers or manufacturers' revenues beyond a three- to five-year timeframe must be treated as speculative, because of the number of assumptions which must be made to reach a figure. This section discusses a range of factors that will drive satellite numbers and revenues.

Compression — If technology becomes available that can reduce the bandwidth required for the transmission of a video signal, the impact on the satellite industry will be substantial. Such technology is not yet available, but a number of US firms claim to be close to launching products.[17] The utilisation of existing satellites, and the demand for new satellites with European coverage, would both be threatened if these products were successful.

16 See Chapter 5, Exhibit 5.6 for a table of planned communications satellites with European coverage.

17 Some of these were demonstrated at the 1992 ISOG Conference (Munich).

LEO satellites

The success or failure of the various ventures that depend upon low earth orbit (LEO) satellites will be a major determinant of the shape of the satellite manufacturing sector in the coming years. For example, it is predicted that if the Iridium LEO project is implemented, Lockheed will jump from having almost no presence in the civil satellites sector to being the world's largest civil satellite producer, ahead of Hughes.[18] There is a wide range of other ventures at various stages of preparation, but it is very difficult to predict which, if any, will reach full deployment.

GEO satellite trends

There is continuing debate within the satellite industry concerning the relative merits of smaller and larger geostationary (GEO) satellites. The pattern of demand that will finally emerge is not clear, but will be important for the competitive position of European manufacturers. If US manufacturers are able to continue to build derivatives of their current designs (with low development costs), then European manufacturers will struggle to match these on price. If demand is for satellites whose specifications are substantially different from current designs, this US advantage will be reduced.

Demand for 'national satellites'

For a variety of reasons, many national governments around the world wish to have nationally or regionally controlled satellite systems. The potential demand for such systems is significant, accounting for perhaps 20-30% of satellite launches in the remainder of this decade, but because the driver of demand is not simply commercial, long-range forecasting is not straightforward. US and European satellite manufacturers compete aggressively on price to win this class of business, as the platforms and payloads tend to be derivatives of existing designs, with low development costs.

The decline in US defence expenditure on satellite programmes

The magnitude and details of the reductions in US military space and satellite programmes are difficult to quantify, but the effects are nonetheless visible. The entry of traditionally defence-based firms such Lockheed into the commercial satellites sector, and the restructuring of the sector (such as General Electric's sale of its satellite division to Martin Marietta), are indicative of the search to replace lost revenues, and the consequent overcrowding of the civil supply base.

18 See Forecast International/DMS (1992).

The primary impact will be in the US domestic market, affecting Europeans through their US links (e.g. Alcatel / Alenia / Aerospatiale / DASA / Loral, and Matra / Fairchild). There will also be increased competition for non-US contracts, which will directly affect Europeans bidding for such work.

Entertainment Broadcasting

As a major consumer of satellite capacity, the entertainment broadcasting industry is a key driver of demand for new satellites. However, the number of channels that can be supported by the European marketplace is not yet clear, and the balance between satellite distribution, cable distribution and hybrid solutions has also not yet stabilised. New broadcasting formats, particularly HDTV, are likely to increase the capacity required, but the timetable for their introduction is uncertain.

Several commentators believe that the broadcasters' demand projections of the late 1980s were over-optimistic, and that there will be increased numbers of idle transponders over Europe by 1995 even before the potential effects of compression are considered.[19] Reduced expectations for broadcasting traffic – while the capacity in orbit is steadily increasing – may undermine the viability of some satellites planned for launch after 1995. If launch programmes are delayed, scaled-down or cut, this will have a direct impact on European satellite manufacturers.

International trunked telephony

International trunked telephony has historically been an important application for communications satellites. There is currently a balance between satellite links and submarine cables as bearers for international trunked telephony, with about 500 000 cable voice paths on trans-Atlantic routes, and a similar number of satellite voice paths.

A similar balance exists on trans-Pacific routes (200 000 voice paths on each bearer).[20] We believe that the decreasing unit cost of fibre-optic transmission will give submarine cables an advantage over satellite links in the long run, and that they will capture more of the medium-term growth in traffic than satellites.

19 Source: Press comments, CIT and others. Many comparisons have been drawn with US experience, where substantial over-capacity still exists due to unrealised broadcasting projections.

20 See IIC (1992), MIRC (1991).

As a consequence, we project that international trunked telephony is unlikely to be a major driver of growth for satellite manufacturing, although it will remain an important application for several years to come. The new satellites already scheduled to serve this application will be utilised at close to planned levels.

Demand for satellite telecoms (excluding trunk telephony)

Satellite telecoms currently occupy only a small number of transponders over Europe (equivalent to about 5-10% of the total capacity), and the utilisation of this capacity is estimated to be no better than moderate.[21]

If satellite telecommunications traffic were to grow at 30% annually until 1995 (the upper limit of forecast growth), and the increase in transponder capacity over Europe is 20% annually (the projected rate), then in 1995 only 11% of transponders would be needed to carry all of the satellite telecommunications traffic, assuming reasonable levels of transponder utilisation. It is quite possible that over 11% of transponders could be idle (i.e. spare) by 1995, in which case no extra (unplanned) transponders would need to be added to meet the demand for satellite telecoms.[22]

This analysis is included to show that satellite telecoms is extremely unlikely to grow to a level where it results in an increase in the planned satellite numbers before 1995. Even if satellite telecoms growth is strong and there is no idle capacity arising from shortfalls in other demand, then satellite telecoms traffic would result in the equivalent of no more than one or two extra (unplanned) satellites being required over Europe before 2000. In the context of the world market, this is less than 1% of demand over the period. For European manufacturers it represents a maximum of about 4% of their expected market.

21 Source: Study interview and revenue allocation calculation.

22 This flexibility derives from the fact that a growing proportion of transponders in orbit can be configured for either broadcasting or telecoms traffic.

The future of the international satellite treaty organisations

The future roles, strategies and purchasing policies of Intelsat, Eutelsat and Inmarsat are important determinants of the future shape of satellite manufacturing. Historically responsible for around 30% of world civil communications satellite purchases (by value), their importance as specifiers and buyers is likely to increase to 35% or more in the years to 2000.

Each of these organisations is coming under a variety of pressures to change their roles and strategies in the coming years; Intelsat and Inmarsat have already undergone major restructuring to increase their commercial focus. The ownership and signatory structures of the organisations make them vulnerable to disagreements and internal stresses. These may show through in the scale of future approved programmes, and in the tendering and selection procedures for placing contracts with satellite manufacturers.

The main area of vulnerability for European manufacturers is the purchasing policy of Eutelsat, which has, to date, acquired only European-built satellites. If Eutelsat were to buy fewer satellites, or select US satellites, this would be a major blow to the European satellite manufacturing industry.

Of all of the factors discussed above, only the final two are related to the de-regulation of European satellite telecoms. The change in European regulations might impact on the strategies or policies of Eutelsat (discussed further in Section 5.4.3 below), and the liberalisation of satellite telecoms might slightly increase the addressable market for European satellite manufacturers. Either of these changes could also increase the opportunities for non-European satellite manufacturers in the European marketplace.

European de-regulation, therefore, is only one of many determinants of the size and form of the satellite manufacturing industry. The performance of European players in this marketplace is discussed in Section 4.2.3 below.

4/ Success Factors for Satellite Telecoms Players

In this chapter, we first outline the success factors for competitors in each of the three market areas under study (Section 4.1), before examining the potential performance of different classes of European and non-European players against these success factors (Section 4.2). European players are seen to be better matched to the success factors in a well-developed market than in a poorly-developed market.

The determinants of future performance for European players are then summarised for each market area in Section 4.3.[1]

4.1 Success Factors

In order to succeed in the satellite telecoms market, a player must be well matched against the factors that are important for winning and retaining business. This section identifies the key factors in each of the three market areas under consideration – service providers and network operators, ground-equipment manufacturers, and satellite manufacturers.

We distinguish between those factors which are essential for effective participation ('Qualifiers'), and those that are valuable for obtaining competitive advantage in the marketplace ('Differentiators'). It is not necessary for a player to match all of the differentiating factors in order to be successful.

4.1.1 Service Providers and Network Operators

Exhibit 4.1 shows the critical success factors (qualifiers and differentiators) for service providers and network operators. Below the table we discuss each of the factors in turn.

1 The assessments of success factors, and performance against these factors, are subjective.

EXHIBIT 4.1: Critical Success Factors: Service Providers and Network Operators

Telecoms track record	Qualifier
Technical capability	Qualifier
Price of services	Qualifier
Responsiveness to users	Qualifier
Smooth installations	Qualifier
Smooth operations	Qualifier
Geographic coverage	Qualifier
Financial strength/stability	Qualifier
Interconnectivity to other networks	Differentiator
Clarity of offering and prices	Differentiator
Sales and marketing capability	Differentiator
User education skills	Differentiator
Identification of niche services	Differentiator

QUALIFIERS

Telecoms track record

A visible track record of reliable telecoms provision is a pre-requisite for selling to most corporate telecoms managers. A short record is a weakness. Any reputation for unreliability is extremely damaging.

Technical capability

Corporate customers will look for a high level of technical expertise and capability in potential suppliers. This must be demonstrable at every stage of the selling, specification and installation process, and continue for the operational life of the network. Service providers who have to rely on others for significant technical capability will be inherently weaker in this area.

Price of services

Pricing strategy is an essential element in the marketing of any telecommunications offering. The mix of connection, rental and usage charges will clearly position the offering relative to competing solutions and will be a major determinant of patterns of usage. Service providers who are vulnerable to increases in the costs of their inputs (such as equipment or space-segment access) will find it more difficult to price their services effectively, because of uncertainty over their margins.

Responsiveness to users — Most corporate customers will no longer tolerate traditional low levels of service, flexibility or responsiveness from their telecoms suppliers (where they have a choice). Their benchmarks for telecoms supplier responsiveness and service levels are now the same as their expectations of other professional service suppliers.

Smooth installations — Service providers must be able to install indoor and outdoor units quickly and professionally on customer premises, bring these into operation smoothly, and establish interfaces with the customers' other telecoms equipment and networks.

Smooth operations — Normal operation, reconfiguration, billing, maintenance and repair must all be to specification. A service provider who is, or appears to be, overstretched in operational matters will not win business. Satellite telecoms is perceived by many potential users as an inherently troublesome technology. Many preconceptions are commonly held by potential users about equipment unreliability, sensitivity to atmospheric conditions and weather, problems with signal delay etc. The service provider can avoid fulfilling these preconceptions only through satisfactory operational performance.

Geographic coverage — The geographic coverage of the service provider needs to be well matched to the scope of demand for the offered services. This may require a presence outside the European region (in, for example, North America or the former USSR), or it may be a particular subset of the European region (such as the major financial centres or specific countries). In general, to be able to address the major opportunities, service providers will need to be able to cover at least a significant portion of Western Europe. Where the geographic coverage of the service provider is constrained by regulations or lack of resources, and a mismatch exists, the business will suffer significantly.

Financial strength/stability — Most corporate telecoms managers will not do business with suppliers that do not appear to be financially strong, well funded and stable. This applies to divisions and subsidiaries of larger firms as well as to independent companies (since such units can be sold, closed, or re-focused).

DIFFERENTIATORS

Full interconnectivity	Service providers should be able to meet the full interconnection needs of their customers at all of the required sites, whether this is for interconnection to private or public circuits, or for carrying voice or data traffic. This requirement was frequently identified in interviews with service providers and users, as a pre-requisite for satellite telecoms being seen as part of the mainstream of telecoms services.
Clarity of offering and prices	Corporate customers will demand straightforward service definitions and prices, whether they are buying standard services or negotiating a custom package. Service providers that cannot present their offerings clearly will not be able to demonstrate the benefits of their services, and will lose business. Both in interviews for this study and in the press, users have commented that they find some of the current service offerings confusing.
Sales and marketing capability	Satellite telecoms service provision has been shown historically to be a difficult product to market and sell, often because of the negative preconceptions which potential users hold. The contribution of the sales and marketing functions can thus be crucial in achieving market penetration.
User education skills	Ignorance of the capabilities and features of satellite telecoms is currently a major constraint to growth in Europe. Service providers who can develop the level of awareness and understanding of key groups within customer organisations will gain business and improve their positioning.
Identification of niche services	Those players that can identify and exploit specific niche requirements for the application of satellite services will be advantaged. However, it should be noted that finding successful niche strategies relies on either deep insight or good fortune, and that, as a general observation from other sectors, many attempts to exploit apparently attractive niches do not succeed.

4.1.2 Ground-Equipment Manufacturers

Exhibit 4.2 shows the critical success factors for one particular kind of ground-equipment manufacturer, the VSAT manufacturer.

EXHIBIT 4.2: Critical Success Factors: Ground-Equipment Manufacturers (Example Case: VSAT Manufacture)

Equipment performance	Qualifier
Equipment reliability	Qualifier
Equipment prices	Qualifier
Ease of integration	Differentiator
Sales and distribution channels	Differentiator
User education and marketing	Differentiator
Responsive product development	Differentiator
Quick development cycles	Differentiator

QUALIFIERS

Equipment performance

The pace of improvement in satellite ground-equipment performance is rapid, and obsolescence is increasingly swift. There will be no market for equipment that does not match its competitors on price-performance.

Equipment reliability

Reliability is sufficiently important to be singled out from other performance issues. The effects of equipment failures on the confidence of users are very great; equipment can quickly develop a reputation for unreliability, based on a very small number of problems.

Equipment prices

The global equipment supply industry is highly competitive in most product areas, and contracts are often won or lost on price. Clearly, however, competitive pricing must be underpinned by a matching cost position. Because of the high fixed costs associated with the development of today's ground equipment, unit costs are highly dependent on the overall volume of product sales. In the key area of VSAT equipment, the market leaders achieve their competitive cost positions by addressing the global market, in order to maximise volumes.

DIFFERENTIATORS

Ease of integration

Equipment that can be integrated effectively with a wide range of network management systems, protocols and hardware will have an advantage in the marketplace. Equipment manufacturers who can achieve this ease of integration without losing control of unit costs will win more business.

Sales and distribution channels

Equipment suppliers must have effective channels for selling and distributing their products, whether they are selling to end users or to service providers. If it is found to be necessary to address the global market to achieve high volumes and low unit costs, then a sales and distribution presence is necessary in all of the main regional marketplaces (North America, Asia, and Europe). The regional operation must have all of the capabilities and resources necessary to be credible and effective, but need not be a large team, as Hughes and others have demonstrated in Europe.

User education and marketing

As with service providers (Section 4.1.1 above), an equipment manufacturer can accelerate the sales of its products by being pro-active in the development of knowledge and awareness amongst potential customers.

Responsive product development

It is essential that improvements and upgrades to equipment address the real needs of customers. This is best achieved by investing time and resources in contact with customers and potential customers, to discover problems with existing equipment and opportunities for new features and enhancements that will be valued. To quote one US equipment manufacturer, 'the development of new-generation products must be centred on spending time with users, not buried in the laboratory'.

Quick development cycles

New product releases and product upgrades are increasingly frequent in the ground-equipment market, as in most technology businesses. Manufacturers must at least match the industry-standard product development times. Fast response to changing requirements is a valuable source of competitive advantage.

4.1.3 Satellite Manufacturers

Exhibit 4.3 shows the critical success factors for satellite manufacturers.

EXHIBIT 4.3: Critical Success Factors: Satellite Manufacturers

Performance to specification	Qualifier
Reliability	Qualifier
Price	Qualifier
Track record	Qualifier
Specified performance levels	Differentiator
Manufacturing lead-time	Differentiator
Access to new technologies	Differentiator
Ability to win overseas orders	Differentiator

To participate in the satellite manufacturing industry it is necessary to combine the highest standards of engineering design, production and project management with an effective cost-management capability. The requirements are so stringent that there are still only a small number of organisations in the world that have the technical capability required to manufacture state-of-the-art communications satellites.

In a recent study of the European space industry,[2] the buying criteria of satellite purchasers were identified as follows:

International Public Organisations	*European Private Organisations*	*National Public Organisations*
1/ Supply price	1/ Supply price	1/ Supply price
2/ Fit with technical specifications	2/ Delivery schedule	2/ Fit with technical specifications
3/ Financial terms	3/ Reliability	3/ Commercial offsets
4/ Delivery performance	4/ Financial terms	4/ Local content
	5/ Incentives	5/ Technology transfer

Although the process of selecting suppliers for satellite contracts often has many dimensions, it is ultimately necessary for manufacturers to be competitive on price in order to be selected (although this is not to say that the cheapest bid will always be selected). The manufacturer's underlying cost position must match the prices offered. There are several ways in which the issue of costs can be addressed:

- Tight control of real costs incurred in fulfilling the contract. The management of real costs covers control of the costs of components and subcontracting, design engineering and development, production and testing, and so forth. Best practice in this area tends to be found in commercial aerospace businesses, and many

2 Euroconsult (1991a).

techniques and methods have been transferred into the space industry from this sector.

- The re-use of designs, components, software, production procedures, test equipment and other assets can be a major source of cost advantage. It is widely recognised that the marginal cost of replicating an existing satellite is substantially below the original cost.[3]

- A further cost advantage exists where the manufacturer can cross-subsidise research, development or production expense from government-funded programmes. There are many examples of successful commercial satellite designs and components that derive directly from government programmes.

Substantial cost advantages can be obtained from building long runs of similar satellites, and from achieving significant technology transfer from government programmes. It does not seem likely that a manufacturer without these advantages can remain competitive by simply improving efficiency.

In order to maximise the length of production runs and achieve other scale economies, it is necessary for manufacturers to address the widest possible market. This includes tendering for satellites in all regions of the world, for governments, private buyers and treaty organisations. The process of selling to each class of customers appears to require different skills. A manufacturer needs to be able to sell effectively in a wide range of environments.

4.2 THE POTENTIAL PERFORMANCE OF CLASSES OF PLAYERS

For the three market areas under study, this section addresses the strengths, weaknesses and potential performance of different classes of players - Europeans and non-Europeans, TOs and independents, large and small players, and so forth. Each class is assessed against the critical success factors listed in Section 4.1 above. In some cases the assessment depends on the level of market development - i.e. it differs according to whether the European market is small and under-developed or larger and better structured. Where this is the case we indicate our assessment for a developed and an under-developed market.

3 Economies of scale are addressed in Euroconsult (1991a) and frequently feature in press articles and conference papers. However, reliable quantified assessments of scale effects are not available.

4.2.1 Service Providers and Network Operators

Our analysis of the potential performance of service providers and network operators indicates that European players will be at a competitive disadvantage if the market remains small and under-developed. In a small market, large integrated US players will be better matched to the success factors.

Exhibit 4.4 shows our assessment of how the different classes of service providers and network operators will perform against the critical success factors. Our assessment assumes that the market is healthy and growing; the symbols in brackets - {} - show where we believe that performance will be affected if the European market remains small and undeveloped.

EXHIBIT 4.4A: Assessment of the Likely Match between Service Providers and the Critical Success Factors for the European Market from 1993

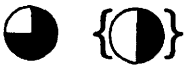
	EXISTING PROVIDERS		
	Large European TOs and subsidiaries	Small European TOs and subsidiaries	European independent service providers
Telecoms track record			
Technical capability			
Price of services			
Responsiveness to users			
Smooth installations			
Smooth operations			
Geographic coverage			
Financial strength/stability			
Full interconnectivity			
Clarity of offering and prices			
Sales and marketing capability			
User education skills			
Identification of niche services			
Overall match			

EXHIBIT 4.4B: Assessment of the Likely Match between Service Providers and the Critical Success Factors for the European Market from 1993

	POTENTIAL NEW ENTRANTS			
	Large Non-European TOs	Large US satellite businesses	European independent new entrants	US/ European joint ventures
Telecoms track record				
Technical capability				
Price of services				
Responsiveness to users				
Smooth installations				
Smooth operations				
Geographic coverage				
Financial strength/stability				
Full interconnectivity				
Clarity of offering and prices				
Sales and marketing capability				
User education skills				
Identification of niche services				
Overall match				

We consider the classes of service providers and network operators in turn below.

Large European TOs and subsidiaries [e.g. France Telecom, Deutsche Telekom, BT]

Although the TOs and their subsidiaries are reasonably well matched to the requirements of the market, they are unlikely to take advantage of the opportunity, due to broader strategic considerations (see Section 3.3 above). Their contribution to the success of the European satellite telecoms industry in future is unlikely to be significantly greater than it is at present.

Small European TOs and subsidiaries [e.g. Unisource, Cable & Wireless, Belgacom]

Those smaller TOs with ambitions to broaden their business in this field are reasonably well matched to the requirements of the market. These players are not likely to have a major impact on the satellite telecoms market, however, because satellite solutions are only a part of their portfolio of products. They will not have a single-minded concentration on selling satellite solutions.

European independent service providers [e.g. Teleport Europe, Bishopsgate Communications, ANT, SIS]

The existing independent service providers should do well if the market is healthy and growing, but will be particularly disadvantaged if this is not the case:

- They are less able than larger players to sustain prolonged periods of poor cash flow or unprofitable operations. They will not have the opportunity for flexibility on pricing if they remain small.
- Their track records are being built from zero, and a small market slows the rate at which this building can occur.
- Most will rely on equipment manufacturers' support for much of their technical capability – this dependency will remain until they have grown to several times their current sizes.
- They will not have the security of owning their own satellite capacity. If there is not a healthy and open market for capacity, then they will be disadvantaged.
- Their utilisation of expensive fixed assets is likely to remain low, damaging their financial performance and hence their ability to raise further investment capital.

The competitive performance of the European service provision industry will depend to a great extent on the success of the independent players. If this class of players

is disadvantaged because of the condition of the marketplace, the impact of the non-Europeans will be substantially increased.

Large non-European TOs [e.g. AT&T, MCI]

Large non-European TOs could perform well in the European market if they decided to enter with adequate levels of investment.[4] The US TOs, in particular, would be able to transfer much of their existing experience in satellite telecoms to Europe. If they could demonstrate their long-term commitment to the European market (through establishing a visible support structure for their European operations), then they would appear credible and attractive to potential customers. They are likely to win the business of US corporations active in Europe who are already their customers in the USA, Asia or South America.

Overseas TOs would not have an advantage in obtaining satellite capacity until such time as they deployed their own satellites in orbital slots with European coverage (or LEO systems). This would not be for some years. If the European satellite access market improves before such new satellites can be deployed, this will reduce any advantage that can be gained.

The US TOs currently have a low profile in the European satellite services market, not having taken up any of the satellite telecoms licences which have been available in Europe. This is not based on any concerns about competitive disadvantage - rather, they have not yet entered Europe because they do not yet see good business. This does not give any comfort to European service providers. One commented in interview that the low profile of US players was a symptom of the current unhealthy state of the market, rather than a direct consequence of regulatory restrictions.

4 In Exhibit 4.4 it is assumed that these players would invest less if the market is small (hence their geographic coverage would be reduced).

Large US satellite businesses [e.g. Hughes, TRW, GE/Martin Marietta]	The large US satellite businesses with satellite telecoms experience in the USA could perform well in the European marketplace if they decided to enter, and devoted sufficient resources to the strategy. Their competitive position would be similar to the US TOs (see above), although their telecoms track record and overall credibility would not generally be rated so highly. It is debatable how soon these players could deploy their own satellites over Europe, and what advantage this would bring them in a market where satellite access had been liberalised.
European independent new entrants	This class of players is assumed to be generally similar to the existing independent service providers, but likely to be weaker in specific areas, as shown in Exhibit 4.4. It is clearly difficult to anticipate the profiles of unknown potential new entrants.
US/European Joint Ventures [e.g. Orion, various other rumoured potential groupings]	There are many possible collaborative groupings that bring US and European players together as service providers. Several of these groupings have the potential to perform well in the European marketplace, although joint ventures carry extra risks such as diverging partner interests and lack of strategic focus.

In a healthy, growing market, there will be competition between non-European entrants (who know the satellite telecoms business from their overseas experience) and European players (who know the European telecoms markets). Some players will attempt to combine these sources of advantage through US/European joint ventures. European service providers should be able to compete well in such a market.

In a small, under-developed market, such as exists at present, non-European service providers (specifically US service providers) will be at an advantage, if they should choose to enter. The potential competitive advantage of the US players comes from two sources:

- The value of their overseas experience is magnified if Europe has only a sparse experience of satellite telecoms.
- Their industry structure is better suited to sustaining service provision in an under-developed market, as explained in Exhibit 4.5.

EXHIBIT 4.5: Impact of Vertical Integration

In the early stages of the development of a market, successful and dominant players are often those who have resources and capabilities in all of the key elements of the value chain. These 'vertically integrated' players can rely on relatively secure supply of the necessary inputs to each stage of the value chain, at costs that are under their control. They are sensitive to developments and trends in the market, particularly to changing end-user requirements, because they are active in all important areas. Because they are vertically integrated, they are able to respond to these developments more quickly, flexibly and safely.

As markets develop, the benefits of vertical integration are reduced. Players that focus on particular elements in the value chain can achieve a competitive advantage through specialisation. They can be more confident that the necessary inputs will be available because the market is larger and more mature. Vertically integrated players find it increasingly difficult to match the flexibility, innovation and lower costs of the specialist players.

In European satellite telecoms, the following forms of integration predominate:

- The ownership of satellites and the supply of satellite services are integrated with national telecoms operations. Service providers that are not integrated with TOs are small and not integrated with other satellite or telecoms activities.
- The manufacture of satellites and the manufacture of ground equipment are integrated with the aerospace and defence industries.

The case of the US players that are looking to compete in Europe is very different:

- The ownership of satellites, the supply of satellite services and the manufacture of ground equipment are integrated. In some cases the manufacture of satellites is also integrated.
- US players are not integrated into the provision of terrestrial telecoms in Europe.

The US form of integration is well suited to the exploitation of a small and immature European marketplace. The European forms of integration would be well matched to a mature and developed market, but are poorly matched to a small, undeveloped market.[5] The high level of integration with terrestrial telecoms is a particular problem, as is the non-participation of potential European ground-equipment manufacturers in the provision of services.

The US form of integration has evolved in a competitive environment. Ground-equipment development is acknowledged to be closely linked to service provision, and so there is a strategic rationale for operating in both areas. In contrast, the European position has been a consequence of regulatory restrictions. The potential ground-equipment suppliers have had very strong relationships with individual monopoly TOs, and are not willing to take on their major customers by moving into service provision.

In a mature market, vertical integration is not so necessary for competitive strength. Service provision can become increasingly a 'stand-alone'[6] business as the necessary ingredients become more easily available – standard ground equipment, cheap access to transponders, straightforward terrestrial interconnect, etc.

5 CEC (1992d).

6 That is, not integrated into physical network ownership. Some 'stand-alone' terrestrial service providers do offer satellite services, which are embedded in their overall product package (e.g. Reuters information distribution).

4.2.2 Ground-Equipment Manufacturers

Our analysis indicates that the European ground-equipment industry will be at a significant disadvantage compared to non-European players, whatever happens to European markets or regulation.

The actual performance of the European ground-equipment industry is dependent on the size and growth of the European satellite services market, because the domestic services market drives demand for European ground equipment. If there is only a small European market for ground equipment then the European industry will remain very small, the product portfolio will stay weak, and the value of exports will be very low. However, if de-regulation brings about a larger market, the European manufacturers will benefit, even if their share of that market is reduced.

Exhibit 4.6 shows our assessment of how the different classes of ground-equipment manufacturers will perform against the critical success factors. Again, our assessment assumes that the market is healthy and growing; the symbols in brackets - {} - show where we believe that performance will be affected if the European market remains small and undeveloped.

EXHIBIT 4.6A: Assessment of Likely Match between Ground-Equipment Manufacturers & Critical Success Factors for the European Market (1993 on)

	CURRENT PLAYERS IN EUROPE			
	Major US/ Japanese manufacturers	European one-way manufacturers	Smaller US manufacturers	European niche product manufacturers (e.g. marine)
Equipment performance	◕	◕	◕	◕
Equipment reliability	◕	◑	◑	◕
Equipment prices	◕	◑ {◔}	◑	◑
Ease of integration	◕	◔	◑	◑
Sales and distribution channels	◑ {◔}	◑ {◔}	◑ {◔}	◑
User education and marketing	◔	○	○	◔
Responsive product development	●	◔ {○}	●	◑
Quick development cycles	◕	◔	◑	◔
Overall match match	◕	◑ {◔}	◑	◑

EXHIBIT 4.6B: Assessment of Likely Match between Ground-Equipment Manufacturers & Critical Success Factors for the European Market (1993 on)

	POTENTIAL NEW ENTRANTS			
	Potential European two-way manufacturers (large firms)	Potential European SME entrants	US/ European joint ventures	US manufacturers not yet active in Europe
Equipment performance				
Equipment reliability				
Equipment prices				
Ease of integration				
Sales and distribution channels				
User education and marketing				
Responsive product development				
Quick development cycles				
Overall match match				

We consider the classes of ground-equipment manufacturers in turn below.

Major US/Japanese manufacturers [e.g. Hughes, GTE, AT&T Tridom, NEC, Scientific Atlanta]

The major satellite ground-equipment manufacturers – such as Hughes, GTE, AT&T Tridom, NEC, and Scientific Atlanta – are well placed to dominate the main equipment markets in Europe, notably the two-way VSAT market. Some lack an organisational presence in Europe, but this can be quickly and effectively addressed when the decision is taken to do business here.

European one-way manufacturers (incl. Business TVRO) [e.g. Matra Marconi, OTE]

Although European manufacturers appear reasonably well placed in the one-way terminal segment, it is not projected to be a high growth area, and it will be very difficult for these players to make the transition into two-way equipment. European manufacturers of one-way equipment who do not develop their export volumes will suffer strong competition from US and Far Eastern manufacturers with higher volumes and lower unit costs.

Smaller US manufacturers [e.g. STM, Wegener]

Several smaller US manufacturers have made sales in Europe. Their long-term performance in Europe depends on their ability to develop globally competitive products. Joint ventures with Europeans are likely to be particularly attractive to those looking to develop their business in this market.

European niche product manufacturers [e.g. ABB Nera, Thrane & Thrane, Racal, Philips, Newtec, Marconi International Marine]

European niche product manufacturers are well placed to continue to be successful in their specialised areas. Most, however, will find it difficult to grow large businesses based on products that are outside their current niches.

Potential European two-way manufacturers (large firms)

The prospects are not good for a European manufacturer, or a group of European manufacturers, developing and entering production with a new two-way VSAT product. The market-leading products have long development pedigrees, and are continuing to improve their performance in all major respects. Even an intensive R&D programme would be unlikely to match the many years of experience of components, systems integration issues and operational understanding that underpin the established products.

Analysis of the costs and risks of such a European venture have steered a number of potential manufacturers towards collaborations with experienced US firms (see *joint ventures* below). The magnitude of the gap to be closed by an independent venture grows wider with each product upgrade announced.

Small and medium-sized enterprises in ground-equipment manufacturing

Exhibit 4.6 above includes an assessment of the competitive position of European SMEs in the future market. Although their position will not be universally strong, some SMEs will enter the market if it grows rapidly and attractive opportunities arise. SMEs are particularly adept at 'reverse engineering' (within the boundaries of patent and copyright law) – that is, producing cheaper versions of industry-standard products, and eroding the margins of larger players. They are a fertile source of innovation and improvement.

The current absence of SMEs from the European ground-equipment supply base is in marked contrast to the position in the USA. In the early stages of the US satellite telecoms market (the mid 1980s), large numbers of small new entrants and start-up enterprises were active in products and services. The pace of technical improvement was high, driven by the energy, innovation and enthusiasm of such players. Many of these pioneering organisations have now ceased trading or been acquired by larger corporations, having been unprofitable or poorly positioned. But in spite of the difficulty of competing with dominant and well-resourced market leaders, there are still significant second and third tiers of players in the USA.

Europe's competitive position in satellite ground equipment is likely to remain very weak if no tier of SMEs grows in the industry, and progress relies entirely on the traditional large equipment suppliers.

US/European joint ventures

An attractive strategy for European ground-equipment manufacturers is to collaborate with US/Japanese manufacturers. The collaboration could take various forms:

- a simple distribution and after-sales agency agreement
- a 're-badging' agreement, where the equipment is sold under the European brand
- a manufacturing joint venture, where some value is added by the European player (components, assembly, test, etc.), possibly in Europe
- a joint venture to develop new products for the European or world markets, where the European player has a design role; manufacturing could be shared, and some may occur in Europe.

By such means, the European manufacturer can gain a toe-hold in a market that would otherwise be very difficult, and can reduce the product development risk. The non-European partner can gain funds for investment and have easier access to the European market. Such arrangements are likely to appeal particularly to smaller US manufacturers whose European presence might otherwise be limited, but some of the larger manufacturers already have links that could develop into formal joint ventures.

Over time there may be some skills transfer to the European manufacturer, but it should be recognised that the major short-term beneficiary of joint venture arrangements is likely to be the non-European partner. In industrial policy terms such arrangements would not count as a significant strengthening of European capabilities.

US manufacturers not yet active in Europe [e.g. Scientific Atlanta, Comstream, Zephyrus, many more]

Many US manufacturers have either not considered marketing their products in Europe, or have maintained only a low profile in Europe, awaiting developments. Many of the purely domestic US suppliers would struggle to market, sell and support their products in Europe, but there will be some successful new entrants who will launch their products here if the market demonstrates sustained growth.

Whatever happens to European markets or regulation, non-European ground-equipment manufacturers will continue to make a major impact on the European marketplace.

In the service provision business, market knowledge and market presence have been identified as important ingredients for success; these are much less difficult to achieve for ground-equipment manufacturers. A single European sales and support office is generally adequate to maintain contacts with service providers. The dynamics of the ground-equipment business are much more global than the dynamics of service provision. This requirement to perform in a global marketplace is a major element in the challenge facing European manufacturers.

It is possible to envisage a European manufacturer acquiring a US ground-equipment manufacturer as part of a strategy to develop its capability. At present, however, no European manufacturer seems ready to take this sort of risk, and joint ventures seem more likely. Likewise, if a major European player were to announce a significant entry into VSAT services, it is possible to envisage a non-European satellite ground-equipment supplier teaming up with a European partner to win the resulting equipment supply contract. Again, however, there is no sign of such a development at present.

In strategic terms, most European equipment suppliers would probably gain more through collaborating with non-Europeans than with other Europeans, who share their weaknesses. This is a major obstacle to supporting measures that rely on a concerted effort by European manufacturers (see Sections 6.2.3 and 6.2.5 below).

4.2.3 Satellite Manufacturers

Exhibit 4.7 shows our assessment of how US and European satellite manufacturers will perform against the critical success factors.[7]

The table shows that European satellite manufacturers appear to be disadvantaged in certain respects relative to their US competitors, but that their overall match to the requirements of the marketplace is still good. The specific areas of disadvantage are:

Price — Our interpretation of Euroconsult figures show that the average price per kg of European satellites in 1988-91 was 5-15% higher than US satellites (compared with a difference of 50% in the early 1980s). This price differential was also observed for other measures such as price per output watt and price per MHz.

7 Unlike the service provision and ground-equipment markets, we do not believe that player performance will be affected by the size of the European market for satellite telecommunications.

EXHIBIT 4.7: Assessment of the Likely Match between Satellite Manufacturers and the Critical Success Factors for the World Market from 1993

	US satellite manufacturers	European satellite manufacturers
Performance to specification		
Reliability		
Price		
Track record		
Specified performance levels		
Manufacturing lead-time		
Access to new technologies		
Ability to win overseas orders		
Overall match		

European manufacturers tend to bid higher than US manufacturers in tendering for satellite contracts. Euroconsult[8] has analysed ten recent contracts and concludes that Europeans bid higher than US manufacturers in six of the ten cases. Bids for European broadcast satellites since 1990 have been won by US manufacturers with bids that were up to 40% below the European manufacturers.[9]

European manufacturers' low economies of scale and consequently poor cost position reinforce the conclusion that European manufacturers will be disadvantaged on price.

Lead-times

The longer production runs of US manufacturers tend to lead to shorter manufacturing lead-times. Private customers in the

8 Euroconsult (1991a).

9 Financial Times, 31 July 1992.

domestic US market have demanded much more rapid deployment of satellites than the treaty organisations, and US manufacturers have learned how to meet these tighter schedules.

Access to new technologies

The massive difference in US and European expenditure on government space programmes gives US satellite manufacturers much easier access to a range of important advanced technologies (component integration, materials science, antenna design, stabilisation and control systems and so forth).

Ability to win overseas orders

US manufacturers have demonstrated a greater ability to win orders away from their domestic markets by putting together the right package of price, performance, delivery, financial terms, offsets, local content and so forth. They have also made full use of political opportunities and advantages to win business.

It is possible that continued re-structuring and rationalisation of the European industry will improve the underlying cost position, but this will not show through in the short term. It is unlikely that circumstances will arise that allow European manufacturers to achieve the economies of scale that are available to the largest US manufacturers.

In Section 2.6 above it was observed that there is overcapacity in global satellite manufacturing, and that this is expected to persist for some years. Overcapacity is leading to increasingly aggressive competition for business. In such a fiercely competitive global environment, the Europeans' competitive disadvantages will make it difficult for them to increase their penetration of overseas markets, and will increase the pressures of competition in vulnerable areas of the European market (particularly private satellites). Moreover, as discussed in Section 3.5, the overall size of the European market after 1995 is not clear, and there is the prospect of demand being depressed by an overhang of idle transponders.

In such difficult conditions, the retention of business with the Europeans' major customer, Eutelsat, becomes significantly more important. The issues that will affect the relationship with Eutelsat are discussed in Section 5.4.3 below.

4.4 Summary of the Determinants of Performance for European Players

The following Exhibits summarise the key factors which will determine the performance of European players in the three market areas under study.

EXHIBIT 4.8: European Service Providers

The competitive advantage of European *independent service providers* depends on:

- **A high growth rate** in the European market in 1993 and subsequent years. This will lead to:
  - declining benefits from being vertically integrated (reducing the competitive advantage of potential US players)
  - a growth in revenues and strengthening of finances
  - increased customer numbers, track record, credibility and breadth of applications, before the 'window of opportunity' begins to close.
- A **competitive equipment supply market** in Europe. European service providers need easy access to the world's best equipment, at prices close to US domestic levels.
- An accessible and cost-effective **supply of space-segment capacity.** European service providers without their own satellites must not be disadvantaged.

The *TO-linked service providers* are well equipped to succeed. The main determinant of their actual performance is their strategic motivation to develop satellite telecoms, which is likely to be low.

EXHIBIT 4.9: European Ground-Equipment Manufacturers

The fate of the European ground-equipment industry turns on the **rate of growth of the European services market.** European industry will only invest in new products and systems if it has confidence in the size of the domestic European market.

If confidence in the size of the potential market grows, European firms that have the required capabilities will increase their investment and activity levels. For many firms, **access to key components and technologies** (through licensing or partnerships) will be necessary to fill gaps in their capabilities.

EXHIBIT 4.10: European Satellite Manufacturers

The competitive position of the European satellite manufacturers **does not primarily depend on developments in the European satellite telecoms market**

The main determinants of their competitive advantage will be whether they can:

- Establish **cost-effective satellite production:**
  - higher volumes for each platform, payload and propulsion design, to obtain economies of scale equivalent to US competitors
  - developing lean manufacturing and component supply chains, to minimise the impact of US cost advantages
  - leveraging technology developed for government and military programmes to reduce costs on commercial programmes.
- Become more focused on the global satellite market, and integrate more fully with the global satellite industry (as partners, suppliers and prime contractors).

5/ Scenarios for the Performance of European Industry

This chapter presents three scenarios for the development of the market, drawing together the outputs of Chapters 3 and 4. For each scenario the likely performance of each category of European players is assessed. The three scenarios are:

- Scenario 1: no EC regulatory change (Section 5.1)
- Scenario 2: 1993 de-regulation (Section 5.2)
- Scenario 3: 1995 de-regulation (Section 5.3).

Section 5.4, finally considers the likely outcomes for European players in the main market areas under consideration.

5.1 SCENARIO 1 : NO EC REGULATORY CHANGE

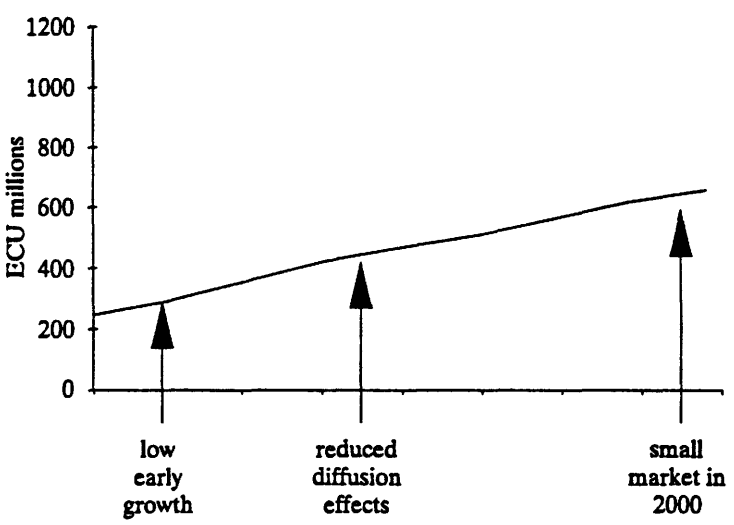
In this scenario there is no regulatory action at EC level to liberalise satellite telecoms. None of the 1990 Green Paper positions (as summarised in Exhibit 3.1) are adopted. Some national governments continue with their own programmes of liberalisation, but in 2000 most of today's restrictions still remain in most Member States. Eutelsat space segment capacity continues to be accessible only through its signatories. ETSI produces pan-European standards for satellite telecoms, but these are not widely adopted as a basis for approvals or new product design because of continuing national differences.

Exhibit 5.1 illustrates this scenario. The preservation of the current complex, fragmented and restrictive European regulatory environment is a continuing burden for the independent service providers. Their market remains effectively restricted to the more liberal European states, and even in these markets their penetration continues to be weak. Potentially large and valuable customers cannot be converted to satellite solutions when it becomes clear that the providers cannot offer pan-European coverage.

EXHIBIT 5.1: Timelines for Scenario 1 : No EC Regulatory Change

	1993	1994	1995	1996	1997	1998	1999	2000
REGULATORY CHANGE								
Activity to reduce regulatory restriction at EC level	none							
Activity to reduce regulatory restriction at national level								
NEW ENTRANTS								
Example of an individual potential new entrant:								
- becomes aware of commercial opportunity								
- prepares business plan and tests the market								
- obtains financing								
- begins marketing								
- launches and rolls out products/services								
- early growth phase for products and services								
Cumulative impact of new entrants								
MARKET DEVELOPMENT								
Diffusion effect becomes significant driver of growth								
Point-to-point & small network applic'ns are attractive								
Point-to-multipoint applications develop								

European Satellite Telecoms Service Revenues



The independent service providers are unable to overcome most users' perceptions that satellite telecommunications is a risky, unusual and generally unattractive solution to their corporate telecoms requirements, a view reinforced by the publicity surrounding the cancellation of EC de-regulation.

Several existing players and potential new entrants cut back their investment plans in 1993-95 because their market projections are unattractive. Most large potential entrants from the USA draw back from becoming European service providers; those already with a European presence deciding to remain as equipment suppliers until the market has developed further, although one major US player enters the market through the acquisition of a European independent service provider. The low levels of overall investment and the shortage of major new entrants hold back the development of the market.

Most independent service providers turn away from trying to compete in the mainstream corporate telecoms markets, in search of niche opportunities that can be exploited within the limits of regulatory framework and without major risk or investment. This limits the growth in revenues, reinforces the European image of satellite solutions as a specialist, niche activity.

Because of the continued small size of the customer base, the service providers do not have the opportunity to work on a large scale with customers to develop new corporate applications that make full use of satellite capabilities. Point-to-multipoint applications remain rare and poorly understood by most corporations. Diffusion of knowledge, experience and confidence in satellite solutions is very weak.

None of the independent service providers is sufficiently confident or financially strong enough to attempt to stimulate the broad market through major tariff reductions. Their hub utilisation levels remain very low, and their cost of sales is high. Satellite links remain considerably more expensive than they are in the USA. The cost and inconvenience of access to the space segment is not reduced, adding to the expense of offering satellite solutions.

The financial performance of many of the independent service providers is poor because of the difficult market conditions. As a consequence of this, two providers are sold very cheaply to major US integrated players providers in 1995-96. On the basis of this small investment, these US players are able to continue feeding their ground equipment into the European market, pick up business from US corporate customers who also operate in Europe, and increase their flexibility to take advantage of opportunities as they arise.

The large TO service providers and the large TO subsidiaries continue with their current strategies, maintaining high prices for satellite links and aiming to serve only demand that cannot be met by terrestrial telecoms (such as links to Eastern Europe, press agency

information distribution, emergency telecoms deployment and so forth). This strategy yields low growth and poor hub utilisation, but the TOs can tolerate the poor financial performance produced by the majority of these operations.

The smaller TOs, who saw satellite services as one means amongst several for penetrating foreign markets, have had more success with their other products (facilities management, terrestrial resale etc), and satellite services have become a small part of their overall businesses.

The price of terrestrial telecoms continues to fall, particularly international leased-line prices. At the same time, the quality and availability of terrestrial infrastructure rises steadily. As each year passes, the cost-benefit equation changes to favour terrestrial solutions for an increasing number of applications that could once have been served by satellite solutions. By 2000, many early applications of satellite telecoms, such as those running on small or localised VSAT networks, data broadcasting and videoconferencing links, are significantly cheaper to implement on terrestrial networks. The failure to develop point-to-multipoint applications leaves the service providers with a much reduced potential marketplace. The opportunity for Europe to develop a strong, innovative and sustainable satellite telecoms sector has passed.

The consequences of this scenario for European players are discussed in Section 5.4 below.

5.2 SCENARIO 2: 1993 DE-REGULATION

In this scenario, European satellite regulation is modified along the lines of the 1990 Green Paper, with the changes coming into effect in 1993. The EC Member States, and some other European States, reflect these changes in their national regulation during 1994. Eutelsat moves to allow direct access to its satellites in 1994, and transponder prices fall steadily.[1]

Existing service providers and potential new entrants respond to the regulatory changes, and reflect the new opportunities in their business plans, preparing to launch new services as soon as possible. ETSI moves rapidly to produce European standards for ground equipment, interfaces, protocols, installation, maintenance and other satellite-related areas, and approvals begin to be granted in 1994.

1 Transponder prices fall due to the elimination of signatory surcharges, the arrival of more non-Eutelsat capacity, Eutelsat policy changes designed to increase transponder utilisation, and the impact of video compression on demand for broadcasting transponders.

EXHIBIT 5.2: Scenario 2: 1993 De-Regulation

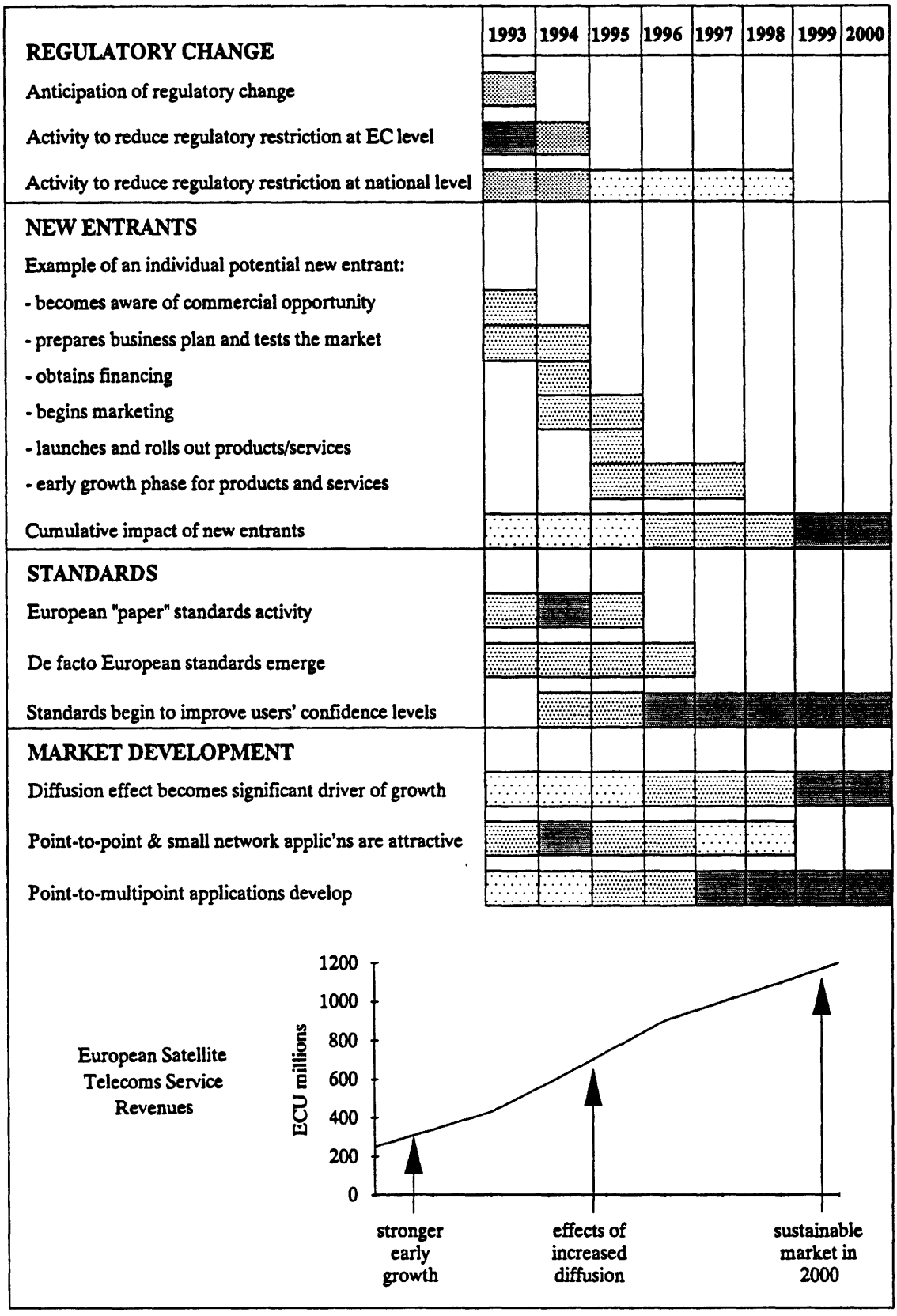


Exhibit 5.2 illustrates this scenario. The announcement of a de-regulation timetable is a major boost to the confidence of existing service providers, and encourages potential new entrants to proceed. As the exhibit shows, there is a considerable lag (potentially 18 months to 2 years) before the effect of new entrants will be seen in the marketplace.

The de-regulation process is accompanied by a significant increase in the interest and awareness of corporate telecoms managers, several of these becoming new customers in 1993. Early growth is driven by corporate users and service providers using satellite links for existing applications, such as data transfer and videoconferencing, but often extending the number of sites covered by the customer's network and adding international sites. Most of the early networks are relatively small (less than 100 terminals), and use 2-way VSAT terminals. The impetus to the satellite telecoms market provided by de-regulation helps to overcome many of the other supply-side impediments to market growth (as discussed in Chapter 3).

The financial positions of a number of independent service providers become considerably more healthy as they increase sales and improve the utilisation of their hub stations. As their purchased volumes of ground equipment increase, they are able to negotiate lower unit prices. With their margins expanded, and firmer indications of the existence of a sizeable market, some become sufficiently confident to drop their prices, hoping to gain share and increase volumes. Prices begin to fall towards the levels seen in the USA, stimulating further growth in usage.

The increased number of satellite telecoms users accelerates the diffusion of awareness and interest through the potential customer base. The credibility and track records of the service providers increase steadily as their customer lists grow.

The strong performances of the independent service providers helps to protect them against acquisition by competitors. One service provider is sold by its parent company to a large US player for a substantial sum, but US entrants hoping to buy market share through cheap acquisitions are disappointed.

The use of satellites for many of the early applications becomes less attractive in the later 1990s as terrestrial leased-line prices fall (particularly for international leased lines) and terrestrial infrastructure improves. By this time, however, satellite solutions have become familiar to many corporate telecoms managers. They have built up relationships with service providers and gained confidence in the performance of satellite solutions. Many European users and systems integrators have developed a wide range of innovative point-to-multipoint applications, and awareness of these is steadily spreading to other telecoms managers, who are keen to apply them to their own businesses. For reasons of cost, many of these applications could not be contemplated using terrestrial solutions.

By this stage, satellite solutions are firmly entrenched in the European corporate telecoms marketplace. Hybrid networks, meshed networks, mobile systems and other innovations are all available to meet the specific needs of users. A credible, dynamic and generally profitable supply-base has developed, and satellite telecoms is seen as an important part of mainstream telecoms.

The consequences of this scenario for European players are discussed in Section 5.4 below.

5.3 SCENARIO 3: 1995 DE-REGULATION

In the delayed de-regulation scenario, the measures included in the 1990 Green Paper are not put in place until 1995. Some EC states continue to liberalise their national regulations in advance of EC de-regulation, but it is not until 1996 that adequately harmonised pan-European regulation is achieved. Eutelsat moves to allow direct access to its satellites in 1995, and after 1995 transponder access prices fall steadily.

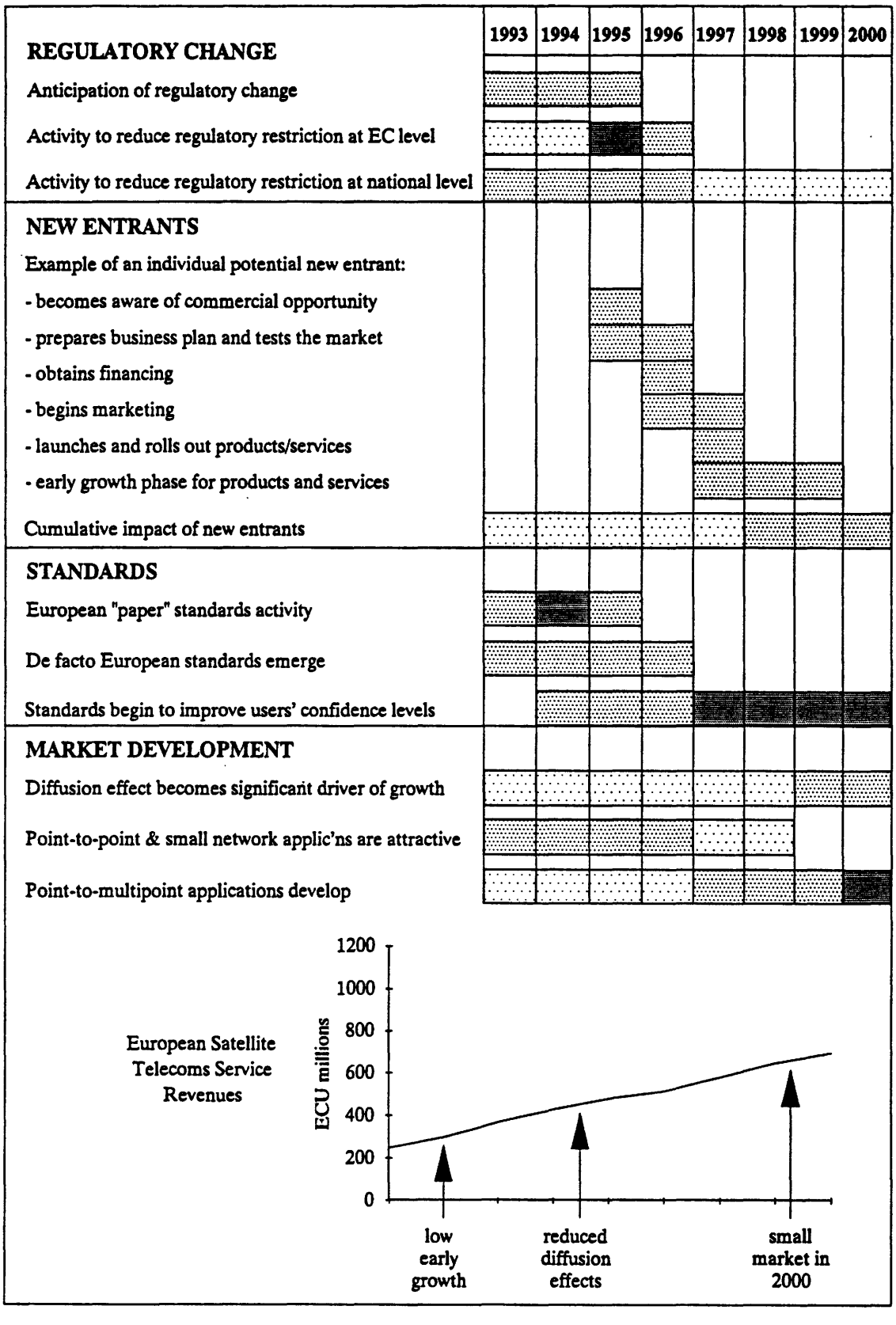
The intention to de-regulate is noted by existing service providers and potential new entrants, but most are reluctant to launch new services or even to invest in preparations until the marketplace looks less uncertain. An increase in the marketing and launch of new services occurs in 1995-97, but because they are starting from a low base, these services do not establish significant numbers of users until the end of the decade.

In the period to 1998, none of the independent service providers has sufficient strength or confidence to cut prices in order to increase volumes, so satellite links to not establish themselves as being significantly cheaper than terrestrial solutions for point-to-point or small network applications.

ETSI acts to produce European standards in satellite-related areas, but their impact is not great. Because of national regulatory restraints they cannot be applied simply to pan-European networks until 1996. Approvals are problematic in many states, so the *de facto* industry standards in Europe (the leading US equipment designs) retain their importance in the eyes of many potential buyers.

Exhibit 5.3 illustrates this scenario. By the late 1990s the door has been closed on using satellites for most simple point-to-point and small network applications in Europe. In order to sell satellite links, service providers now have to convince corporations of the benefits of more complex applications. The potential customers, telecoms managers, are still unfamiliar with satellite solutions and are wary of the promises of unknown suppliers. The applications need to be individually tailored to specific customer requirements, adding to the selling costs. These problems hold back market growth.

EXHIBIT 5.3: Scenario 3: 1995 De-Regulation



By missing the opportunity to grow through simple, mainstream applications, the market fails to reach a size where diffusion effects become significant. Most corporations remain ignorant of the capabilities of the technology and the suppliers. From this weak base the penetration of the market for more sustainable applications is restricted.

The effect of delaying de-regulation is very similar to the effect of not de-regulating at all (Scenario 1). By reducing growth during the satellite telecoms 'window of opportunity' (when terrestrial solutions are still expensive and non-universal), delayed de-regulation prevents satellite telecoms from breaking out of its position as a marginalised and minor element in the European telecoms market.

The consequences of this scenario for European players are discussed in Section 5.4 below.

5.4 THE OUTCOMES FOR EUROPEAN PLAYERS

5.4.1 The Outcomes for European Service Providers

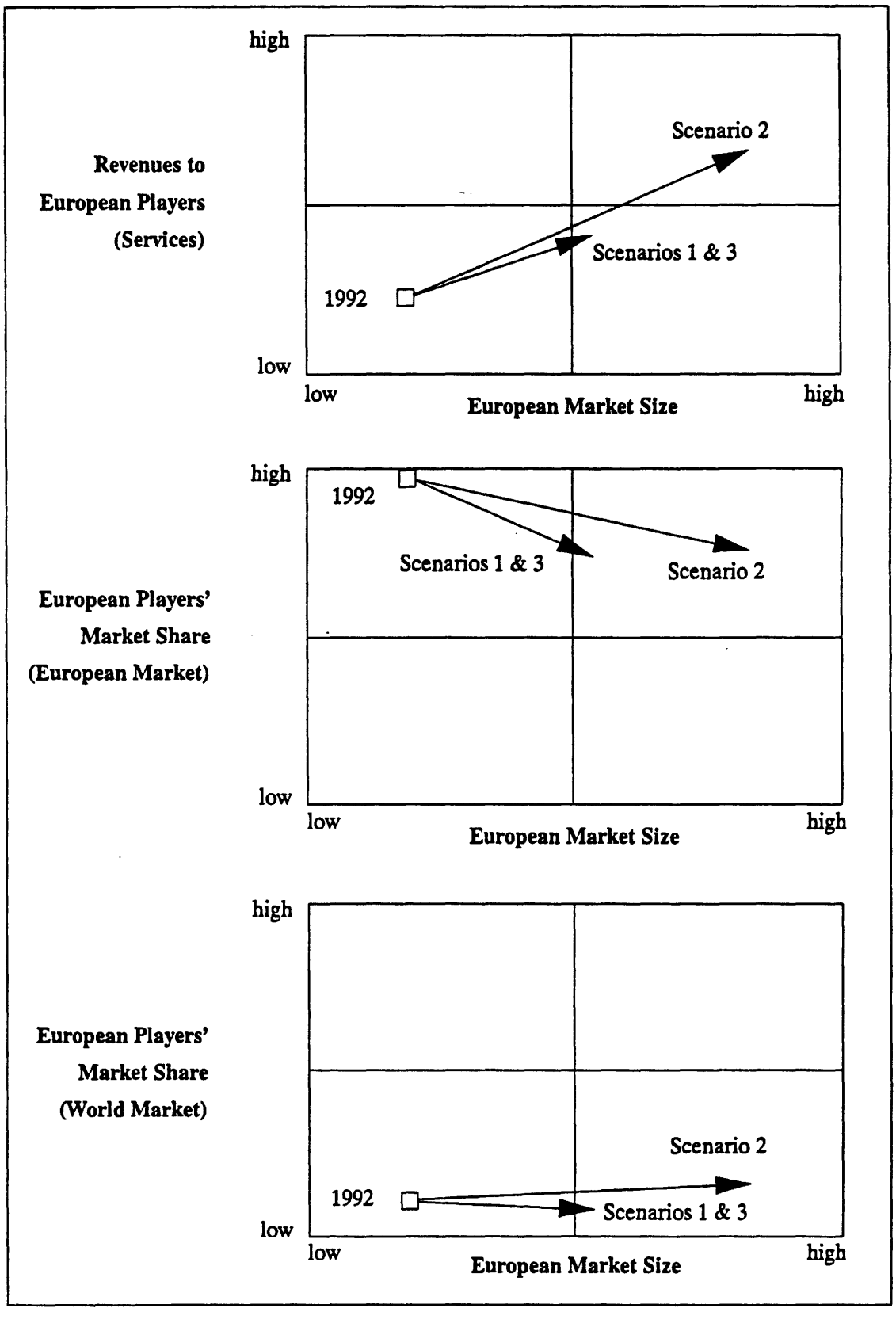
Exhibit 5.4 illustrates the projected outcomes for European service providers in the three scenarios described above.

Currently, European service providers dominate the European marketplace. Total service revenues in 1992 are estimated to be about ECU 300 million; this is estimated to be about 10% of the corresponding world market.[2]

In **Scenarios 1 and 3**, the satellite services market grows to around ECU 600 to 700 million by 2000, and European service providers' share of the market has fallen to less than 70%. About 30% of the market is held by the large European TOs and their subsidiaries. The European service providers have lost most share in the two-way VSAT services sector, where large integrated US players (who entered through partnerships and acquisitions in the mid-1990s) have performed better. European service providers are stronger in the one-way sectors (VSAT and TVRO) where growth has been weakest.

2 It is difficult to estimate the equivalent total world service revenue because separate service revenues are not available for most regions.

EXHIBIT 5.4: Changes in the Revenue and Market Share of European Satellite Telecommunications Service Providers



The US players have not invested heavily in the European service provision industry – they have concentrated on equipment supply in Europe, and on developing their businesses in the Far East and North and South America, where growth has been more healthy. Their relatively strong performance is based on their credibility with customers and their underlying technical capability. They are well matched to the demands of a small, underdeveloped European marketplace.

Very few of the surviving European service providers are achieving expected commercial rates of return on their businesses in 2000. For many, the failure of satellite telecoms to become integrated with the mainstream of corporate telecoms has undermined their business plans and disappointed their financial backers. Their prospects after 2000 look poor.

The influence of the major US players extends beyond their immediate service businesses. Over time, all the TO service providers and the independent service providers have become effectively tied to one or two non-European equipment manufacturers as sources of two-way equipment and technical expertise. They are paying for this support through higher equipment prices and direct payments for training and support.

In summary, the performance of the European service providers is weak in the scenarios where deregulation is cancelled or delayed.

In **Scenario 2**, 1993 de-regulation, non-European satellite service providers have taken about 25% of the market away from European service providers by 2000, but the market leaders are still European. The total European satellite telecoms services market has grown to around ECU 1200 million by 2000, with two-way VSAT networks accounting for almost 50% of service revenues.

Because of their larger revenues and better prospects in Scenario 2, and because of the early production of European equipment standards, the independent satellite service providers are in a much stronger position in their relationships with their equipment manufacturers. They are able to negotiate better equipment prices and can switch between suppliers if necessary. Because of their higher volumes they are able to support a greater level of in-house technical resources, and are not so reliant on equipment suppliers.

Note about personal satellite mobile communications:

Personal satellite mobile communications are not mentioned in the scenarios above. In Section 3.2 we discussed the uncertainties surrounding satellite mobile communications, particularly personal systems relying on LEO satellites, for which some industry

observers predict significant demand. In developing scenarios, it is possible to isolate the issues associated with such systems. For example, the deployment of a successful LEO-based personal mobile communications network could be added to the above scenarios, without needing to alter the outcome of the scenario in other respects, except to take account of the extra satellite manufacturing revenues. The service providers and equipment manufacturers for this service are unlikely to overlap with the VSAT and business TV players.

5.4.2 The Outcome for European Ground Equipment Manufacturers

Exhibit 5.5 shows how the revenues, European market share and world market share of European ground equipment manufacturers vary in the three scenarios.

Currently, European equipment manufacturers have about a 40% share of the total European ground equipment market, which is estimated at about ECU 80 million. European manufacturers are strongest in the areas that are expected to grow more slowly (large earth stations, ship terminals, business TVRO and one-way VSAT). European manufacturers have very limited presence outside Europe, and their world market share (for all equipment types) is estimated to be about 6%.[3]

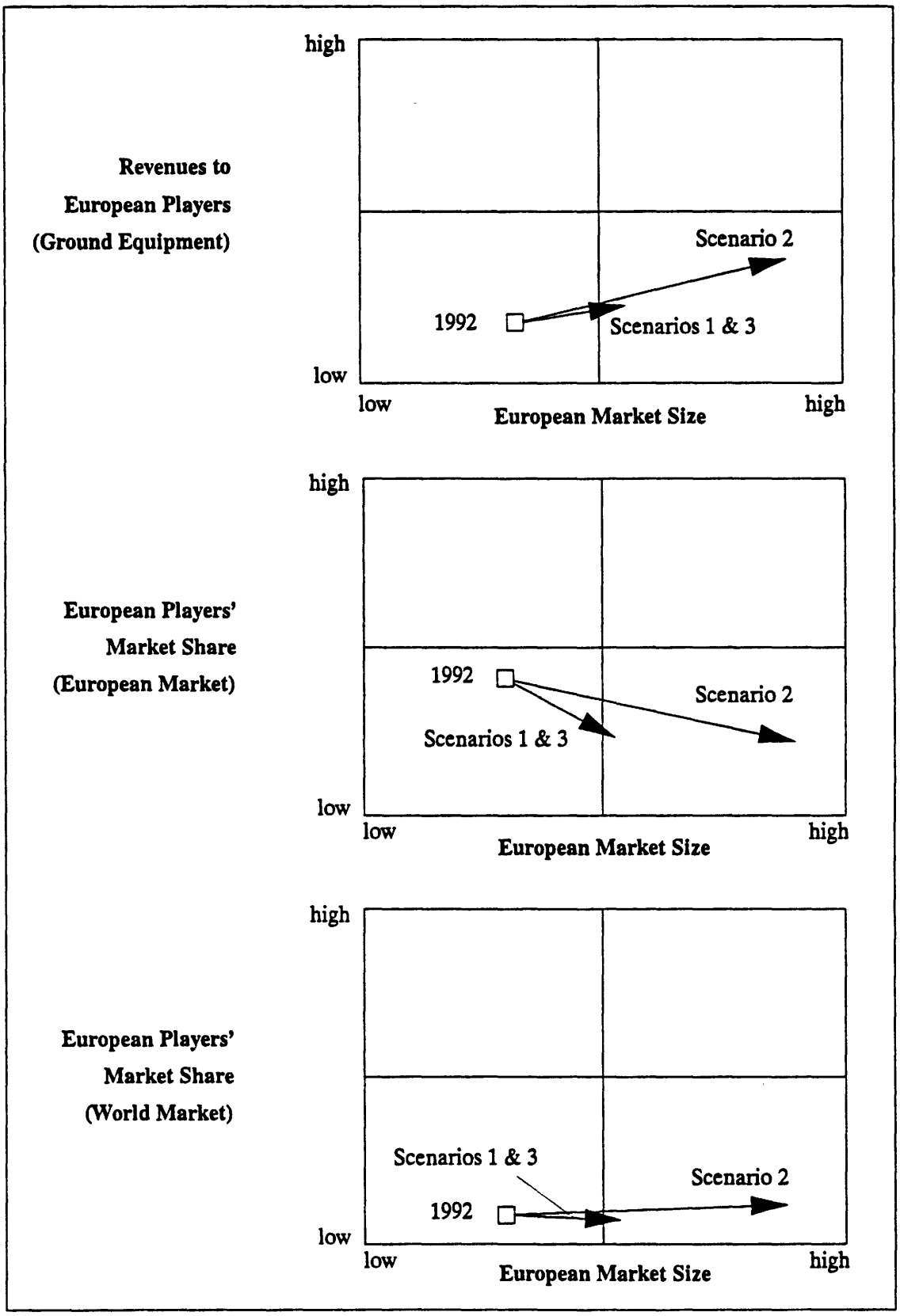
In **Scenarios 1 and 3**, while European equipment manufacturers' revenues grow to ECU 40-45 million in 2000, their share falls to around 25% of the European market. Their world market share falls to about 5%.

In these scenarios, the non-European equipment suppliers not only capture 75% of the European market, but are also able to dominate sectors of the service provision market, where relatively weak service providers depend on them for technical support and credibility with customers. They are successful at integrating forwards into service provision in Europe.

In **Scenario 2**, the Europeans' loss of share is greater, with European manufacturers' share falling to around 20% by 2000, because of the strong growth of two-way VSAT sales, where there is continued absence of European products. European players' revenues are significantly higher than in Scenarios 1 and 3, however, and their share of the world equipment market remains almost unchanged at 6%.

3 Contrast this with the European manufacturers' share of the total world telecoms equipment market of around 40%.

EXHIBIT 5.5: *Changes in the Revenue and Market Share of European Ground Equipment Manufacturers*



The non-European equipment manufacturers achieve significant market penetration in Scenario 2, but are unable to exploit their relationships with service providers to the extent that was possible in Scenarios 1 and 3. The relative strength of the independent European service providers in this scenario keeps the equipment manufacturers in check, and prevents them from dominating the service provision market by integrating service provision with their equipment businesses.

In summary, the European manufacturers do not perform well in any of the scenarios, but the loss of European share produced by early de-regulation is only 5% greater than the loss of share that can be expected if there were no de-regulation. In revenue terms, the industry does better in the early de-regulation scenario.

5.4.3 The Outcome for European Satellite Manufacturers

The fate of European satellite manufacturers under the three scenarios hinges on the reaction of Eutelsat to the de-regulation of space segment access. Eutelsat is the major customer for European-built satellites (see Exhibit 5.5).

If Eutelsat were to buy its satellites on a purely commercial basis, it would almost certainly buy far fewer European satellites. The impact of this on the economics of the European satellite manufacturers would make their position untenable, and production of complete geostationary communications satellites in Europe would probably cease. The industry would continue to supply satellite sub-assemblies to US manufacturers, to build military, scientific and earth observation satellites, and to seek a share of the LEO/HEO market.[4]

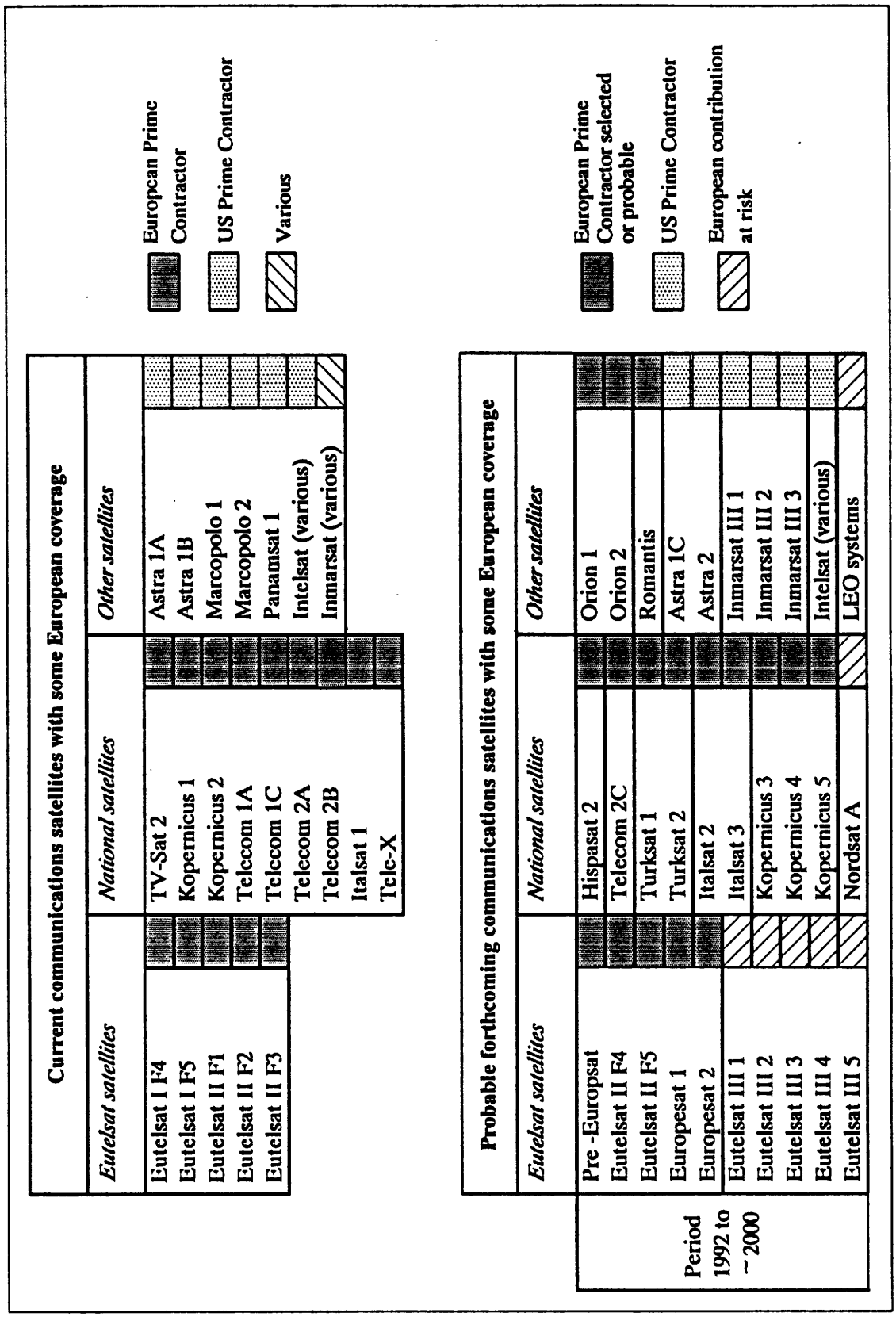
Exhibit 5.6 shows communications satellites with European coverage, both those which currently exist and those which are expected by around 2000. The exhibit indicates where the European contribution might be at risk.

Section 3.6 of this report concluded that demand for satellites in the period to 2000 is unlikely to be affected by variations in the levels of satellite telecoms traffic caused by de-regulation. During the period shown, there are unlikely to be any additions to the list of forthcoming satellites.

The key issue for European satellite manufacturers is whether Green Paper de-regulation would cause Eutelsat to change its pro-European purchasing policies. If this were the effect, then we conclude that the impact of non-European competitors would be to threaten the continued existence of an independent European satellite manufacturing industry.

[4] Low Earth Orbit satellites and Highly Elliptical Orbit satellites.

EXHIBIT 5.6: Communications Satellites with European Coverage



Below, we examine each of the Green Paper[5] space segment positions in turn. (Caveat: The precise legal interpretation of each position is not fully transparent in a Green paper):

POSITION 5: Regulatory separation and equal access to orbital slots and frequencies

The main commercial impact of position 5 will be on the signatory TOs, who will have to modify their current approach to the sale of satellite access.

While this position would lead to a fundamental review of Eutelsat's current mechanisms, policies and legal constitution, it would not prevent Eutelsat from continuing to charge the prices that it needs to remain in profitable operation. If a special regulator were introduced, it would be unlikely to prevent this.

If the terms of position 5 were applied to the other satellite treaty organisations (which may in fact prove impossible), this could result in increased competition for Eutelsat, as customers could choose to buy from Intelsat or Inmarsat if they wished.

The requirement to ensure equal access to orbital slots and frequency allocations is not expected to have a dramatic impact on the European picture in the 1990s[6]. There is unlikely to be a scramble to fill vacant slots in a period of over-capacity, and the key frequency allocations are not expected to change.

It is possible that a vertically integrated US operation could launch (or re-locate) a satellite into a European slot in order to support its service provision business in Europe. This would only make sense commercially if access to existing capacity were too expensive or otherwise difficult.

POSITION 6: Application of competition law

This position should not harm Eutelsat's revenue position unless it were found to be abusing its market power.

5 See Exhibit 3.1.

6 It is quite possible for non-European operators to obtain access to European slots in the current regulatory environment (through applications at national level).

POSITION 7: Direct access and commercial freedom for Eutelsat	Again, the major impact of this position will be on the signatories. Provided that Eutelsat charges different customers equitably, its revenue streams will not necessarily be affected.
POSITION 8: Cost-orientation for pricing	This position many lead Eutelsat to rebalance its price structures, but will not necessarily affect its net revenue levels.

If implemented, the Green Paper positions would lead to a major upheaval of the Eutelsat organisational structure. However, the direct threat to Eutelsat's future revenues from the terms of the Green paper is not great. When compared to the challenge from the forthcoming private satellite systems, and potentially from the national systems, the Green Paper is by no means the major threat to Eutelsat revenues in the immediate future.

The Green paper does, however, threaten the revenues of the signatories who control access to the Eutelsat system.[7] If the signatories were to change their attitude to Eutelsat in the light of their reduced revenues, this could have a much greater impact on Eutelsat's commercial position.

The key question is whether this impact would be sufficient to force Eutelsat to change its procurement policies, in order to obtain the lowest-price satellites for its next generation. It is not possible to predict the outcome of this complex situation with confidence, but, on balance, we believe that Green Paper de-regulation is unlikely to be a primary cause for Eutelsat to place orders for Eutelsat IIIs with US manufacturers. However, a variety of other circumstances could combine with the effects of deregulation to lead to Eutelsat reducing its expenditure on European satellites.

In summary, the European satellite manufacturing industry faces a difficult period, whether or not the European satellite telecoms market is de-regulated. A possible direct consequence of de-regulation could be the loss, to US manufacturers, of contracts to build the Eutelsat III series satellites. This would be a severe blow to the European manufacturers, and might lead to the loss of an independent European satellite building capability. On balance, we do not anticipate this outcome, although the future of the manufacturers is far from secure.

7 If end users are permitted to access capacity directly, the signatories will have no opportunity to make money on this transaction.

6/ Implications for Regulatory Action and Supporting Measures

6.1 The Need for Supporting Action

This study has found that many parts of the European satellite communications industry are poorly prepared to take advantage of many of the opportunities that de-regulation of satellite communications will bring.

Many observers argue that there are strong industrial policy reasons for maintaining and enhancing European capabilities in parts of the satellite communications industry. Although (as explained in Section 1.3.2) this study does not make a judgement on the relative strategic importance of different activities in the space and telecoms sectors, it is nevertheless appropriate to examine the likely consequences of measures that might be taken as part of national or regional industrial policy. Moreover, aside from industrial policy concerns, the weakness of parts of the European industry will be a constraint on the rate of development of the European market, and will reduce the benefits to end users that will come from market development. This concern makes it necessary to consider measures that could improve the performance of the European satellite telecommunications industry.

This chapter surveys the range of regulatory and supporting actions that are available to national governments and EC bodies, and discusses their likely costs and benefits.

6.2 Survey of the Options for Supporting Actions

Exhibit 6.1 summarises the measures that could be taken by the CEC and others to attempt to improve the competitive position of European industry in different areas of the satellite telecoms business.

EXHIBIT 6.1: List of Measures Considered to Improve European Competitiveness

6.2.1 Early introduction of Green Paper de-regulation measures
6.2.2 Delayed introduction of Green Paper de-regulation measures
6.2.3 Accelerated development of standards
6.2.4 Encouraging the involvement of small and medium-sized enterprises (SMEs)
6.2.5 Refocusing support for R&D
6.2.6 Increasing the awareness of potential users
6.2.7 Encouraging industry consolidation and co-operation
6.2.8 Specific restricting measures:
- Tariffs and quotas on imported ground equipment
- Limiting new private satellites
- Restricting non-European ownership and control
- Retaining and re-introducing TV broadcasting restrictions

A key ingredient for the successful implementation of such measures is confidence that the declared goals are achievable. Our contacts with European industry[1] indicate that there is widespread pessimism about the prospects for dramatic improvements in some areas of European satellite telecoms - notably ground-equipment and satellite manufacturing. There is more confidence, however, that European service providers can do well, and that supporting measures for other sectors can be effective in specific niches, with less ambitious objectives.

In more detail, we found that:

- There is widespread confidence that European **service providers** can compete effectively with non-European entrants if the environment is liberalised. The requirements for supporting measures identified by respondents to this study tended to be aimed at general market development, rather than at fending off non-European entrants.

- There is very widespread pessimism regarding the ability of European **ground-equipment manufacturers** to take significant market share from US and Japanese manufacturers. This pessimism is a major obstacle to any supporting measures with ambitious goals in this area (such as a generational leap forward in VSATs). Less ambitious goals, such as strengthening European equipment niches (e.g. shipborne terminals) or targeting certain equipment components (e.g. software or encoders) are more likely to succeed, since there is more confidence that they can be achieved. As one might expect, however, there is wide variety in the range of niches and components that are recommended as foci for development.

1 As indicated in Section 1.3.4, this study has not made a statistical survey of industry views. The levels of confidence or pessimism reported here are based on our limited sample.

- There is a widespread determination that the achievements of the European **satellite manufacturers** should not go to waste. It is recognised that European manufacturers are at a disadvantage compared with US manufacturers in terms of cost, inherent subsidy level and addressable market size. Nevertheless, there is a belief that through consolidation, co-operation and efficiency improvements, European satellite manufacturers will be able to survive in some form.[2]

The following sub-sections (6.2.1 to 6.2.8) discuss various specific types of measure, expanding on those listed in Exhibit 6.1.

6.2.1 Early Introduction of the Green Paper De-Regulation Measures

Areas of impact: Service providers, ground equipment manufacturers and satellite manufacturers.

The impact of early de-regulation along the lines proposed in the EC's Green Paper has been discussed in Sections 3.1 and 5.2 above. For the European service providers, the impact will be beneficial. They are well placed to compete with non-European players; their competitive position will improve as the marketplace matures; and early de-regulation will accelerate the development of the marketplace.

European ground-equipment manufacturers, on the other hand, are not well prepared to succeed in the current marketplace, and will not gain a significant share of the expanded market that would result from early de-regulation. Nevertheless, it is important to note that their revenue opportunities will increase, and their confidence in the future size of the market will be strengthened if de-regulation proceeds.

The impact of early de-regulation on European satellite manufacturers is more difficult to predict. The chain of events that could lead to significant loss of business is complex and uncertain. There are many threats to the future of Europe's satellite manufacturing industry; the Green Paper de-regulation is less significant than such factors as space segment over-capacity and other world market developments (as discussed in Section 3.6).

6.2.2 Delayed Introduction of the Green Paper De-Regulation Measures

Areas of impact: Service providers, ground equipment manufacturers and satellite manufacturers.

2 Some interviewees did not share this view, arguing that only profound intervention by European governments can save the European independent capability.

The impact of delayed implementation of the Green Paper has been discussed in Section 5.3 above. In their feedback to ESA on the Green Paper, a number of industry representatives suggested delay as a means of supporting European industry. They argued that by postponing the onset of potentially rapid growth, delay would provide European industry with a 'breathing space' to prepare to compete with non-Europeans.

Use has been made of such 'breathing spaces' in other industrial sectors – notably textiles, iron and steel – with some evidence of success. In this instance, however, there are a number of factors that make it unlikely that a delay in de-regulation will be effective as a means of increasing European competitiveness:

- A 'breathing space' for uncompetitive industries is valuable when restructuring, rationalisation or cost-cutting are required. The European satellite telecoms industry, however, requires increased confidence, investment and commercial energy. We are not aware of any convincing precedent for a 'breathing space' stimulating changes of this kind.

- Comments from industry representatives and observers collected in the interviews for this study indicate that in the key area of ground equipment, European manufacturers would not take advantage of a postponement. The rationale for this is as follows:

  - Major investments in product development would require confidence that a significant European market would exist (penetration of other markets being unlikely). Delay does not increase confidence.
  - Because the marketplace is global and the pace of technical improvement is accelerating, US and Japanese manufacturers are likely to widen the gap in equipment capability and cost over the duration of the 'breathing space'.

- There is a limited 'window of opportunity' for offering competitive point-to-point satellite links and small satellite networks (see Sections 3.2). Point-to-point links are a relatively straight-forward service that would have a major stimulating effect on the development of the overall satellite telecoms market. Delayed de-regulation is likely to cause this window of opportunity to be missed, with serious consequences for the longer term development of the overall market in Europe.

- Large integrated US players are better suited to compete in the current small, fragmented marketplace than the small independent European service providers. A postponed de-regulation will make it easier for the large US players to gain effective control of some of these smaller and weaker service providers, increasing the impact of non-Europeans on European industry.

We do not believe that postponement of de-regulation will be beneficial to the European satellite telecommunications industry, either in the short or long term.

6.2.3 Accelerated Development of Standards

Areas of impact: Service providers and ground equipment manufacturers.

Standards can have a major role to play in the development of markets for technology-based products and services. *De facto* standards emerge when individual players are strong enough to dominate a market with their product or service (for example the IBM personal computer). Formal standards are produced when groups of players recognise that it is in their interest to define shared specifications (such as the GSM standards for digital cellular telecoms). The existence of accepted standards brings wide-ranging benefits that increase the rate of development of the market:

- **Users' confidence in the product or service is increased.** Assurance of the quality, legality and compatibility of the product is increased. The commitment of suppliers is made more visible and the risks of purchasing are reduced.

- **The risk to manufacturers is reduced.** Through collaboration with others to define a standard, the risk of the product failing in the marketplace is decreased, and the probability of early obsolescence is lowered.

- **New entrants benefit if the standard is non-proprietary.** The risks of designing and launching new products and services are reduced through the use of clear and widely accepted technical specifications. The common handicaps of new entrants (weak branding and poor differentiation) are less damaging.

In the field of satellite telecoms the most important standards are *de facto* ground-equipment standards developed by US manufacturers (notably Hughes and AT&T). These tend to take the form of proprietary designs, system configurations, coding algorithms, etc. These US *de facto* standards apply in Europe as a consequence of the strong position held by non-European suppliers. In the study interviews, service providers frequently referred to the dominant US ground-equipment configurations as their benchmarks for considering the performance of others.

The possibility of a 'great leap forward' for European ground equipment

In the course of this study, it has been suggested by industry interviewees that the production of formal standards for a new generation of satellite ground equipment could give a major boost to the European industry, referred to by some as a 'great leap

forward'. The benefits of the GSM standards for European manufacturers are frequently cited to support this view.

We agree that a major emphasis on developing European equipment standards would form an important part of any initiative to re-invigorate European industry. However, standards development alone cannot bring this re-invigoration. Several other ingredients are required for a 'leap forward' by European equipment manufacturers – ingredients which were present in some form for the development of GSM. Some of these ingredients appear to be present for satellite communications, while others are not. For example:

- **Confidence that a new generation of products is a sound commercial proposition.** Several European firms appear to be convinced that the VSAT market will be attractive, and will require increasingly sophisticated products. There is uncertainty, however, about the players' ability to introduce profitable products to meet this demand.

- **Commitment to co-operate with other European manufacturers to develop shared standards.** Many European manufacturers already have close relationships with US partners, and may be reluctant to co-operate effectively with a European grouping.

- **Sufficient technical insight to establish standards** that represent an attractive and achievable 'step forward'. Europeans' limited track record and tiny user bases make such insight very difficult.

The problems of staging a European 'leap forward' in satellite ground equipment are significant, with few of the necessary ingredients available. There seems to be little belief in the industry that such a desirable goal will be attained, and this is likely to be a self-fulfilling prophesy. We conclude that such an initiative is unlikely to be feasible.

However, many of the benefits of standards can be realised by less ambitious efforts, targeted at making ground equipment more attractive and accessible, and less demanding, for users and service providers:

Supporting type approvals — Changes to the system of type-approvals along the lines envisaged by Positions 1, 3 and 11 of the Green Paper (see Exhibit 3.1 above) will accelerate the removal of bureaucratic restrictions on installation and use. Users and service providers will become more confident as purchasers of equipment.

Producing standards for interfaces and protocols

Standards for interfaces and protocols will be valuable to those wishing to offer components or peripheral devices, or to act as systems integrators. New entrants and start-up manufacturers will benefit particularly from such standards.

Ensuring that mainstream telecoms standards address satellite issues

Ensuring that mainstream telecoms standards address satellite issues will benefit European service providers who are attempting to embed satellite links in telecoms networks, and European equipment manufacturers who are designing satellite equipment to interface with terrestrial systems. US players are currently at an advantage in these areas because of their experience and resources.

The arena for standards initiatives will be ETSI. Europe is fortunate to have such a forum for making progress on satellite telecoms standards, and full use should be made of the expertise that exists there.[3] If satellite telecoms standards development does not proceed rapidly in ETSI, it will reinforce the view of some interviewees concerning the lack of self-confidence of Europe's existing equipment suppliers and the reluctance of Europe's TOs to encourage satellite telecoms.

6.2.4 Encouraging the Involvement of Small and Medium-Sized Enterprises

Areas of impact : Ground equipment manufacturers and service providers.

The space industry and the telecoms industry are dominated by large corporations, but both rely to a significant degree on small and medium-sized enterprises (SMEs) as suppliers of products and services, and as sources of innovation. Section 4.2.2 noted the key role which SMEs have played in the development of the US VSAT market, and their continued importance. This tier of smaller players is largely absent in Europe, depriving European industry of a source of energy for growth and development.

Various measures can be taken by the CEC and others to support the growth of SME involvement in satellite telecoms:

3 Relevant expertise centres on the Satellite Earth Stations (SES) Technical Committee. Other TCs with satellite concerns are Transmission and Multiplexing (TM) and Network Aspects (NA).

Liberalisation measures designed to attract entrepreneurs

The most powerful incentive to SMEs is the existence of attractive commercial opportunities. The Green Paper de-regulation should provide such opportunities to smaller service providers, systems integrators, equipment and component manufacturers and resellers, and contractors to larger players. Similar regulatory changes in the USA initiated the rapid growth in SME activity of the mid-1980s. The detailed implementation of the Green Paper reforms must reflect the needs of smaller enterprises - licence terms, type approvals and other bureaucracy can easily deter and exclude small players.

Vigilance for anti-competitive practices aimed at deterring SME involvement

It is very easy for large organisations and bureaucracies, with an interest in maintaining the status quo, to deter SMEs from exploiting opportunities - by placing bureaucratic, legal or commercial obstacles in their path. Larger enterprises can stand higher costs and risks to overcome such obstacles. The international dimension of many satellite telecoms opportunities increases the risk of such practices.

Support for satellite telecoms R&D tailored to SME requirements

Some of the best work in existing CEC Programmes such as ESPRIT and RACE has been carried out by SMEs, even though they tend to be under-represented. Many Member States have schemes to support SMEs in high-technology areas, through subsidised consultancy, grants and export support. Such schemes can assist satellite telecoms initiatives.

Ensuring that training is made available in ways that are appropriate to SMEs

Training and education (see Section 6.2.6 below) are important if European industry is to increase its competitiveness. For SMEs to be attracted to participate, training must be:

- cheap (probably subsidised)
- accessible (without excessive air travel)
- highly focused (short, clear specification, clear benefits)
- practical (based on real equipment, systems and problems)
- backed up by on-going support (links to academia, research establishments etc.).

The CEC is well placed to ensure that SME involvement is maximised, and the importance of SMEs in general is clearly recognised by the Commission. In the field of satellite telecoms, SMEs are particularly worthy of support.

6.2.5 Refocusing Support for R&D

Areas of impact: Service providers, ground equipment manufacturers and satellite manufacturers.

The total public R&D[4] funds available for support of the European satellite telecommunications industry are unlikely to be substantially increased above the current figure (estimated at about ECU 300-400 million annually, including all government civil spending, relevant defence spending and ESA expenditure – approximately 10% of total space expenditure[5]). In fact, reductions are more likely – the overall budgets of ESA and the French Space Agency, CNES (the two main sources of European space R&D funding) are under pressure to be reduced, and several other national R&D budgets are vulnerable at present.

European space expenditures are an order of magnitude lower than space US expenditure (Exhibit 6.2), and even after adjusting for the high content of military programmes in the US figures, the value of US support for R&D in satellite telecommunications is many times the European level.

Given the overall European budgetary constraints, the issue becomes one of allocation. There is a continuing debate within the European space and telecoms communities concerning the division of resources between the various areas of activity, and little consensus on the objectives or nature of R&D support:

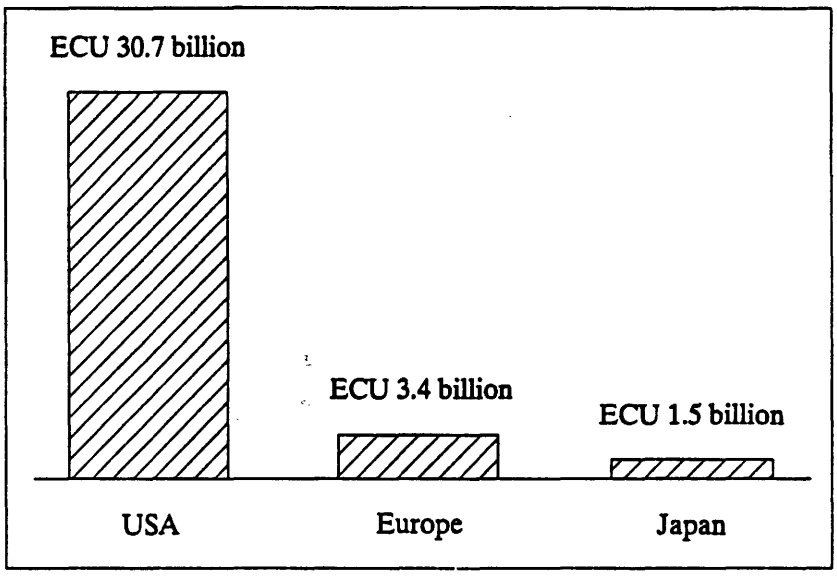
- The correct balance between satellite telecoms R&D (including transponders, ground equipment, transmission) and other areas of space research (launchers, vehicles, other satellite areas) is disputed. The medium-term commercial returns on telecoms research are difficult to compare objectively with the longer-term benefits of other space programmes.

- The balance between supporting pre-competitive research or more commercial programmes is difficult to strike. The results of 'close-to-market' R&D are more predictable and more rapidly available, but many argue that the private sector should invest in such work, and that public sector involvement is not appropriate.

4 R&D taken to include expenditure on 'space infrastructure' (much of ESA's expenditure is classified as infrastructural)

5 The ratio of R&D expenditure to market size is extremely high in the space sector (compared with other industrial sectors).

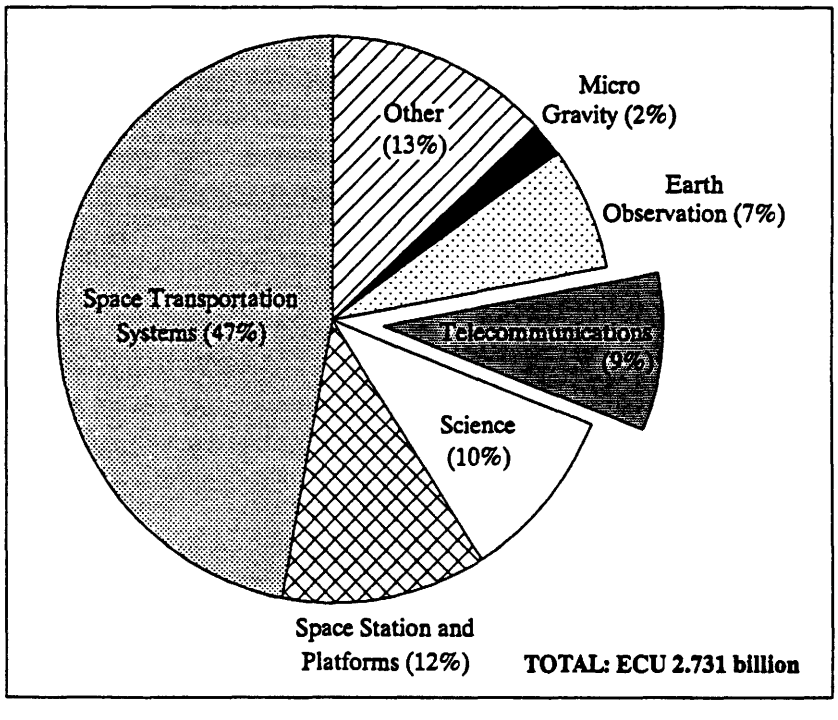
EXHIBIT 6.2: National Space Expenditures, 1990 [Source: CIT]



Note: These figures exclude expenditure classified as 'commercial'.

Exhibit 6.3 shows the budgetary split for the European Space Agency for 1992. The rationale for this split was questioned by some of those interviewed for this study, although it was acknowledged that the allocation of budgets would always be a contentious issue. ESA's telecommunications programmes are concentrated on space segment developments (Artemis, Marecs, programmes for Eutelsat etc).

EXHIBIT 6.3: ESA Expenditure on Approved Programmes, 1992 [Source: CIT]



A frequently encountered view is that R&D resources should be used to support an industrial consortium of European space and telecommunications companies, formed

with the objective of making a generational leap in the capabilities of small aperture terminal systems. This great 'leap forwards' was discussed earlier in Section 6.2.3, where we concluded that it was unlikely to be a successful venture. The cost of developing a system that could significantly outperform today's two-way shared hub VSATs could be several hundred million ECU, which would entail a substantial re-distribution of public and corporate R&D funds.

We have come to the following conclusions concerning targeting of R&D funding for maximum impact on the performance of the European satellite telecommunications industry:

- Satellite telecommunications has had a relatively modest share in the historical allocation of European and national R&D budgets, and its percentage share may benefit from a review of priorities.
- Agencies should consider an increased emphasis on the funding of programmes that have a strong telecommunications content rather than being primarily linked to space technology. The diffusion of results from the space industry to the telecommunications industry (where they must be applied) is very poor.
- Work that aims to build on the existing capabilities of devices and systems is particularly valuable, to ensure that European research workers are fully aware of the capabilities of state-of-the-art commercial products.

The role of the CEC is important in influencing the agenda for European R&D priorities. Also the CEC can directly influence R&D activities through its own research programmes (RACE, ESPRIT etc). The CEC is in a position to monitor the distribution of resources between R&D objectives, and to identify any mismatch between the needs of the European satellite telecommunications industry and the R&D resources that it receives.

6.2.6 Increasing the Awareness of Potential Users

Areas of impact: Service providers and ground equipment manufacturers.

Earlier chapters of this report have described how many of the potential users of satellite telecoms in Europe are unaware of the benefits or are wary of the potential risks. This poorly-informed and under-developed marketplace has a double impact on the prospects for European suppliers: the overall growth of the market is retarded; and larger, more experienced and more credible US players are at an advantage because

their stronger marketing capabilities and more robust branding are better suited to winning over sceptical users.[6]

There are several approaches that can be taken to support the development of the European satellite telecoms market by increasing the awareness of potential users. Each approach can be applied in ways that benefit European players:

High-profile demonstrators

The Commission, ESA, Eutelsat or other bodies could fund a suitable VSAT demonstrator. This would probably need to be mobile, and should be designed to challenge corporate telecoms managers who currently make no use of satellite solutions in their corporate networks.

The contract to develop and run the demonstrator should probably go to a grouping of European players. The emphasis should be on cost saving and reliability in mainstream applications, rather than esoteric advanced services (although this emphasis may deter TOs from becoming involved). The demonstrator should be built from 'off-the-shelf' equipment that is clearly priced (although this will present a problem of European content).

A demonstrator would be a cost-effective means of accelerating market development at the same time as boosting the presence of a subset of European service providers.

High-profile public procurements

Many of the risks and uncertainties that prevent corporate telecoms managers from using satellites would be reduced if there were satellite networks in use in more high-profile public sector applications.

An initiative to provide a network for ETSI is already underway (in partnership with Eutelsat). The Italians, French and British have various public sector applications. Further opportunities will arise to use satellites – either in a CEC network, in national or local government networks, or in a pan-European public sector network (inter-governmental, police, medical, banking, etc.).

These networks should be clearly seen to be cost-effective, reliable and relevant to the corporate sector (not, for instance, a

6 This does not apply to the European TOs, but as discussed in Chapter 3, they are unlikely to develop their domestic satellite markets significantly.

specialised secure military system). The public sector networks currently in place are not publicised in a way that registers strongly with corporate telecoms managers. We encountered a view, which may be typical of European telecoms managers, that they are 'just costly experiments'.

Subject to the constraints of the Procurement Directive, such projects should also provide European service providers with a marketing and sales boost. Again, there may be some difficulties with the level of European equipment content.

Publicity for existing users

The Commission could raise the profile of existing users of satellite telecoms, particularly those who have clearly chosen the technology on a commercial basis that is relevant to other corporate users (i.e. not TOs). Suitable examples include Reuters, Deutsche Bank, the Paris Stock Exchange, BP and Daimler Benz.

Subsidy of training courses and awareness seminars for telecoms managers

Corporate telecoms managers are an easily addressable group. They are mostly associated with active national user associations. It would not be costly or difficult to target this key group for educational purposes. In our experience they are eager to increase their knowledge and insight if the following conditions are met:

- The content of training courses must be objective and quantitative, particularly on matters of cost, reliability and performance.
- The format must be concise.
- The presenters must be professional and well informed, and able to answer detailed questions authoritatively.

It should be possible for the CEC or another body to stage an appropriate programme of sessions in a selection of Member States. Presenters could be drawn from the European industry without compromising objectivity, while still raising the profile of their organisations.

This measure is not directly supportive of European industry; we include it on the grounds that it can accelerate the development of the overall market, benefiting European industry indirectly.

6.2.7 Encouraging Industry Consolidation and Co-Operation

Areas of impact: Satellite manufacturers and ground equipment manufacturers.

We distinguish two categories of measure aimed at encouraging consolidation and co-operation in the European satellite industry:

Measures to encourage consolidation of satellite manufacturers

Pressures for the consolidation of Europe's satellite builders have existed for several years, and progress has been made in concentrating activities within a smaller number of firms[7]. However, Europe is still disadvantaged by having a fragmented and under-scale satellite manufacturing sector.

In order to realise the main benefits of consolidation, real control of the industry needs to be concentrated in the hands of a smaller number of players. It is not sufficient for there to be merely an increase in co-operation agreements, partnerships and joint venture companies. For this to occur, some European states will have to surrender national control over their space industries but to date, this has been politically unacceptable.

There is a danger that forming ever increasing numbers of joint venture groupings and co-operation agreements will actually reduce the efficiency and cost-effectiveness of the European industry. A considerable amount of management time has been consumed in recent years with negotiating possible consolidation agreements, mergers and take-overs.

A complicating factor is the parallel rationalisation of the European aerospace industry. Many of the parent companies of satellite manufacturers are caught up in the political and commercial negotiations that will determine the future shape of European aerospace. There is a danger that satellite manufacturing divisions become bargaining chips within this large and extended game, rather than being considered on their own merits.

The CEC has only limited and indirect influence on the rate of consolidation, so it is important that full use is made of the mechanisms that do exist for influencing industry development. For example, the Commission could encourage Member States to sacrifice their perceived national interest in maintaining a

7 The Euroconsult studies referenced by this report address the recent history of consolidation in detail.

complete national satellite building capability. The strict enforcement of **Procurement Directives** could assist in this process.

Eutelsat, as the major customer for communications satellites, could have a significant influence on the structure of European industry, but its current constitutional position would prevent it from exercising any such influence explicitly. ESA is similarly restrained from explicitly exerting any power over the structure of the industry.

The forces which are most likely to correct the industry structure spring directly from the commercial realities of European satellite production. Commercial pressures will continue to force the European industry to consolidate and rationalise until it has reached a sustainable size.

Measures to encourage vertical integration of European players

Chapter 4 discussed the advantages of vertical integration in immature markets. No European satellite telecoms player, however, is truly vertically integrated in the satellite telecommunications value chain; the predominant form of integration is with terrestrial telecoms (the TOs).[8]

It is difficult to envisage measures that could be taken by the Commission, or by other bodies, which could significantly increase the level of vertical integration in European satellite telecoms and which would have an impact in a reasonable time. It is more productive to consider measures that will reduce the benefits of being vertically integrated, and thus reduce the competitive advantage of integrated US players:

- Green Paper de-regulation, to reduce the need to be a satellite owner in order to offer cost-effective satellite services.
- Standards, to reduce the advantage of being both an equipment manufacturer and a service provider.
- Other measures to accelerate the growth and maturity of the market, reducing the risks of buying from smaller and less

8 Inmarsat is a partially European integrated player. Orion Network Systems will be vertically integrated and a partially European player. Some of the options for the future of Eutelsat envisage integration into service provision. There is no prospect of any European service provider being integrated into ground-equipment manufacture.

fully integrated suppliers. Examples include the provision of training, demonstrators, user education and measures to encourage SME involvement.

6.2.8 Specific Restricting Measures

Areas of impact : Service providers, ground equipment manufacturers and satellite manufacturers.

Finally, we consider a number of specific restricting measures which have been put forward as ways of protecting the European satellite industry:

Tariffs and quotas on imported ground equipment

Tariff barriers to restrict imports of US and Japanese ground equipment would slow the rate of development of the satellite telecoms market, harming the prospects for European service providers and users. Moreover, it would be relatively straightforward for US and Japanese equipment builders to find European partners who could manufacture their products under licence in Europe. This would not provide European industry with significant medium-term competitive benefits, and would not be a very effective supporting measure.

Import quotas are a common alternative to tariff barriers. In the case of an unpredictable new market such as satellite telecoms, however, it would be very difficult to agree a basis for import quotas. The multilateral negotiation of import restrictions (with the importing countries and within the EC) would be difficult and time-consuming. It could not easily be accommodated within the schedule for early de-regulation.

Limiting new private satellites

The restriction of further private satellites would preserve the current space-segment market share of the European TOs and Eutelsat, and would therefore protect part of the European satellite manufacturers' domestic market. This measure has been suggested by interviewees in this study as a possible protecting measure. This measure can be argued against on two counts:

- No practical mechanism for imposing this restriction exists within the current international space-segment management structures.
- The effect on European competitiveness would be indirect, delayed and very limited.

Restricting non-European ownership and control

Restricting non-European ownership and control is a legitimate and potentially beneficial approach to supporting European satellite telecoms players. Many countries, including the USA and Japan, restrict foreign ownership and control of a variety of enterprises, to protect 'national interests' and to support domestic industries. In international relations terms, these restrictions do not cause the same difficulties as other forms of trade barrier.

In the case of satellite telecoms, the most appropriate application of these restrictions would be in the area of service provision and network operation. Licences and permits can be drafted to stipulate limits for non-European ownership.

The restrictions would need to be sufficient to encourage non-European players to share ownership and control with Europeans, without completely deterring them from participating. It will be very difficult to strike this balance correctly across all of the EC countries and each of the relevant classes of licence. The role of the Commission would be important in setting this balance.

The danger of retaliatory measures is small, but should be considered - similar restrictions for many telecoms activities are already in place in several non-European markets including the USA. Although US ownership regulations do not appear to cover non-interconnected VSAT networks (this has not been tested with the FCC or in the courts), there is no European presence in this market. Retaliatory measures might be taken against European SNG operators.

Although the potential impact of retaliatory measures is not great, the restriction of non-European ownership could lead to a reduction in investment levels in European satellite telecommunications. Important US satellite players might be deterred from investing as heavily in the European market as they would have done, if permitted to have full control of their operations.

It would be difficult to justify forcing member states to impose restrictive licence terms for domestic satellite licences, particularly where the current national regimes have liberal ownership conditions. The ideal vehicles for this measure are the pan-European licences envisaged in the Green paper.

Such measures would not prevent non-Europeans from being active in European satellite telecoms, but would help to maximise the involvement of Europeans. Several US and Japanese players are already pursuing strategies that rely on European partnerships.

Retaining and re-introducing TV broadcasting restrictions

Restrictions on satellite TV broadcasting could be used to protect the broadcasting revenues of Eutelsat, and preserve its position as the main customer for European communications satellites. However, the reaction of public and political opinion to such measures would be hostile, and the regulatory mechanisms would have to be intrusive, complex and unusual.

This measure is included here to highlight the difficulty of protecting Eutelsat revenues through regulatory action. It is only through rather contrived and regressive regulatory measures that Eutelsat can be protected from the commercial pressures and uncertainties that face all space-segment owners.

6.3 Conclusions on Regulatory Actions and Supporting Measures

There are a range of measures that the Commission could undertake directly, or encourage others to take, that would strengthen the position of the European satellite telecommunications industry. Many of the supporting measures will be required by some sectors whether or not de-regulation occurs.

The restriction of foreign ownership of service providers through the definition of licence terms appears to be the only practical restrictive measure that could be taken without a clearly negative net effect on the development of the market. This measure may steer non-European activity towards collaborative involvement with European partners, without significantly damaging the prospects for market development. The other practical restrictive measures that could be taken to impose limits on the actions of non-European players would have significant negative consequences for the European marketplace, reversing some of the benefits resulting from de-regulation.

Annex A: Satellite Telecommunications Applications

A1 The Range of Applications

Exhibits A1 and A2 (at the end of this annex) are compiled from CEC (1992d). They have been included as an illustration of the range of satellite telecommunications services and applications.

A2 Limitations to the rate of uptake of services

It is important to note that the rate of uptake of satellite telecoms services will be limited by several factors. As with most markets, potential satellite telecommunications customers need to go through a series of stages[1] before they become actual customers:

Simplified Stages in 'Readiness to Buy'

- Aware of the satellite telecoms product/service
- Aware of the general benefits
- Aware of the potential corporate benefits
- Convinced of the achievability of the benefits
- Willing to become a customer

Different telecoms managers and corporations will proceed through these steps at varying rates:[2]

1 Based on the Awareness/Interest/Evaluation/Trial/Adoption model (see reference Kotler 1988).

2 Reference E. M. Rogers, Diffusion of Innovation, NY Free Press, 1962.

Buying Behaviour Classifications	
Innovators	- The first to experiment with new products/services
Early adopters	- Often have specific applications in mind
Early majority	- Respond to growing user base and reduced risks
Late majority	- Respond more slowly
Slow movers	- Risk averse, difficult to convince

The decision-making process depends on whether existing services are to be migrated or new ones developed.

- Some potential users may wish to migrate existing applications, either in full or partially, onto satellite networks, in which case the key individual in the buying decision-making process will be the Telecoms Manager.
- Some may wish to develop new applications that rely on the characteristics of satellite telecommunications to be viable (for example a point-to-multipoint application). In this case, many more individuals are likely to be involved in the decision making process. IT managers, operations managers, marketing and strategy executives are all potentially concerned with new applications development. The net effect is likely to be that the adoption of satellite telecommunications for new and innovative applications becomes a more extended and complex process.

Corporate telecommunications managers have a range of criteria to satisfy before they are prepared to change existing practices:

Cost/Benefit improvement **Positive Net Present Value**	Lower costs, or greater benefits Probably low capital expenditure
Low project risk	Overruns (cost/time) Failure to complete Supplier problems
Low on-going risk	Future price increases Reliability problems Supplier problems
Flexibility	Low 'get-out' costs Network flexibility
Simplicity	Not 'multi-stop shopping' Minimum legal concerns
Overall credibility	References 'scale' (= safety) Personal rapport

EXHIBIT A1: Satellite Telecommunications Services

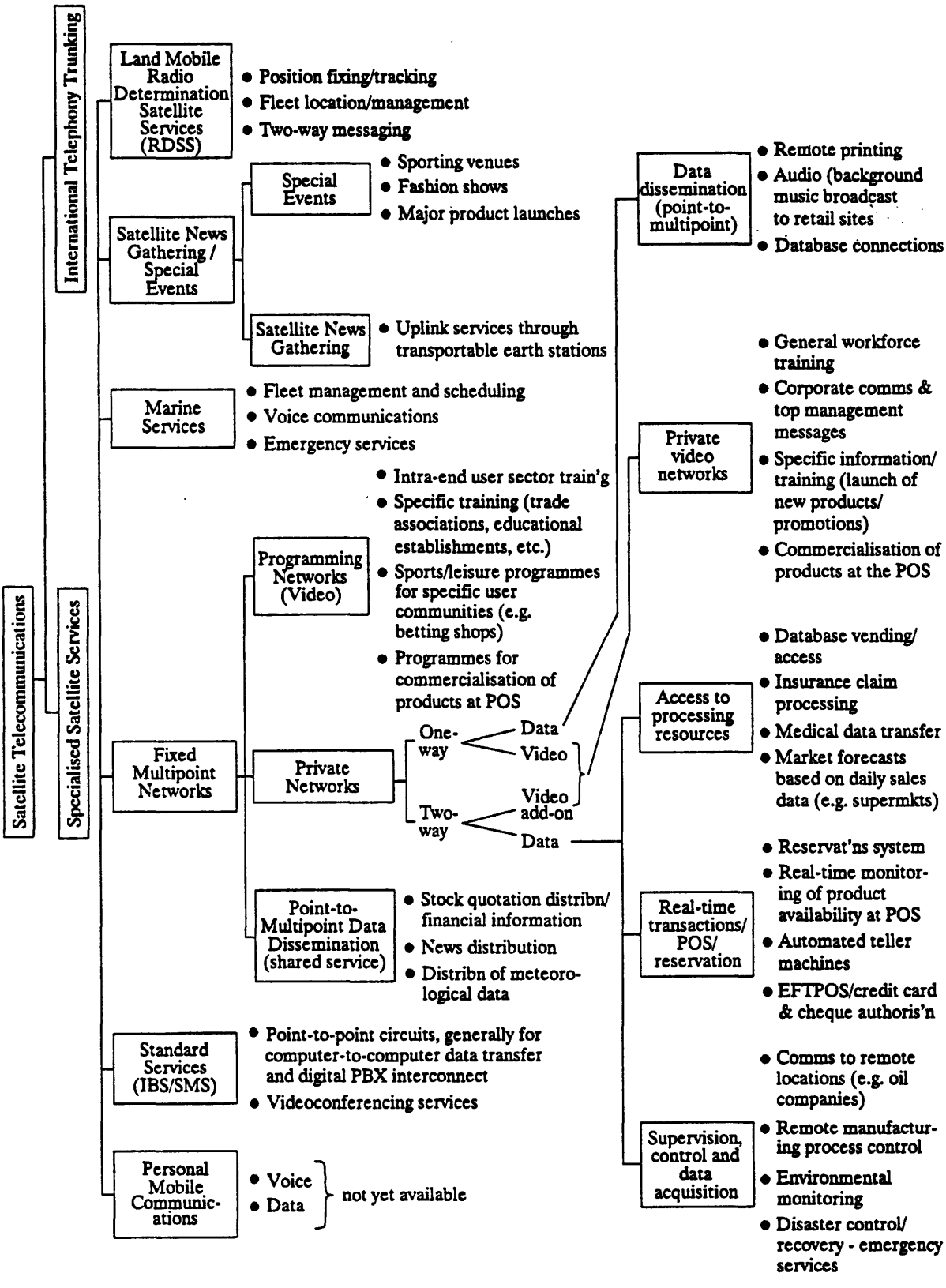
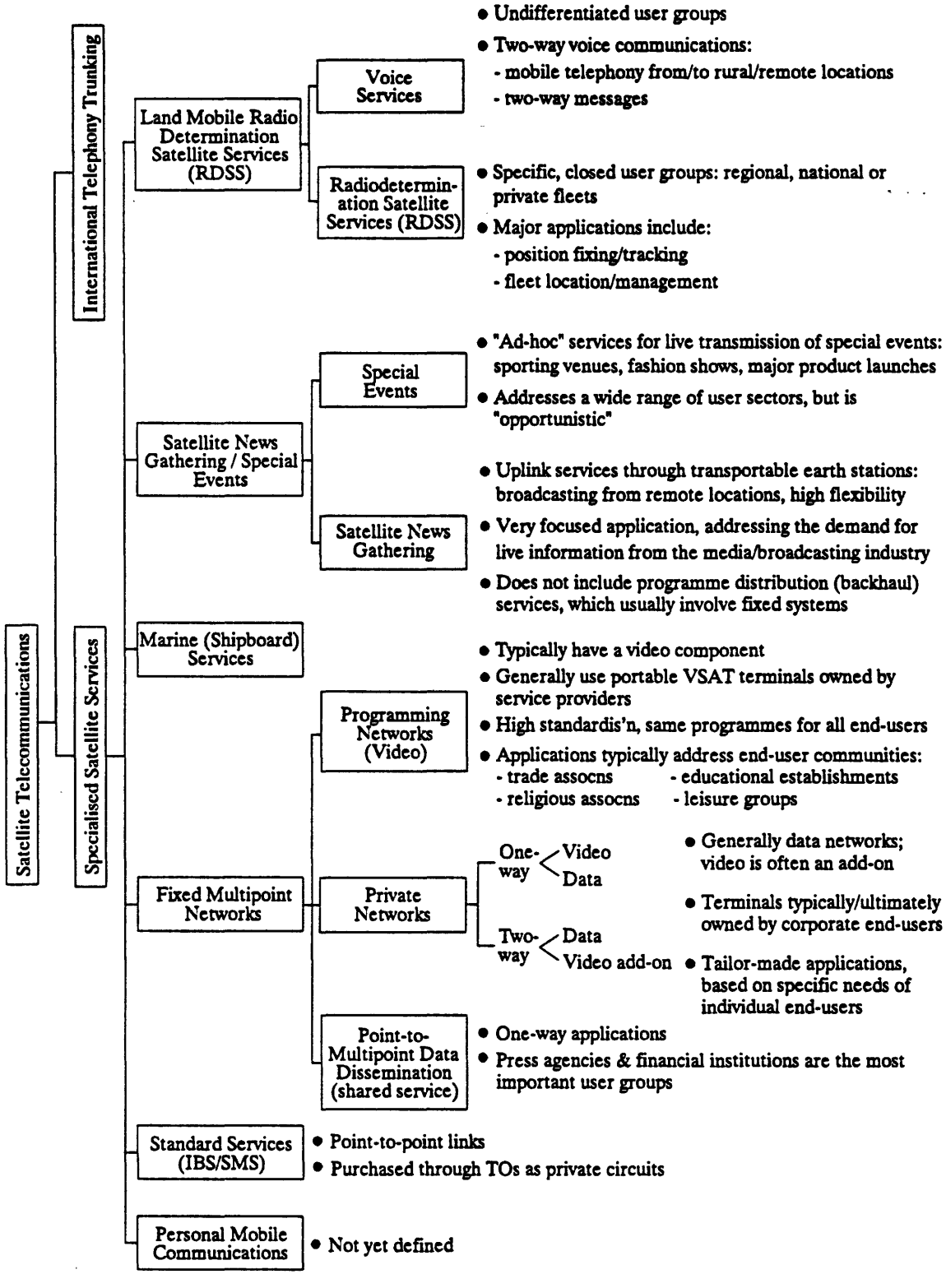


EXHIBIT A2: Satellite Telecommunications Applications



Annex B: Industry interviews

Satellite Manufacturer	Aerospatial Alcatel Espace Alenia British Aerospace Hughes Loral Matra-Marconi MBB
Terminal Manufacturer	Alcatel Amstrad ANT AT&T Tridom Dornier EB Nera ERA Ericsson Hughes Motorola NEC Nokia Racal Scientific Atlanta Siemens Thomson-CSF

Service Provider	Bishopsgate BT C&W France Deutsche Phonesat Deutsche Telekom France Telecom IBM Info AG Inmarsat Loral (Globalstar) Mercury Polycom SIS Link Skyphone Teleport Europe Telespazio
Users	IBM Mobil data services Press Association Reuters SITA
Space Segment Providers	Alpha Lyracom (Panamsat) Eutelsat Intelsat SES Astra
Other	ETSI

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Glossary

Backhaul	A term for the movement of TV programmes from point to point
Business TV	The use of television broadcasting/narrowcasting for business use, rather than for public entertainment purposes
CATV	Cable Television
CEC	Commission of the European Communities
CNES	Centre National d'Etudes Spatiales (The French national space agency)
Diffusion rate	The rate at which awareness, interest or usage of a product or service spreads through a marketplace.
DTH, DBS	Direct-To-Home and Direct Broadcast by Satellite - two terms for the satellite broadcasting of TV channels
Earth stations	Fixed ground equipment used to transmit/receive to and from satellites
EC12	The 12 member States of the European Community
ESA	European Space Agency
ETSI	European Telecommunications Standards Institute
Eutelsat	European Telecommunications Satellite Organisation

FCC	Federal Communications Commission, the US federal communications regulatory body
Footprint	The area of the earth's sufrace covered by a satellite transmission beam
Frame relay	A protocol for the high speed packets of data
Ground equipment	Equipment used to transmit to or receive from satellites.
GSM	Groupe System Mobile, a set of standards for digital cellular telecommunications.
HEO satellites	Highly Elliptical Orbit Satellites
Hub stations	For VSAT networks, the main control station that manages traffic on the network
Hybrid networks	Networks that consist of both terrestrial and satellite links
Inmarsat	International Maritime Satellite Organisation
IN	Intelligent Network
Intelsat	International Telecommunications Satellite Organisation
ISDN	Integrated Services Digital Network
LEO satellites	Low Earth Orbit Satellites. LEO satellites are not in geostationary orbits
Meshed networks	An advanced form of VSAT network where pairs of terminals can communicate directly without traffic passing through a hub station.
MIS	Management Information Systems

Orbital slots	Usually with reference to geostationary satellites. The geostationary orbit is divided into a number of 'slots' to assist with the management of the space segment. More than one satellite can occupy a given slot.
Payload	The part of a satellite that is concerned with the application of the satellite (telecoms, broadcasting, remote sensing etc)
Platform	The part of a satellite that is concerned with maintaining the satellite in orbit (stabilisation and control etc)
Point-to-point	A form of communication where the transmitted signal has only one target destination
Point-to-multipoint	A form of communication where the transmitted signal is intended to be received at more than one destination.
PSTN	Public Switched Telecommunications Network
Rapid deployment services	Telecommunications services that need to be deployed quickly in case of emergencies, disasters, major events etc.
RDSS	Radio Determination Satellite Services - a service for locating and communicating with remote terminals, normally vehicle-mounted.
Robust systems	Systems that are not sensitive to small changes in operating conditions, low levels of interference or minor degradations and faults.
SAO	Signatory Affairs Office. A department of British Telecom established to provide service providers with access to satellite systems.
Satellite capacity	The amount of traffic that can be handled by a satellite - various measures exist - Mbits/s, MHz, Voice Paths, Mbit Erlangs/second etc.
Shared hub VSATs	A type of interactive VSAT system where more than one VSAT network is supported by a single hub station

SMEs	Small and Medium sized Enterprises
SMS services	Satellite Multi-Services. The Eutelsat satellite business service, sold through signatory TOs
SNG	Satellite News Gathering
Space segment	Refers to the elements of a satellite communications system that are in orbit.
SSSO	Specialised Satellite Services Operators - a class of satellite service licence issued in the UK
Terrestial telecoms	Telecommunications based on copper, fibre optic, radio or microwave links.
TOs	Telecommunications operators. This term is used in preference to PTO (Public Telecommunications Operator), PNO (Public Network Operator), PTT (Posts, Telephony and Telegraphy) or others. The term includes all 'facilities based' telecommunications operators.
Transparent satellite links	Transparency is achieved when the user is not readily aware of the nature of the medium that is carrying the call - Example: International PSTN calls, where the user cannot easily distinguish whether satellite or undersea cable is carrying the call.
Transponder	The component on a satellite that receives and re-transmits signals from earth. Satellites can carry many transponders operating in different frequency ranges.
Trunked telephony	Telephony traffic that has been concentrated on to a single point-to-point link.
TVRO	Television Receive Only. A term used to describe ground equipment that is only capable of receiving broadcast television signals (for example domestic roof-mounted satellite TV dishes)
Uplink	The path between a ground station and a satellite that is used to transmit traffic that is then broadcast over a wide area by the satellite.
VAS	Value-added services. In telecoms, services that make use of basic telecommunications to provide services that can support

	higher prices. Examples include information services, protocol converting services, services that package basic offerings in a more convenient format, such as 'bandwidth-on-demand', etc. This term tends to be used very loosely.
VASP	Value Added Service Provider
Value chain	The connected set of activities that allow a product or service to be delivered to an end user.
Vertically integrated	Present in more than one stage of the value chain
Video compression	Describes techniques used to transmit a video signal using less bandwidth than the traditional requirement (about 6MHz)
VSAT	Very Small Aperture Terminal. Small dish satellite terminals that can have either receive only (one-way) or transmit/receive (two way, interactive) capabilities.