

FINANCING STRATEGIES FOR
GEOSTATIONARY COMMUNICATION SATELLITES
TURKISH EVIDENCE

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Financing Strategies For Geosynchronous Communication Satellites
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Jeosenkron İletişim Uyduları İçin Finansman Stratejileri
Türkiye Örneği

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Abstract

Over the last decades the importance of satellite communication increased rapidly. The satellite sector grew and became a profitable commercial market. Commercial space revenues increased rapidly which caused the change in the players from states to private companies. This was the reason for the birth of the satellite financing models because the states could meet the expense from treasury however it is difficult for a company to pay hundred million dollars in an investment. This paper examines satellite financing models and the satellite market for the geostationary communication satellites and also gives general information about the financial models, satellite history and the satellite systems. The aim is to show the advantage of debt financing compared to equity financing.

Özet

Denizâşırı haberleşmeyi gerçekleştirmek amacıyla ortaya çıkan fikirlerin geliştirilmesi sonucu ilk uydu olan Sputnik 1 Sovyet Rusya tarafından 1957 yılında jeosenkron yörüngeye oturtulmuştur. Bunun sonucunda başta Amerika ve Rusya olmak üzere ülkeler arasında hızlı bir uzay yarışını başlatmış olup ticari amaçlı uyduların ortaya çıkmasına kadar bu gelişmeler hep devletler ve devletlerin oluşturduğu şirketlerce takip ve finanse edilmiştir. Karlı bir yatırım olan iletişim uyduları sektörüne özel şirketler dahil olup bir süre sonra hakimiyeti ele geçirmiş ve devletlerin yörünge hakları dışında söz hakkı kalmamıştır. Yüz milyon dolarların yatırıldığı böyle büyük bir sektörde büyük devlet kaynaklarıyla rahatlıkla yapılabilen yatırımlar özel şirketler tarafından kolaylıkla gerçekleştirilemediği ve tek şirket tarafından kredilendirilmesi zor olduğu için zamanla farklı finansman modelleri ortaya çıkmıştır. Bu modeller genel olarak öz kaynak ve borç finansmanlarının karması şeklinde yapılıyor olsalar da karşılaştırma yapıldığında borç finansmanının öz kaynak finansmanından daha avantajlı olduğu görülmektedir.

Oral Hocam;
Hakkınız ödenmez...

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1. INTRODUCTION

Communication has been one of the most important needs of the human being since the beginning. The communication techniques evolved with the civilizations. Smoke substituted with birds and then telegraph and telephone invented for communication purposes. However the radio link connections were not suitable for overseas connections. This deficiency might have been a reason for the idea of satellite communications.

Satellite communications, as a costly sector, was first at the mercy of the states because the treasury would meet the expenses easier than individuals or private companies. In addition to this advantage also the research programs were under the control of governments. As a result; first satellites launched in the history were governmental enterprises. The following years witnessed the establishment of intergovernmental organizations which later became intergovernmental companies and finally privatized. Because of being a high yield sector satellite business attracted entrepreneurs and the financial aspect of the business also changed in time with the change in the possession of satellites.

The first satellite programs were government supported and for national purposes however after the launch of commercial satellites the priorities changed. As a result; the structures of the companies started to change and the ownership passed to private companies in the long run. Recently the dominant companies in the sector are private or IPO. New companies have been trying several strategies in order to maximize their profit in the competitive market conditions.

Throughout this thesis; the history of satellite communication, general information about satellite systems, financing strategies and special strategies for different projects will be explained. The aim of this research is to examine different financial strategies used in the sector and compare debt and equity financing used in satellite business in a case study with the help of Modigliani – Miller and pecking order theories.

2. METHODOLOGY

In this research different financing strategies are examined and debt financing is favored for satellite operating companies instead of equity financing after comparing the both in a case study. As per the causal and comparative research attempting to determine reasons for the existing condition, the methodology of this research is casual and comparative research. In this research, the same amount of investment is financed through different models and the most profitable of them is favored after the costs calculated. Debt and equity financing as comparison groups have different characteristics such as payment procedure, opportunity costs but also same values of investment.

The participants of the research are the financing methods, satellite cost studies, the debt and equity financing cost studies and other variables such as interest and exchange rates. The sample data is imaginary but similar with market conditions and the assumptions used were the outcomes of the expectations. The comparison is made through the calculations made for debt and equity financing costs.

3. FINANCIAL THEORIES OF INVESTMENT FINANCE

Investment finance and capital structure has been one of the major topics of the financial theorists. Franco Modigliani and Merton H. Miller were discussed the cost of capital, corporation finance and the theory of investment in 'The American Economic Review' on June 1958. The criterions for rational decision making according to the journal are the maximization of profits and the maximization of market value. Interest rate of the market has direct effect on investment decisions because 'risk adjusted' and 'certainty equivalent' yield comparison with the market rate of interest is the base for the investment decisions. In their first proposition; Modigliani and Miller (MM) proved that the market value and the average cost of capital of the firm are independent from its capital structure. Think of two firms with same operating income but different capital structure. For unlevered firm which is financed by only equity, $V_U = E_U$ and for the levered firm which is financed by both debt and equity, $E_L = V_L - D_L$. If an investor buys 1% of firm U's equity than the investment is $0.01 V_U$ and return would be 0.01 of the profit. On the other hand, when he buys 1% of firm L's equity and debt the investment becomes $0.01 V_L = 0.01 D_L + 0.01 E_L$. The return of the investment is equals to: $0.01 \text{ interest (because of } D_L) + 0.01 (\text{profit} - \text{interest}) = 0.01 \text{ profit}$. The same payoff acquired from both strategies where $V_L = V_U$. The value of the firm is independent of the financing method in an efficient market without taxes, bankruptcy costs and asymmetric information. The second proposition states that the return depends on the financial risk which is a function of debt to equity ratio. The return equals to the weighted average of expected returns. $\text{Expected return on equity} = \text{Expected return on assets} + \text{Debt} - \text{Equity ratio} \times (\text{Expected return on assets} - \text{expected return on debt})$. When debt to equity ratio increases the return on equity also increases because of the higher risk. The relation would be linear with a constant interest rate. If there is an income tax with deductible interest expense than levered firms have advantages over unlevered ones since the interest payments can be deducted from tax payments. Also for the second proposition the cost of equity increases with leverage with taxes. The third proposition was derived from the others is that the cut off point of the investment is independent from the investment finance. (Modigliani, Miller. 1958. p.p. 261 – 297) These assumptions are valid in perfect market conditions however policies enhancing the exploitation of complementarities will be more significant with the higher the degree of imperfections prevailing the capital markets. (Stenbacka, Tombak. 2002. p. 271)

There are some other determinants which Modigliani and Miller's assumptions did not include. The theorem is rational in perfect market conditions with no bankruptcy and asymmetric information. There are some other costs which they did not take into account. Financial distress, asymmetric information and imperfect market also effect the investor in the decision taking process. The financial distress is the difficulty of meeting the financial obligations for the firm. It sometimes leads to bankruptcy. The levered firm may be concerned to fall into financial distress by the investors. The more the firm uses debt the more the financial distress the investors have. In such a situation the stockholders can walk away which results in bankruptcy. Stewart C. Myers come along with the 'Strategic Trade-off' theory in his journal 'The Capital Structure Puzzle' printed on July 1984 volume of The Journal of Finance. The theory states that the capital structure is based on a trade-off between the savings by means of tax and the distress of debt cost. There is asymmetric information because the managers know more about the firms than the stockholders and outsiders. They would be aware of a risk or opportunity which others do not. Asymmetric information also a determinant of internal or external financing. This asymmetric information paves the way to the pecking order theory. According to pecking order theory the firms prefer internal to external financing and debt to equity if the internal financing tools are insufficient. The pecking order theory mentions that the internal equity is better than external equity and debt is better if external capital is required. (Myers. 1984. p.p. 575 – 592) "Particularly, since the enactment of corporation income tax laws, it has been argued that these taxes discriminate in favor of debt capital as opposed to equity capital." (Rochester. 1975. p. 919) According to Robert Heinkel and Josef Zechner all equity financed company will overinvest and issuing the appropriate amount of debt before the project becomes available resolves this overinvestment problem. This is an additional motive to taxes and creates additional incentives for debt financing. (Heinkel, Zechner. 1990. p. 1)

4. FINANCING MODELS

Capital markets can and do change quickly just like the chief executives and owner managers. They are becoming more innovative in their approach to securing financing. Maturing companies are realizing that they have to use a variety of techniques to obtain the money they need to continue their growth.

In the early 1980s, venture capital was one of the most popular techniques. However, in the early part of the 1990s, new venture financing was in a lull, partially because venture capital investors did not realize such thrilling gains as they had earlier from initial public offerings of companies they had earlier backed in the second half of the last decade. Nevertheless, the rapid favorable change in the market for initial public offerings (IPOs) that occurred in 1992 and the early part of 1993, along with the significant reduction in debt yields, has created new interest in venture capital investments and financing for entrepreneurs. This volatility in the capital markets has again rewritten the rules for financing and created a more complex and exciting financing environment.

In this new environment, companies have to deal with the continued tough underwriting requirements of traditional sources and the incredible valuations delivered upon successful entrepreneurial companies that go public. Leasing, debt financing, joint ventures, research and development partnerships, mergers and acquisitions, and financing from positive cash flow are still some of the most promising techniques for raising capital.

Throughout this dissertation, the most significant and common financing techniques will be discussed with their characteristics, advantages and disadvantages to the company. The financing categories each of which could be the subject of a separate book are as follows: Going public, Private Placements, Venture Capital, Traditional Financing, Debt, Obtaining a loan, Joint Ventures, Strategic Alliances, Leasing, Government Financing, and Franchising.

4.1. Going Public:

Going public is one of the most challenging experiences that a company can have. As a method for raising capital it has served American business remarkably well. It is a long time and effort requiring process- selling stock in the company for the first time, satisfying the government's and regulatory agencies' requirements, and in the process, giving up some of the control and privacy of the business. Basically going public or participating in an initial

public offering (IPO) is the process of selling shares that were formerly privately held to new investors for the first time. It can be done through the sale of debt or more commonly, equity securities (stocks). It is a very complicated process whose result can not be seen in advance.

In order to go public, a registration statement needs to be prepared by the attorneys and accountants of the company. It needs to be clearly demonstrating the business product/service/markets, company information, risk factors, how the company is going to use money, officers and directors, related party transactions, identifications of your principal shareholders and audited financials. After it is completed, Securities and Exchange Commission, and several other regulatory bodies review it in detail. When this process is completed, the owners are permitted to present the company to the stock brokers who will then sell the stock of the company to the public investors. Assuming that they can successfully market and sell the issues of the company, the company will receive money which is the underlying reason of the whole process. (Garner, *et al*, 1994, p.p 14-40)

Although many public offerings have fallen below expectations or even failed, there are some certain advantages of IPOs. First of all, it brings money that isn't had to be paid back which immediately improves the financial condition of the company. If the initial offering is successful then the company may be able to raise more capital by selling additional shares of stock at terms even more favorable than those of the initial offering. Moreover, it may improve the firm's access to the market for borrowed capital substantially. That is, the improvement in the financial condition of the company may enable the company to borrow funds at more attractive interest rates. Second advantage is that the stocks can be used for acquisition purposes. Owners of a company that another company seeks to acquire may be more willing to accept the company's stock if it is publicly traded. Because the market provides them more liquidity which affords them greater flexibility they can more easily sell their shares when they need. In addition, the price of the publicly traded shares is set everyday in the stock market which eliminates the need for estimating the value of the company. It is already determined in the market. Third of all, companies may use stock options, stock appreciation rights, or stock bonuses to motivate or to attract the key personnel. These arrangements create a healthy sense of ownership in employees, who also benefit from certain tax breaks and the chance to gain. Lastly, IPOs enhance the company prestige by making it more visible through press releases and other public disclosures and daily listing in stock market tables. Hence, the company becomes widely known among the business and financial community, investors, the press, and even the general public. (Henderson, 1988, p.306)

On the other hand, going public may create some disadvantages for the company. The loss of privacy could be one of the most significant drawbacks of IPOs. When a company becomes publicly held it is required to reveal highly sensitive information such as compensation paid to key executives, special incentives for management and many of the plans and strategies that underlie the company's operations to the regulatory bodies. Another disadvantage could be the limitation of the management's freedom to act. While the management of privately held company is free to act by itself, the publicly held company needs the approval of the board of directors on certain issues, and on some special matters the management must even need the consent of the shareholders. (www.venturea.com). Thus, the management is not only responsible to itself but also the investors and in order to take some certain decisions it need to explain the reasoning behind it and make the shareholders satisfied with the explanation. Since the shareholders evaluate the management's performance based on the profits, dividends, and stock prices this could put a certain pressure to increase earnings on management. This puts some level of limitation to their freedom of act. The last disadvantage is the high cost of going public. There are the underwriters' commission, which can be as much as 10% of the offering price, in addition to the legal and accounting fees, printing costs and registration fees. Apart from the initial offering cost, there are also the costs incurred during the process like the costs of periodic reports and proxy statements and the professional fees paid to attorneys, accountants, registrars, and transfer agents for additional services. (Garner, *et al*, 1994, p.p 16-21) In total, the cost of initial public offering is substantial. (<http://www.venturea.com/public.htm>)

4.2. Private Placements (Exempt Offerings of Securities):

Private placement or private investment capital is the type of financing in which private investors invest in the company usually in the form of stocks and sometimes bonds. (Garner, *et al*, 1994, p.p 40-55) It is generally considered when initial public offering is not suitable for or applicable to the underlying company. For instance; when the company is a new one lacking the financial strength and reputation to attract investors, or when it seems too costly to the company to engage in an initial public offering the alternative way to raise capital could be private placements. However, compared to IPOs, private placements will probably involve only a few investors. Take the example of a manufacturing company which sells the product to dealers, franchisors or wholesalers. These are the parties depending on that company to supply the product they sell. Thus, they may consider it to be in their own

self-interest to buy the stock of that company if they believe it will help assure the continuation of product supply and maybe provide them some concession. There are other kinds of investors searching for growing companies which will probably go public soon. For them, private placement could be a positive signal and they may be interested in investing in such companies. Lastly, private placements may attract venture capitalists who hope to take the advantage from such companies when they go public or are sold. Hence, there are certain groups interested in private placements, not many tough.

Private placements have some significant benefits to the company. First of all there is less paper work and cost involved in the process than there is in the IPOs. It is easier to approach the potential investors of private placements than that of initial public offerings. Besides, it provides a high degree of flexibility in the amount of financing ranging from 100 thousands to 10-20 million with combinations of debt, equity, or debt and equity capital. Moreover, investors are more tolerant than venture capitalists; they may be satisfied with 10 to 20% return on their investment over a longer term of 5 to 10 years. (<http://sbinformation.about.com/>) In addition, it takes less time to raise money in this way than usual venture capital markets.

Apart from the above stated benefits, private placements may have some pitfalls as well. The management may disproportionately focus on the favorable information and mislead the potential investors. This may create a problem of trust and dissatisfaction in the future. Thus, the management must point out the risks related to the investment and emphasize the positives while explaining the negatives. Beside this pitfall, private placement advisory fees may be high relative to the size of the issue, even though the total cost is less compared to that of initial public offering. Moreover, privately placed securities lack the secondary market advantages which puts a limitation to the amount of funds that may be raised since the number of potential investors included is small compared to the number of potential investors for publicly available investments. Hence, the investors may ask for higher yield to compensate the lack of liquidity involved. This is a serious disadvantage when it is thought that it is the absence of a public market for privately placed securities which makes them ineligible as investments for national bank securities portfolios.

(<http://sbinformation.about.com/cs/creditloans/a/prplacemt.htm>)

(<http://www.occ.treas.gov/handbook/PrivatePlace1.pdf>)

4.3. Venture Capital:

One of the most promising ways to raise capital for growth is also one of the oldest. Venture Capital refers to the money provided by professionals who search for and invest in young, rapidly growing, promising companies that have potential to develop into significant economic contributors. (www.nvca.org). The organized venture capital industry provides capital for businesses in development stage of the business life cycle, invests in firms that are unable to attract capital from conventional institutional sources, provides bridge financing for firms that are restructuring their equity positions, and provides funds for acquisitions and leveraged buyouts. Venture capital-as its name implies-very much related with the risk that the company or investment involves; the more the risk, the higher the expected return. Since the venture capitalist will share the risk, he needs to examine the company in which he is going to invest in detail. And the company management needs to examine the counter-side to see whether he understands the kind of business that the company does well. When a mutual understanding and agreement is reached the “marriage” is possible between the company and the venture capitalist.

There are some general characteristics of the venture capital industry. The venture capital investment horizon is usually long-term in nature. In order to undertake and share the responsibility of a business, the venture investor is usually locked into an investment for a five to seven year time frame. Another characteristic is that venture capital is invested mostly in firms having a compound annual growth rate potential of at least 30 percent. Since a firm earning a return of 10 percent can no grow faster than that without deforming its equity-debt structure, the investors are mainly interested in opportunities yielding 30 to 50 percent return on equity. (Henderson, 1988, p.p 254-266) Venture capital investors generally tend to have divergent interests. While some specialize in specific industries, others take the advantage of any opportunity satisfying their risk/return criteria. Another characteristic of the venture capital industry is that it provides a wide range of investment situations from development-stage financings such as start-ups and first-stage financing to later-stage expansions, acquisitions, and leveraged buyouts. However, there is a tendency toward later-stage expansions since it is safer than development-stage financing, and there is a lack of good development-stage opportunities. (UN, 1996, p.p 9-10) Lastly, venture capitalists do not just give the money and watch the company to invest it. They are active investors who are capable of providing management and technical assistance in the areas of planning, personnel, marketing, and financing.

Venture capital can be obtained from several sources such as private venture capital partnerships (family money, pension funds, large individual investors, etc.), public venture capital funds, corporate venture capital, venture capital funds of investment banking firms, individual investors, and state governments. (D.Gill, *et all*, 1985, p.p 29-49). There are also some new initiatives in venture capital like state-created venture capital pools and incubators. Incubators have become an innovative approach to help small business in the start-up phase with reduced overhead costs, expert assistance, and financial backing. This is also becoming an increasingly preferred and used way of raising capital.

There are some certain advantages of venture capital over the other forms of financing. First of all, the venture capitalist invests in the company for a considerable long time frame, that is, provides long-term equity finance. This creates substantial source to be used in future growth. The venture capitalist may also be capable of further investing money if it is required to finance growth. Furthermore, the venture capitalist is a business partner, sharing the risks the faces with while they are rewarded by the business success and the capital gain. They are active investors, fairly involving in the activity and the business of the company which allows them to provide strategic, operational, and financial advice to the company based on their past experiences. Moreover, since they have been most probably engaged some business activities in various industries, they may have a wider perspective which will contribute to the company much. Along with that, their involvement in various industries and different businesses give them a network advantage. They may be beneficial to the company by using their network contacts in recruiting key personnel, entering international markets, introducing strategic partners, and engaging in co-investments with other venture capital firms when additional rounds of financing are required. Hence, their personal contacts and networks could be a great contributor to the company. Lastly, their experience in the process of preparing a company for an initial public offering and facilitating in trade sales are other benefits that the venture capitalists provide to the company. (www.nzvca.co.nz).

Likewise any of other financing alternatives, venture capital has also some disadvantages and pitfalls. Initially, if a company's business plan considers a timetable longer than five or seven years before it provides liquidity, venture capital may not be an appropriate way to raise capital since the venture capitalists generally expect to realize their investments in five to seven years. If it is appropriate, it is difficult to obtain tough, and the process is quite time-consuming. Moreover, there are some disadvantages originated from the fact that venture capitalists are more sophisticated investors and they interfere with the business more than the other type of investors. Hence, they may drive a harder bargain. They have higher

expectations, and require various reports. What is more, venture capitalists are more likely to want to influence the strategic direction of the company since they share the risk and responsibility. It is something good when it is thought that they contribute to the company with their experiences. Nevertheless, when the management is unable to drive the business they are willing to take control, which puts pressure on the management. (Henderson, 1988, p.p 269-271) The last but not the least, there is no guarantee for success, meaning if the venture doesn't go well it may cost you the company. (<http://www.nvca.org/def.html>) (<http://www.nzvca.co.nz/VCandHowToGetIt1.aspx>) (http://www.tritonfoundation.org.au/index.php?option=com_content&task=view&id=433&Itemid=150)

4.4. Traditional Financing=Debt:

Although large firms have many financing options, small firms generally have to rely on certain types of financing due to their being in the development stage of their life cycle. As the firm progresses into the early-growth stage, state-guaranteed bank loans, trade credit, and institutionalized equity funds become more available. Thus, an attractive alternative for small companies is seeking debt in order to raise capital.

The traditional sources for debt capital for growing businesses have been banks and finance companies. Finance companies offer forms of financing similar to banks, but are typically willing to assume more risk. However, the lender definition has become more complex today, and lending can be further defined by specific lending criteria such as minimum-maximum loan size, credit agreements vs. demand contract agreements, pricing considerations, industry preferences, geographic preferences, purpose of the loan, and type of the loan. (Garner, *et al*, 1994, p.p 71-74) In order to better understand the lending and borrowing process, it is appropriate to focus on the different types of lenders and the characteristics of these lenders.

A *cash-flow lender* refers to the traditional handshake lender of yesterday. He may or may not ask for a security but relies heavily on the past profitability and expects it to continue. The credit criteria he uses is based on the proceeds, leverage considerations and the cash-flow coverage available to repay the principle and the interest when due. There is the credit agreement to monitor the loan. For the most part, the company remains in control for its cash. Secondly, a *secured lender* is generally the asset-based lending department of a commercial bank or a regional bank. Since secured loans are perceived as being more risky

and requiring more administrative attention to monitor the collateral, pricing for them tends to be higher than for cash-flow loans. Moreover, these types of loans tend to be governed by demand agreements that generally allow the lender to control the receipt and disbursement of company cash. While the secured lending departments exist within commercial banks and perceived to be riskier in their lending activities, it is important to remember that these departments are subject to high levels of government regulatory scrutiny; like the bank itself is. Hence, this “regulated” secured lender will have less flexibility in its lending practices than asset-based lenders will, such as unregulated commercial financing companies. *Asset-based funds* are secured with collateral provided by the borrower such as accounts receivable, inventory, or plant and equipment; similar to the secured loan from a commercial bank. Finance companies charge higher interest rates than commercial banks and secured lenders. This is because of the increased level of risk associated with highly leveraged and undercapitalized borrowers, the greater amount of administrative time and costs required to monitor collateral, and the higher cost of funds to the finance company resulting from the origin of the lendable dollars, which is mostly borrowed. The last type of lender represents a cross between a cash-flow lender, a secured lender, and an equity investor; namely the *hybrid lender*. The borrowers may obtain both secured and unsecured debt as well as revolving term debt and equity financing from hybrid lenders. This type of lenders can be found among large commercial finance companies, commercial banks, insurance companies, pension funds, public-private investment funds, and venture capital firms. (www.gecommercialfinance.com)

After giving a deep insight about the types of the lenders, it is time to analyze the type of debts in detail. The examination of debts will be held in main two headings: long-term debt and short-term debt. Long-term debt sources can be further discussed under three headings such as Fixed-Asset Acquisition, Term Loans and Leases while short-term debts sources are Borrowing Working Capitals, Accounts Receivables Financing, Inventory Financing, and Revolving Line of Credit.

(http://www.gecommercialfinance.com/gecmf/learnlend/asset_guide.pdf)

4.4.1 Long-Term Debts

i) Fixed-Asset Acquisition: In order to serve customers better or to expand their productive capacity, young and growing businesses need to obtain capital loans to finance the purchase of capital asset. The loan is usually secured by a lien on the asset being purchased. The repayment period for a capital loan is generally five to seven years. If a specific asset

secures the loan, then the bank has the right to repossess the asset if the borrower does not meet its obligations. These long-term capital loans can be obtained from several sources other than banks such as insurance companies, leasing companies, equipment and fixed-asset lenders, and pension funds.

ii) Term Loans: They are distinguished from capital loans in the sense that they are generally used for long or intermediate-term credit needs, usually three to seven years. Principal payments may be structured to increase over time as cash is provided. Due to the higher credit risk associated with the uncertainty about the future, the term loans are often subject to higher interest rates, periodic fees, compensating bank account balance requirements, restrictive covenants, and annual anniversary reviews. For this type of borrowing, if the bank sees the borrower as one who is able to generate sufficient cash flow to repay the loan within the predetermined period.

(www.fountainheadfunding.com/termloans.htm)

iii) Leases: Leasing occurs when the right to use certain equipment is transferred from the owner (the lesser) to the user (the lessee), for the payment of certain sums over a predetermined period of time. This type of financing can be preferred since cancellation options are available, maintenance services are provided, the terms may be longer and flexible compared to other types of financing and lastly the tax reduction may be greater than the one applied to the depreciation if the asset is acquired. (Garner, *et al*, 1994, p.77). Leasing will be discussed in detail in following pages.

4.4.2. Short-Term Debts

Short-term debt is generally used to finance unplanned cash needs that long-term financing does not cover while long-term financing helps business to handle large and sometimes irregular growth in capital needs that are planned for in advance. The major forms are revolving lines of credit for working capital, accounts receivable financing, inventory financing, and revolving line of credit.

i) Borrowing Working Capital: Working capital is the excess of current assets over current liabilities. If a company doesn't have enough working capital, the company's ability to grow can be hampered due to limitation of inventory the company is able to buy or of the

amount of sales the company can make on credit. Working-capital loans are usually used to provide the necessary funds to finance inventories and receivables. It may help to smooth the seasonal fluctuations when the company needs to build inventory for sales in later periods. This type of loan is usually short-term, and can be secured or unsecured. These sources are generally not used by start-ups, because even banks are reluctant to make loans to companies without any operating history. The other three types can be thought as forms of working-capital loans.

ii) Accounts Receivable Financing: A company may use its receivables to show as collateral to bank or finance company if its receivables are of good quality. As goods are shipped, funds are advanced on the basis of a predefined percentage of the underlying accounts receivable. When the receivable is collected, a payment is made to the bank reducing both the loan balance and the borrowing base. This type of borrowing is costly both to the borrower and the lender since it requires continuous recordkeeping to track the collateral. Thus, the rate of interest is usually higher.

Accounts Receivables Financing with Factoring, is another form of receivables financing. In the factoring agreement, two parties agree on that the financing institution purchases the receivables, assumes the risk of default and is responsible for collections. Although factoring can be used to get money quickly, to avoid the hassle of collecting bad debt, to smooth the cash-flow and to borrow money secured by the debt of company, is not generally preferred in many industries due to its being expensive. However, through the use of a factor, a company can increase the turnover of its working capital by reducing other financing requirements, limit credit, collection, and bookkeeping expenses to a definite percentage of its credit sales, and protect itself against bad debts.

(www.teamtechnology.co.uk)

iii) Inventory Financing: Lending institutions provide money on the security of inventory like hard commodities and non-perishable goods since they can be sold if a customer defaults on its payments. Three mostly used types of inventory financing are blanket inventory advance, floor planning, and warehouse financing. *Blanket Inventory Advance* is the type in which the bank takes an overall filing against all inventory and other desired assets, and monitor the inventory based on reports submitted. Secondly, in floor planning, which is also called trust receipt arrangement, the lender buys the inventory and the borrower holds the goods in trust for the lender in an area under its direct control. This agreement clearly shows

the assets being used as security and when the assets are sold, the proceeds are used to redeem the trust receipt. The last one, *Warehouse financing*, is quite similar to floor planning except from that the underlying goods are stored at a public warehouse with the receipt held by the lender. (Garner, *et al*, 1994, p.p 80-81).

This form of financing has several advantages. For instance, the amount of funds available is highly related with the growth of inventories, meaning the availability of funds automatically increases as the financing needs increases. Moreover, a field warehousing arrangement increases the acceptability of some inventory items as loan collateral.

iv) Revolving Line of Credit: It is another type of financing in which a bank lends a specific amount to a borrower and allows the same amount to be borrowed again up to a preestablished limit after it has been repaid. Since there is no set principal amount of the loan, there is no scheduled repayment of principal. Coming to the interest rate, it floats at 2%-3% above the prime rate and is applied to the largest amount of outstanding in that account during the course of any month. Generally, the most creditworthy companies can take advantage of this financing agreement. (www.cbasc.org)

These are some of the possible ways to raise capital using short-term debts and long-term debts. In order to assess the benefits of this method, it is appropriate to make a comparison between debt and equity because when a company wishes to expand its business and is unable to provide the additional equity investment itself there are two main ways to raise the additional money needed; debt or equity. One advantage of acquiring debt is that the lender has no future claims over the company; he is just entitled the repayment of the agreed amount. In addition to that, debt does not dilute the owner's interest since the lender does not claim to the equity of the business. Besides, the real cost of debt to the borrower is reduced because it can be deducted on the company's tax returns. Lastly, since most of the time the principal and interest are known the companies can forecast and plan for them. On the other hand, acquiring debt has some certain disadvantages. First of all, highly leveraged companies (that have large amounts of debt relative to equity) often find it impossible to remain profitable enough to grow and prosper. Such companies are also perceived as being more risky by the creditors. Moreover, it is not something permanent; it is a temporary capital which has to be repaid at some point. Apart from these disadvantages, debt instruments may have some restrictive provisions limiting the management's future actions. Last but not the least; debt generally requires pledging assets in addition to the personal guarantee of the owner which puts additional burden on the company. (Garner, *et al*, 1994, p.81)

(<http://www.teamtechnology.co.uk/what-is-factoring.html>)

(http://www.investorwords.com/4276/revolving_line_of_credit.html)

(http://www.cbsc.org/servlet/ContentServer?cid=1102940229994&pagename=OSBW%2FCBSC_WebPage%2FCBSC_WebPage_Temp&c=CBSC_WebPage#revolving)

(http://www.toolkit.cch.com/text/P10_3000.asp)

4.5. Obtaining a Loan:

A loan is a type of debt, but it will be discussed further separate from debt. Like all other debt instruments that are mentioned above, a loan entails the redistribution of financial assets over time between the lender and the borrower. When a company seeks loan, it evaluates the potential lenders in order to find the best possible fund with the best possible conditions. There are some certain criteria; if the lender knows the company and the industry that the company is in, it is preferable. If it is a reliable source of credit, meaning if it stands behind the borrower while the company experiences temporary problems, it puts the lender one step further than the others. Moreover, if the lender provides inexpensive money and easy access to the loan officer, then this lender is a preferable lender for the company. (Henderson, 1988, p.p 275-278). While the company looks for the best lender, the lender searches for the best possible borrower and look for some certain characteristics in the borrower. First of all, the bank examines the company's financial statements, and calculates some financial ratios in order to see whether the company is able to repay its loan. The cash-flow statement indicates the company's ability to generate sufficient funds to pay the accrued interest and the principal. The balance sheet gives detailed information about the company's assets, liabilities and the net worth of the company and it represents the leveraged position of the company. The higher the leverage, the fewer cushions available. Lastly, income statement presents the revenue and expenses of the company over a period of time which can be used as a base for assessing the profitability trends of the company. These indicators provide significant level of information to the banker. In addition to these financial statements, the ban calculates some ratios like receivable turnover, receivable collection days, inventory turnover, payable turnover, current ratio, quick ratio, debt-to-equity ratio, debt-to-tangible effective net worth, interest coverage ratio, and profit margins which indicate the management's ability to steer the company. (Garner, *et al*, 1994, p.p 88-101). Both sides take the necessary information into account in finding the best.

After finding the lender, the borrower should be well prepared to get the best possible deal. While negotiations are made, some of the specific negotiating points are interest rates, collateral requirements, personal guarantee of indebtedness, use of capital and payment terms, future borrowing constraints, and ratio requirements. (ITC, 1995, p.p 42-47). It is very important for borrowers to appreciate the legal implications of signing certain loan agreements. The loan documents that are commonly to be signed are promissory note, security agreement, financing statement, and personal guarantee. Promissory note is the legal obligation to repay the interest charge and the principal. A promissory note gives a bank the right to demand immediate repayment of a loan as circumstances warrant. It includes provisions about the interest rate charged, repayment schedule, late charges, default and discretionary rights. The security agreement describes the assets a business pledges to secure a bank loan. The financing statement names the borrower, the bank, and identifies the collateral pledged. Lastly, the personal guarantee is additional security item that is required by banks often, because it shows the personal commitment of the borrower to the loan. (UN, 1996, p.p 10-13).

4.6. Joint Ventures and Strategic Alliances:

A joint venture can be defined as the legal organization that takes the form of a short term partnership in which partners undertake a transaction for mutual benefit. The partners contribute capital to the joint venture in the form of cash, inventory, distribution networks, manufacturing processes, fixed assets, or intellectual property such as patents and trademarks; and they share risks. This is a type of business generally used to gain entrance to new markets or industries. However, it is also used as an alternative financing method. Most of the time, one of the partners is a small sized one seeking financing while the other one is likely to be a greater one with access to and availability of cash. Engaging in a joint venture makes sense when the large company is interested in a segment of a smaller company's business. In such cases, to create a joint venture around the area of the area of interest with both companies maintaining ownership positions. Another appropriate situation for a joint venture may be when a small company develops a technology or a capability outside the scope of its main business and the larger company contributes development and marketing assistance, as well as cash. (Garner, *et al*, 1994, p.p 111-120).

It is advantageous in the sense that the smaller company can get the necessary money to finance for growth while taking the support of a larger company at its back. Moreover, the

risk sharing aspect is an attractive point for the company. On the other hand, the smaller company can be seen as a potential rival for the larger one in the future, which may distract the relationship of the two companies.

Minority Equity Investment is another way of financing for growth generally used by technology companies. It occurs when one company buys less than 50% equity interest in another company. Such investments are generally accompanied by supporting production, distribution, and marketing agreements. Contrary to the joint ventures, minority equity investments make sense when a larger company is interested in all of the businesses of a smaller company. This alternative is often attractive one to create a separate operating joint venture.

Licensing is a different way of financing in which one company grants the right of using a proprietary process, technology, trademark, or other intellectual property. Licensing could be an attractive financing vehicle for a small company with a proprietary process or technology because the licensee compensates the licensor generally through cash for these rights. The basic component of the payment is royalty which is a percentage of the licensee's sales of products that are incorporate in the property rights. It is advantageous in the sense that it provides royalty payments to the licensor. The licensor receives about 5% of the wholesale price of each sold product on the average. If it is considered that there are no marketing or manufacturing costs for the licensor, it is obvious that this money is directly translated to profits. (www.licensing.org/intro/introduction.cfm).

Strategic Alliance is the next way for financing. It occurs when two or more parties come together in order to seek a set of agreed upon goals or to meet a critical business need while maintaining their independent organizations. In order to create a strategic alliance, first of all the own strategy of the company should be understood clearly. The core competences should be clearly identified as well as the other elements in order to protect the company from the rivals. Then, a strategic partner should be chosen carefully by analyzing potential partners' strengths and weaknesses. Afterward, the contract negotiations start including the discussion of the objectives of both sides, forming teams, each party's contributions to the alliance as well as the rewards allocated. And finally, the alliance officially begins. It is a widely-used technique in the business world.



(www.1000ventures.com)

Figure 1: Strategic Alliances

There are certain benefits of strategic alliances such as reduced R&D costs and risks, increased brand awareness through partner's channels, and access to partner's capital, products, technology, intellectual property and distribution channels. On the other hand, there are some significant risks associated with this type of financing. Strategic alliances can create competition rather than cooperation within the partners. Moreover, if the company assesses its core competence wrong and shares it with the other party, this may lead to loss of competitive knowledge of that company. That is, the specific company may lose its advantage in the market. Moreover, the alliance may fail due to incompatible cultures and objectives. Considering such risks and threats, the parties should negotiate the termination conditions in advance. (http://www.1000ventures.com/business_guide/strategic_alliances_main.html)

4.7. Leasing:

Leasing can be defined as the long-term hiring of an asset since it is the contract whereby an asset is supplied by the lessor (the owner of the asset) to the lessee for a specific period, in return for a periodic compensation which is called the lease payment. The lessor retains the title to the asset, while the lessee acquires the right to use the asset without acquiring ownership rights. (ITC, 1995, p.p 75-77). There are two main types of leasing; *operating leases and financial leases*. Operating leases give the lessee no special property or

purchase rights, but only the right to use the asset temporarily while the lessor doesn't fully recover the cost of the asset from a single lease agreement. The asset may be leased successively to more than one lessee over its economic life since the lease period is shorter than the economic life of the asset. The financial leases are the contractual agreements between lessor and lessee and neither party can cancel the agreement without the consent of the other party contrary to the operating leases. They are generally for longer periods than operating leases. There are two main types of financial leases: *Net leases* are the ones under which the lessee pays for repairs, maintenance, taxes, insurance, and other expenses related to the leased equipment. *Maintenance leases* are the ones in which the lessor has responsibility for repairs, maintenance and insurance of the leased asset. (UN, 1996, p.p 15-16)

Leasing offers several advantages and disadvantages. To start with the advantages, it offers alternative financing opportunities that would not otherwise be available from traditional financing sources. Its costs are fully tax deductible which makes it very attractive along with other advantages. Moreover, leasing periods may be tailor-made to the needs of the enterprise. In addition to that it includes less restrictive provisions than a loan agreement does and it is simpler than securing debt, which may require a much longer time to obtain and significant effort to arrange. Lastly, leasing can be carried out in accordance with the needs of the firm and its cash-flow. On the other hand, there are some considerable disadvantages such as that the interest costs of leasing are generally higher than those of borrowing. Besides, capital investment incentives and tax credits on capital equipment often apply only to fixed assets, meaning lessees do not benefit from these incentives and tax credits. Additionally, leasing allows managers to evade budget restrictions on the purchase of fixed assets. Finally, the lessee can not cancel the lease payments even if he opts for early termination of the leasing agreement when the leased assets become unsuitable for his operations. This is a significant risk for the companies. (ITC, 1995, p.p 79-80) Hence, the companies should assess these advantages and disadvantages well in order to choose the best way to finance their growth.

4.8. Government Financing:

Government may create financing opportunities for private businesses but government financing is not likely to be one's first choice as means of raising capital. Because government will probably impose the same conditions as the bank or any other financial institution would, in addition to that some political provisos may be added. Thus,

companies should be aware of the fact that government financing is a paper-intensive and time consuming procedure. The reason why government provides such sources of finance is that it supports the economy by that way, it can create jobs and it may encourage private companies to invest in risky and critical technologies by supporting them.

There are different types of government financing programs such as direct loans, guaranteed/ensured loans, project grants, insurance, direct payments, and equity participation. In *Direct Loans*, government functions like a commercial bank. That is, it gives the money directly to a business and in return expects for repayment. Hence, the company works directly with the government. On the contrary, the *Guaranteed/Ensured Loans* are made by a commercial lender with no advancements of government. The government involvement is just in the form of guarantee, meaning government advances funds only if the loan goes into default. Thus, it is advantageous. *Project Grants*, as its name implies, generally awarded to particular projects. Most of such programs expect the owner to invest a significant amount of his or her own capital. Grant programs may require applications in specified formats, and may have annual deadlines. *Direct Payments*, just like the project grants, are generally directed to particular projects although a few payments are made for unrestricted use. This type of financing is often used to encourage conservation, pollution control, or other types of public welfare projects. Another type of government financing, *Insurance*, primarily refers to the export insurance which protects the exporters. This may reduce both the commercial and political risk. Like all the other insurance agreements, it has fee and premium structure which changes in accordance with the amount of coverage. Lastly, the *Equity Participation* is the involvement of government directly in the business like an investor. However, regulations dictate that the percentage of a project's total financing supplied by the government must be under 50%. (Garner, *et al*, 1994, p.p 133-157).

4.9. Franchising:

Franchising is agreement between two parties in which owner of a product, service, or concept (franchisor) contracts with an independent entrepreneur (franchisee) to sell or distribute the owner's product or service at a specific location. Franchising is an excellent form of financing. While you receive working capital in the form of franchise fee, at the same time you avoid the need to raise capital to finance new locations. However, not any company can engage in franchising. First of all the company should have a proven concept and it needs to be a profitable one. Moreover, the company should be able to duplicate this business for

others to operate, and it should be easily learnable by franchisees how the franchisor do inventory stocking, staffing, daily and monthly accounting, advertising, and marketing. Apart from these, the company is better to have significant economies of scale in order to engage in franchising.

Franchising offers several advantages and disadvantages as all the other financing sources for growth. First of all, franchising spurs the growth of the business and promotes the market image more quickly than a company itself could. While it could be very difficult for a company to open locations in eight to ten cities at a time, franchisees can do it for the main company. Franchising is also beneficial in the sense that it helps distribute start-up costs to others. Furthermore, it provides front-end cash from the license fee to offset the cost incurred by the company personnel helping to open locations. Besides, the capital requirements for expansion are far below than they would be if a company tried the expansion alone. On the other hand, there are some certain disadvantages associated with this type of financing. Initially, it relies on a proven concept which can be copied and easily performed by others. Thus, an extensive testing of the business ideas and operations is required so that no surprises arise as the franchisees begin to operate. Additionally, the franchisor takes the responsibility of an added dimension which is the franchisee. (Henderson, 1988, p.p 223-229). This puts additional burden on the company. Hence, by taking these advantages and disadvantages into account, the companies need to make the best decision in choosing their source of finance.

Other than the advantages and disadvantages, there are some other issues taken into account while giving the decision of engaging in a franchising agreement. For instance, the franchise fees and the ongoing royalty fees need to be carefully taken care of since the bulk of the company profits will depend on franchise sales and the initial franchise fees. In addition to that, franchising can also require a front-end investment by the franchisor. Thus, adequate capitalization of the existing business is important to undertake this challenge. Lastly, in the future if the company continues to grow and wishes to take its business public, it will probably need to own and operate a reasonable percentage of the existing locations. Therefore, the company should buy back the more successful franchisees at premium prices at a time when the company has other goals and objectives. (Garner, *et al*, 1994, p.p 251-255).

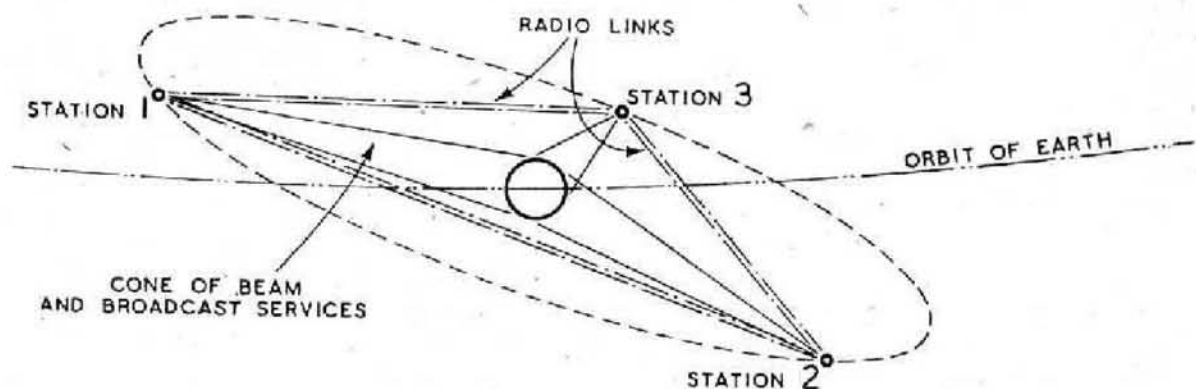
As a result, it is obvious that deciding on a source of finance to raise capital is not an easy topic. It requires a lot of research, knowledge and careful assessment. The companies need to evaluate each alternative carefully. They must have strategy that anticipates the future and is flexible enough to meet changing needs.

5. GENERAL INFORMATION ABOUT SATELLITES

5.1 The Idea of Satellite

“It will be possible in a few more years to build radio controlled rockets which can be steered into such orbits beyond the limits of the atmosphere and left to broadcast scientific information back to the earth.” (Arthur C. Clarke, Extra-Terrestrial Relays Can Rocket Stations Give World-wide Radio Coverage?, *Wireless World*, October 1945, p.305)

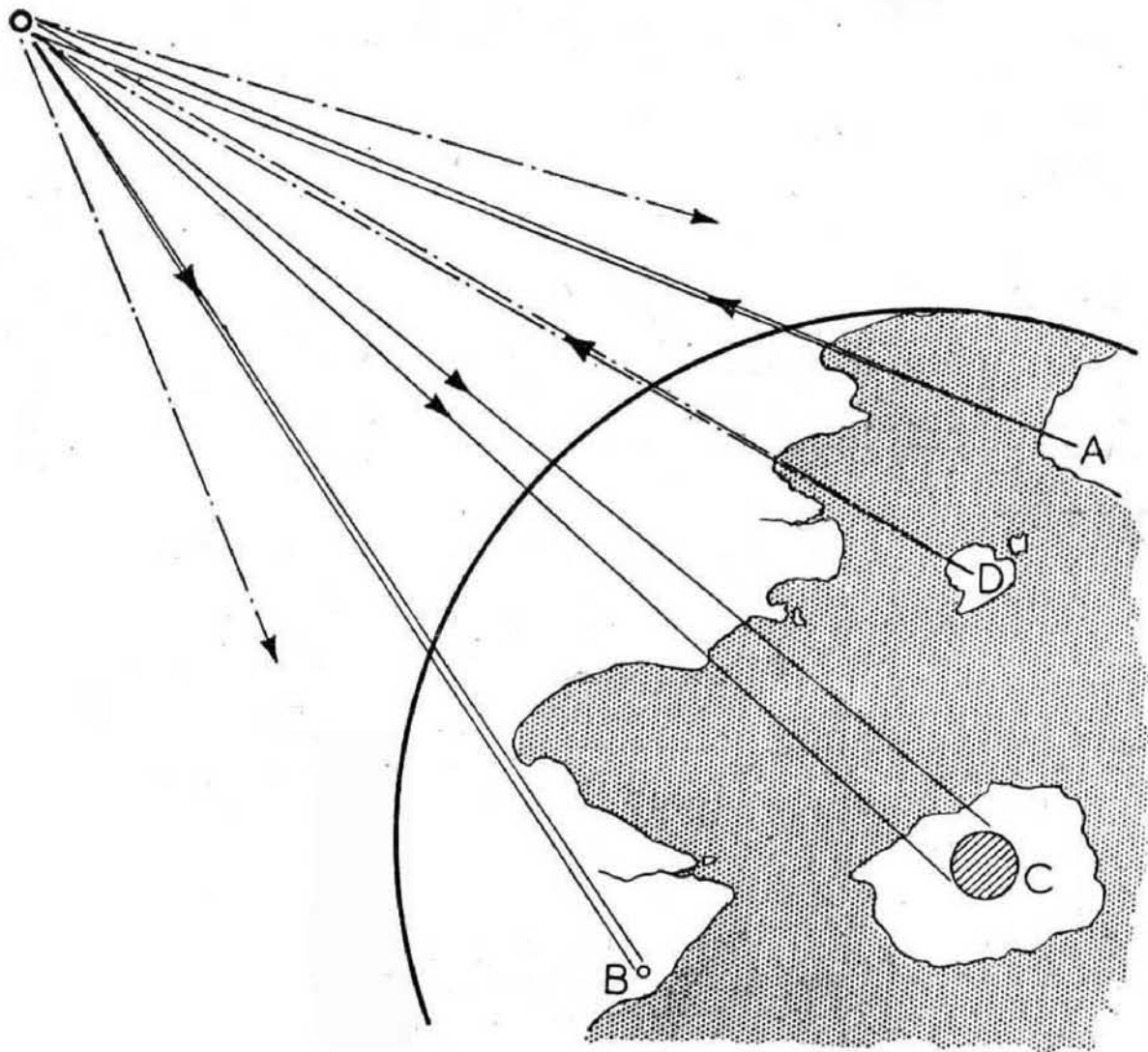
A Royal Air Force electronics officer and a member of the British Interplanetary Society; Sir Arthur C. Clarke’s most famous prediction on the future is his proposal of geostationary satellite communications ‘Extra-Terrestrial Relays Can Rocket Stations Give World-wide Radio Coverage?’ published in the *Wireless World* magazine in 1945. (<http://inventors.about.com/gi/dynamic/offsite.htm?site=http://www.hq.nasa.gov/office/pao/History/commsat.html>) The aim of the article was showing the possibility of satellite communication which is faster, efficient and covers bigger areas. In the article, Clark discussed geosynchronous earth orbit and the possibility of covering the earth with three satellites. According to the article; the whole world except the polar regions can be covered by three satellites and Clarke illustrates the theory as below:



Source: (*Wireless World*, October 1945, p.306)

Figure 2: Clarke’s illustration of satellite coverage.

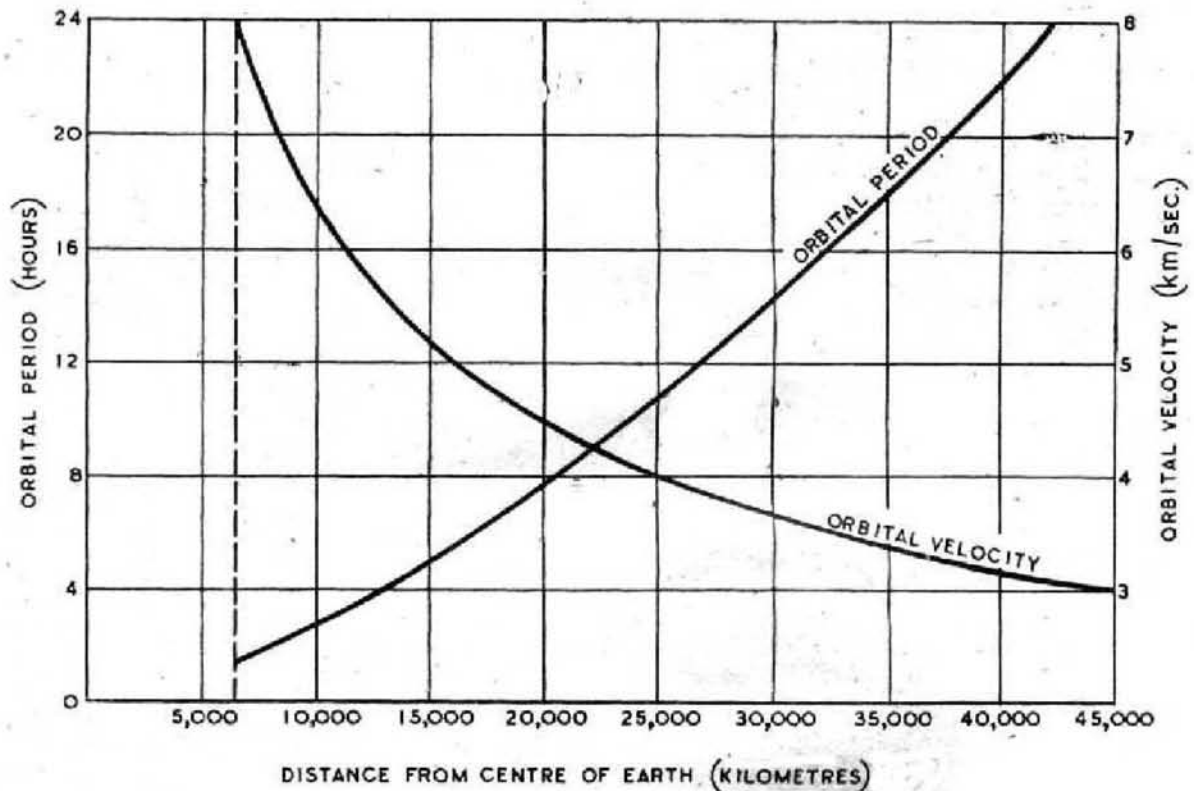
It was also stated that a transmitted signal from the coverage area would be broadcasted to the whole covered zone.



Source: (Wireless World, October 1945, p.306)

Figure 3: Mirroring the signals

The calculations which Clarke had made proved that a satellite in an equatorial circular orbit at a distance of approximately 42,000 km from the center of the earth (the radius of the earth is approximately 6,350 km) which is about 36,000 km above the earth has a period equal to earth's rotation. (<http://lakdiva.org/clarke/1945ww/>) At that point the satellite remains geostationary over the equator which means that the satellite rotates simultaneously with the globe. The following figure which was published in 1945 October issue of the Wireless World magazine shows the orbital period and the orbital velocity regarding the distance from the center of the earth. It can be seen that the distance is about 42,000 km when the orbital period is equal to 24 hours.



Source: (Wireless World, October 1945, p.305)

Figure 4: Orbital Distance – Orbital Period table

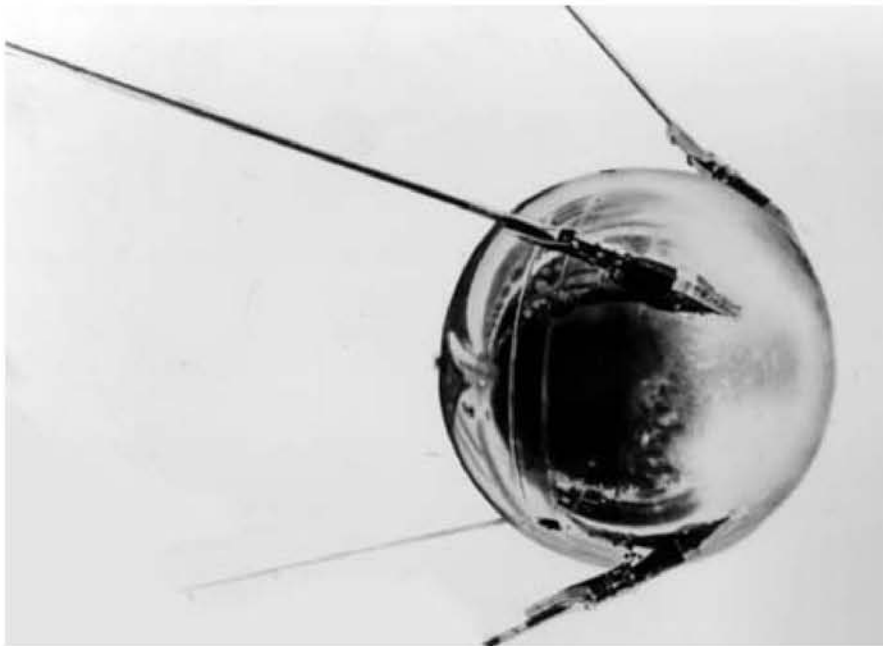
These predictions which Clarke had made were not considered seriously at the time, it was such a science fiction story like 'From the Earth to the Moon' written by Jules Verne in 1865. However the realization of the fiction was a few decades ahead.

5.2. The First Satellites

The Soviet Union successfully launched Sputnik 1 which was the world's first orbital spacecraft on October 4, 1957 from Tyuratam in the Kazakh Republic and started the actual journey into space. It was a 183 pounds aluminum 22-inch sphere with four spring-loaded whip antenna trailing. There was a small radio beacon beeping at regular intervals and verifying exact locations on the earth surface by means of telemetry. It remained in the orbit for three months and fell from the orbit on January 4, 1958. On November 3, 1957; in the following month of the Sputnik 1 launch Sputnik 2 was launched with a dog named Laika in it. Laika became the first known living creature to enter outer space. Sputnik 2 weighed 1,120 pounds and stayed in orbit for almost 200 days.

(<http://www.hq.nasa.gov/office/pao/History/sputnik/sputorig.html>)

(<http://www.hq.nasa.gov/office/pao/History/sputnik/harford.html>)



Source: (www.spacetoday.org)

Figure 5: Sputnik 1



Source: (www.daviddarling.info/images/Laika.jpg)

Figure 6: Laika inside Sputnik 2

United States responded to the Soviets, their arch rival in all competitions, in February 1958 with the launch of Explorer 1. Explorer 1 was carrying a small scientific payload which discovered the magnetic radiation belts around the Earth.

Signal Communication by Orbital Relay (SCORE), the first communication satellite, was launched on December 18, 1958. It was orbited for 12 days and broadcasted a Christmas message from President Eisenhower "Peace on Earth, Good will toward men". The main

purpose of the SCORE project was to prove that an atlas missile could be put into orbit.

Echo 1 was launched on August 12, 1960 by the United States. It was a passive reflector reflecting radiation back to the earth and has no amplification possibilities. There was the thought of passive reflector satellites could be used for communications purposes but it was soon abandoned. (<http://iml.jou.ufl.edu/projects/Fall99/Coffey/HISTORY.HTM>)

Early Bird was the first commercial communications satellite built by the Space and Communications Group of Hughes Aircraft Company for Communications Satellite Corporation (COMSAT). It was launched on April 6, 1965 to the geostationary earth orbit. It was a communication bridge including telephone, television, telegraph and facsimile transmissions between Europe and North America. Point to point communications provided by Early Bird which was soon named Intelsat 1.

(<http://www.boeing.com/defense-space/space/bss/factsheets/376/earlybird/ebird.html>)



Source: (<http://www.boeing.com/defense-space/space/bss/factsheets/376/earlybird/ebird.html>)

Figure 7: Early Bird

Intelsat achieved the near complete Earth coverage except the polar areas. Three geosynchronous satellites were launched to the earth orbit over the Atlantic in 1965, Pacific in 1967, and Indian ocean in 1969.

(<http://iml.jou.ufl.edu/projects/Fall99/Coffey/HISTORY.HTM>)

The first space programs were government supported and done by governmental organizations for national services rather than profit however with the evolution of Intelsat company which was established as an intergovernmental organization commerce and profit became the main apprehensions.

5.3. First Companies

5.3.1. COMSAT

The Communications Satellite Corporation (COMSAT) a private corporation to administer satellite communications for the United States was created in 1962. COMSAT was given responsibility for many activities including the development of a global satellite communications system, the acquisition and maintenance of ground stations around the world, and the development of new satellite technologies. Its shareholders are main communications companies. It is governed by Board of Directors that elected by shareholders and the President of the United States. COMSAT sells and leases satellite routes to private companies and governments around the world for national and international communication. (www.comsatint.com)

5.3.2. INMARSAT

The International Maritime Satellite (Inmarsat) was set up in 1979 under the control of the International Maritime Organization (IMO), a UN body, to regulate a satellite communications network for the maritime community. Inmarsat is the world's first global mobile satellite communications operator aiming to create a self –financing body which would improve maritime communications, assist in solving distress and safety of sea life. Inmarsat has also provided aeronautical and land mobile services. In spite of being a corporate company in 1999, Inmarsat continues its original functions-serving traditional maritime, aeronautical, land and remote area services-, and encounters the requirements of a Global Maritime Distress and Safety System (GMDSS) as established by the IMO. On the other hand Inmarsat builds new opportunities of information technology, telecoms and mobility. (www.inmarsat.com)

5.3.3. EUTELSAT

The European Telecommunications Satellite Organization (Eutelsat) is the first satellite operator in Europe to operate a satellite-based telecommunications infrastructure such as broadcasting television channels to households. Although Eutelsat was established in 1977 as an intergovernmental organization (IGO), currently it is a private company named Eutelsat S.A.

In the beginning the aim of the company was to answer the communications demand in Western Europe however it covered the demands of Central and Eastern Europe, the Middle East, the African continent, and large parts of Asia and the America.

Eutelsat is the major satellite operator in Europe and one of the leading global satellite providers of Fixed Satellite Services (FSS) having 30 satellite launches. (www.eutelsat.com)

5.3.4. INTELSAT

The International Telecommunications Satellite Consortium (INTELSAT) is the world's leading commercial satellite operator. It was formed on the basis of agreements signed by governments and operating entities in 1965. Despite being an intergovernmental organization in the establishment (IGO), it has transferred to a private body in 2001. At the beginning there were 11 participating members then it increased to 80 and by 2001 over 100.

“In fact, Intelsat was first devised to further a developmental program for the technology which called for; an experimental and operational phase in which it is proposed to use one or more satellites to be placed in synchronous orbit in 1965 and succeeding phases employing satellites of types to be determined with the objective of achieving basic global coverage.” (Levy. 1975. p. 658)

The world's first commercial communications satellite Intelsat I (Early Bird) was launched in geostationary orbit above the Atlantic Ocean in April 1965. This satellite has provided TV and voice services. In 1969 the world's first global satellite communications system was completed with the Intelsat III satellite covering the Indian Ocean Region. (www.intelsat.com)

5.4. Satellite Types

Satellites can be divided into five principal types: research, communications, weather, navigational, and applications.

5.4.1. Research Satellites

Research Satellites are used in order to measure important facilities of outer space, such as, magnetic fields, the flux of cosmic rays and micrometeorites, and properties of celestial objects that can not be seen from the earth. Most known research satellites are Hubble Space Telescope, the Compton Gamma-Ray Observatory, the Chandra X-ray Observatory, the Infrared Space Observatory, and the Solar and Heliospheric Observatory. (<http://www.thetech.org/exhibits/online/satellite/3/3e/3e.1.html>)

5.4.2. Weather Satellites

The information about large scale atmospheric conditions is the main usage area of weather or meteorological satellites. Clouds, temperature changes can be observed by means of weather satellites. The first meteorological satellite was launched in 1960. The name of the satellite was Tiros 1 which was transmitting infrared views of the earth's cloud cover. It could also detect the development of hurricanes and chart their paths. The following series nimbus was carrying six cameras for detailed scanning and Itos was able to take night pictures. The weather satellites can transmit visible or ifrared photos, maneuver in the space for maximum coverage. (<http://www.infoplease.com/ce6/sci/A0860930.html>)

5.4.3. Navigational Satellites

The reason for the development of navigation satellites was the need for a navigation system for nuclear submarines. In 1958, US navy established transit program in which a constant signal was provided by transit satellites that helped the aircrafts and ships to determine their positions accurately. The transit system was limited because the coverage of the satellites were small. This limitation resulted the birth of Global Positioning Satellite system which consists of 24 satellites in six different orbital planes and provides 24 hour world wide coverage. It is more accurate than transit system and also information can be obtained 24 hours a day. At least five satelites view provided by GPS system is the reason for high accuracy. Altitude information can be given with GPS system. (<http://www.infoplease.com/ce6/sci/A0860930.html>)

5.4.4. Application Satellites

Application satellites are used to test the satellite systems for improvements. The structure, instrumentation, controls, power supplies and telemetry characteristics of the satellite systems are tested by means of application satellites.

There are some special satellite types used especially for military purposes such as infrared, electronic, optical and other sensors that aid military surveillance. Some of these technologies are being used for civilian use. Commercial remote sensing satellites can give information about the mine, petroleum, forests and crop quantities by means of high resolution photos. (<http://www.infoplease.com/ce6/sci/A0860930.html>)



Source: (Company Presentation)

Figure 8: Remote Sensing Satellite (LEO)

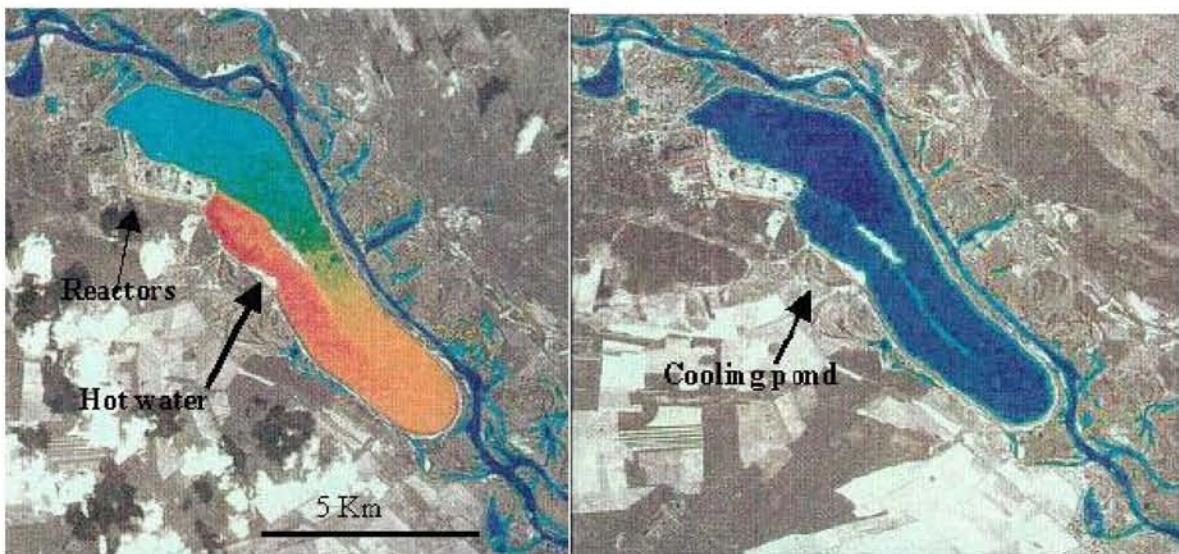
The low earth orbit remote sensing satellites are taking high resolution photos of the earth. The most known project is google earth which shows the high resolution photos of nearly whole world. In recent years this technology became a commercial business after the governments let the civilian use.



Source: (Landsat 5, TIR images)

Figure 9: Satellite Image of Istanbul

Figure 8 is the satellite image of Istanbul. These images are especially used in cartography, geology & exploration, defense & security, agriculture, forestry and environment.



Source: (Landsat 5, TIR images)

Figure 10: Chernobyl Nuclear Reactor Site in Ukraine. Picture (on the left) was taken on 22 April 1986 when the reactor was in normal operation and Picture (on the right) was taken on 8 May 1986 when the reactor was at suspended operation.

5.4.5. Communication Satellites

Communication satellites supplies radio, telephone and television connection. Echo 1, the first communication satellite was a big metal balloon that could send back the radio signals touching it. It was launched in 1960. After this passive version, very soon, an active version including a complex electronic equipment that receives signals from the earth, extends and then sends it to somewhere else. First active communication satellites were Relay 1 and Telstar 1 and launched in 1962. Telstar 1 relayed the first live television broadcast across the Atlantic Ocean. On the other hand Relay and Telstar did not provide a geo synchronic broadcast and that was the key of continuous communication networks. Syncom 3 the first stationary earth satellite launched in 1964 was used to telecast 1964 Olympic Games in Tokyo to United States. This was the first television program crossing over the Pacific Ocean. It depended on three geosynchronous satellites stated symmetrically in the plane of earth's equator. They could cover the whole earth surface. In order to increase the message handling capacity of systems, many other ways were tried. COMSAT launched the first commercial geosynchronous satellite Intelsat 1(generally known as Early Bird) in 1965. Now, network of 29 Intelsat satellites provides immediate communication all over the world. Furthermore, lots of commercial organizations and individual nations orbited lots of communications satellites for their communicational aims. (<http://www.infoplease.com/ce6/sci/A0860930.html>)



Source: (Company Presentation)

Figure 11: Communications Satellite (GEO)

Figure 10 shows a geostationary communications satellite. This is the position of a satellite in the orbit. The right and left antennas are named as East and West according to the areas they cover on earth. The wings are converting solar energy to electrical energy which is used for the electronic devices in the satellite. The life of the satellite is determined by the fuel. The energy gained from the sun does not have any effect on the end of life. the transponders strengthens the signals received from the earth and reflects to the coverage area as unicast, multicast or broadcast signals.

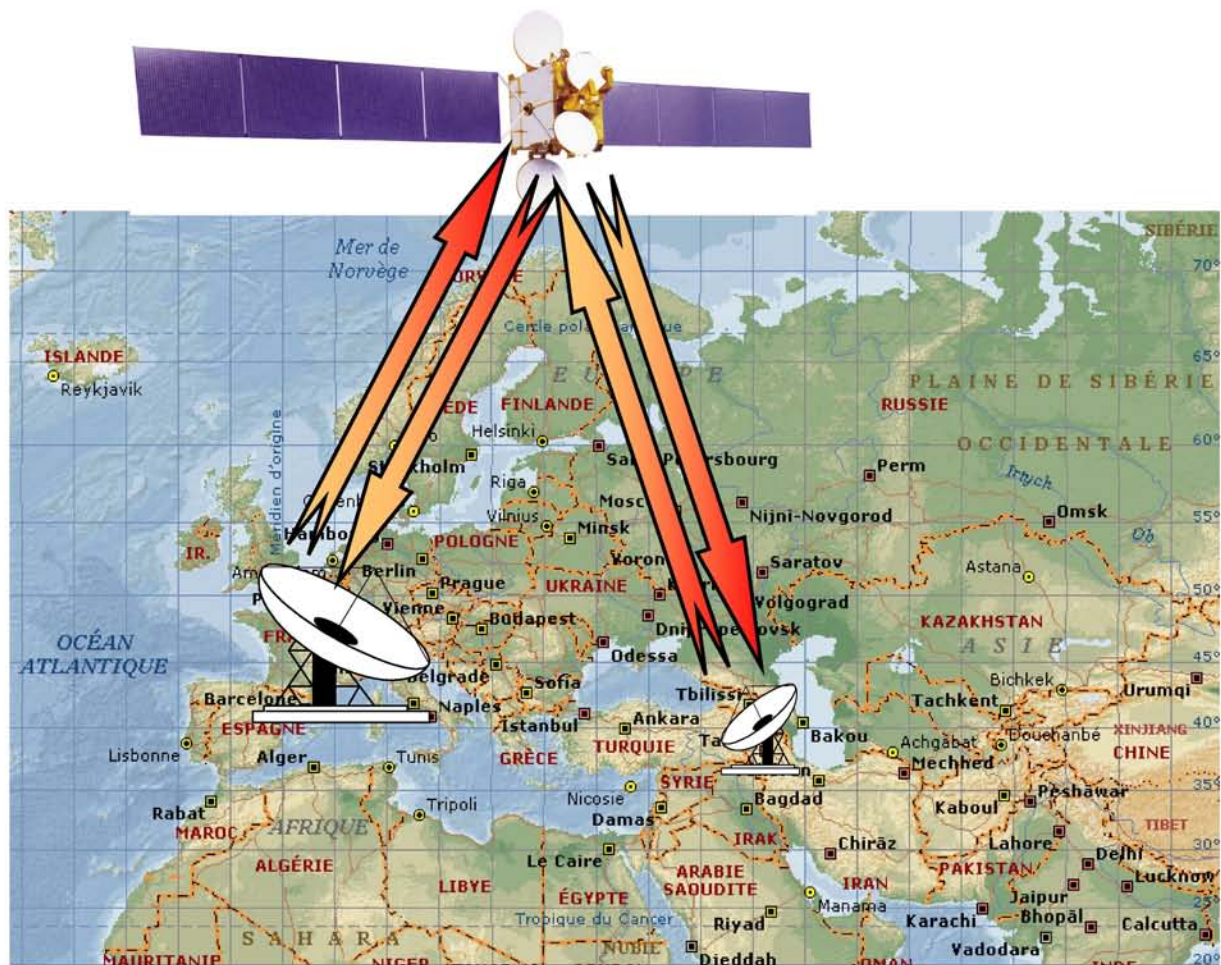


Figure 12: Unicasting (Point to Point)

Figure 11 shows point to point satellite connection in which two locations communicate with each other over satellite. This is generally used in VSAT systems which connect two or more points and provide the whole communication.

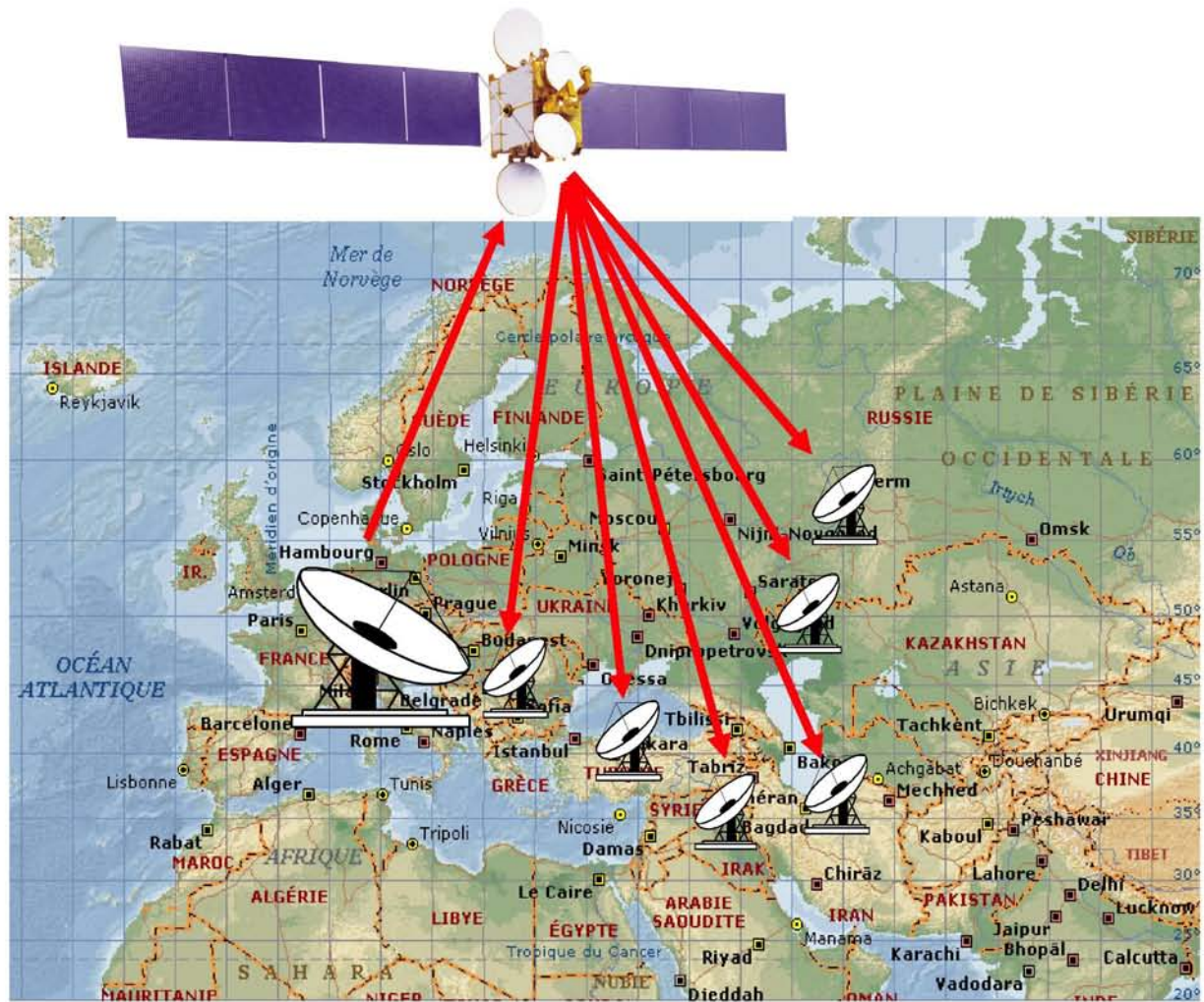


Figure 13: Multicasting

Figure 12 shows multicasting which means sending signals to specific locations. This might be a TV or radio signal which the parts of a unity receive. Internet connection for municipalities might be an example of such a service. Only the points with the receivers or suitable antennas can receive the signals.

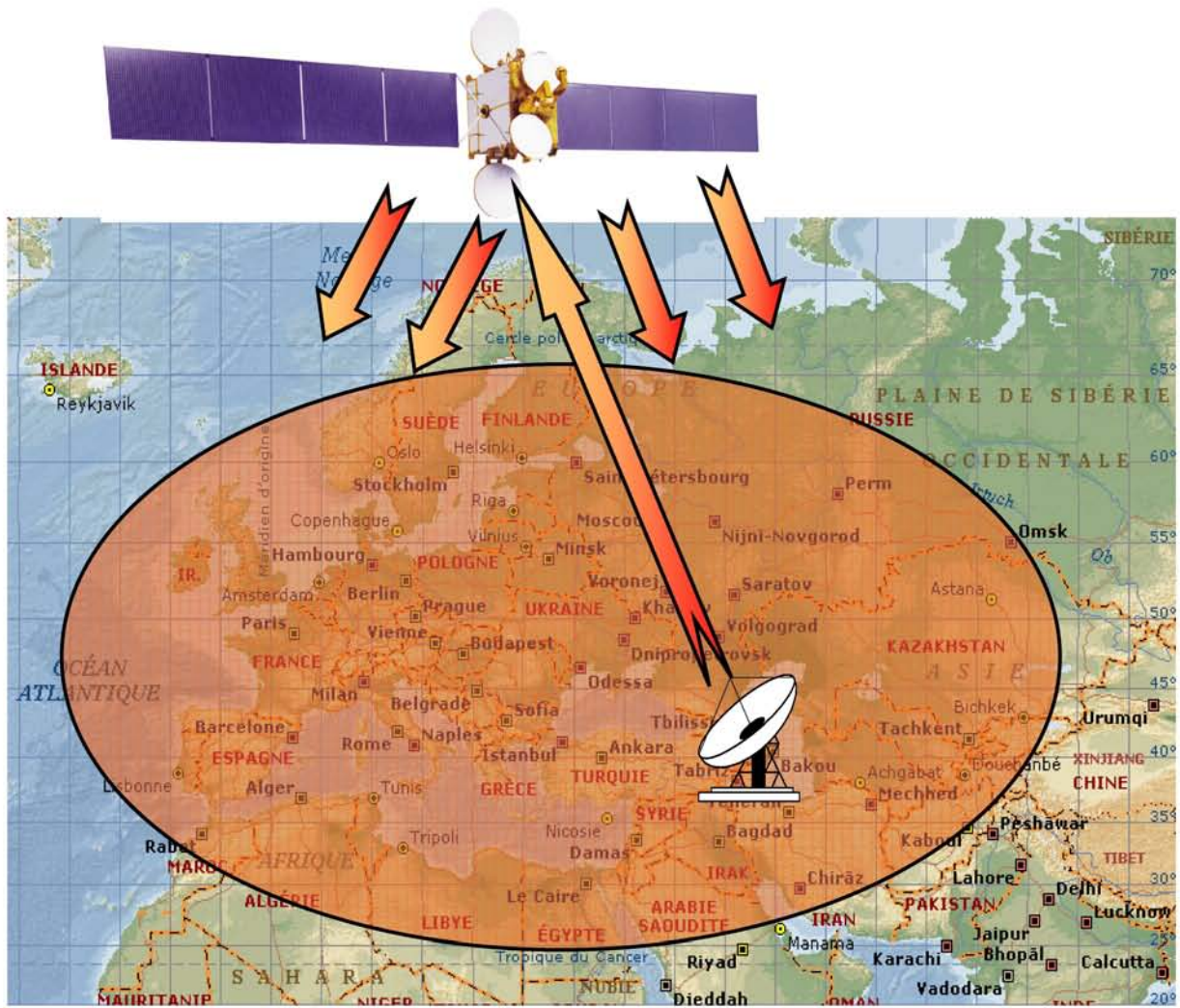


Figure 14: Broadcasting

Figure 13 shows broadcasting which is the common used communication technique. If a signal up linked from the coverage zone than the whole coverage area would receive that downlink.

5.4.6. Fixed Satellite System Services

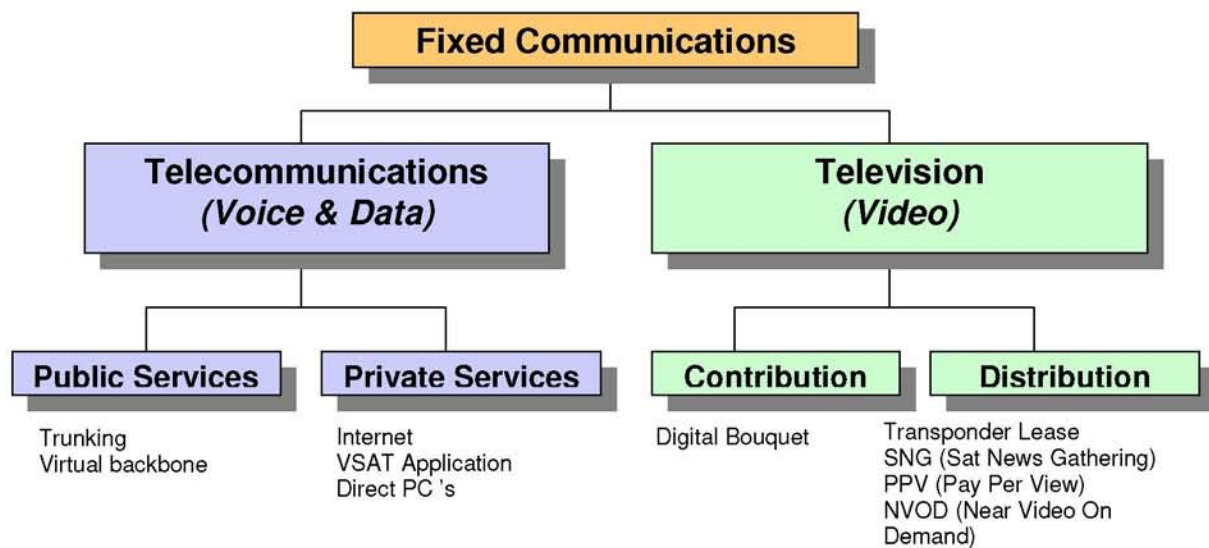


Figure 15: FSS services

The geostationary satellite services are also called the fixed satellite system services because the satellite simultaneously moves with the globe and holds the fixed position. The most important fixed communications service is broadcasting. For broadcasting services, TV channels lease satellite capacity and their shows and programs reach to millions by means of the satellite. The satellite companies also offer occasional use services for TV or radio channels. The occasional use capacity is used for live games, shows or news gathering.

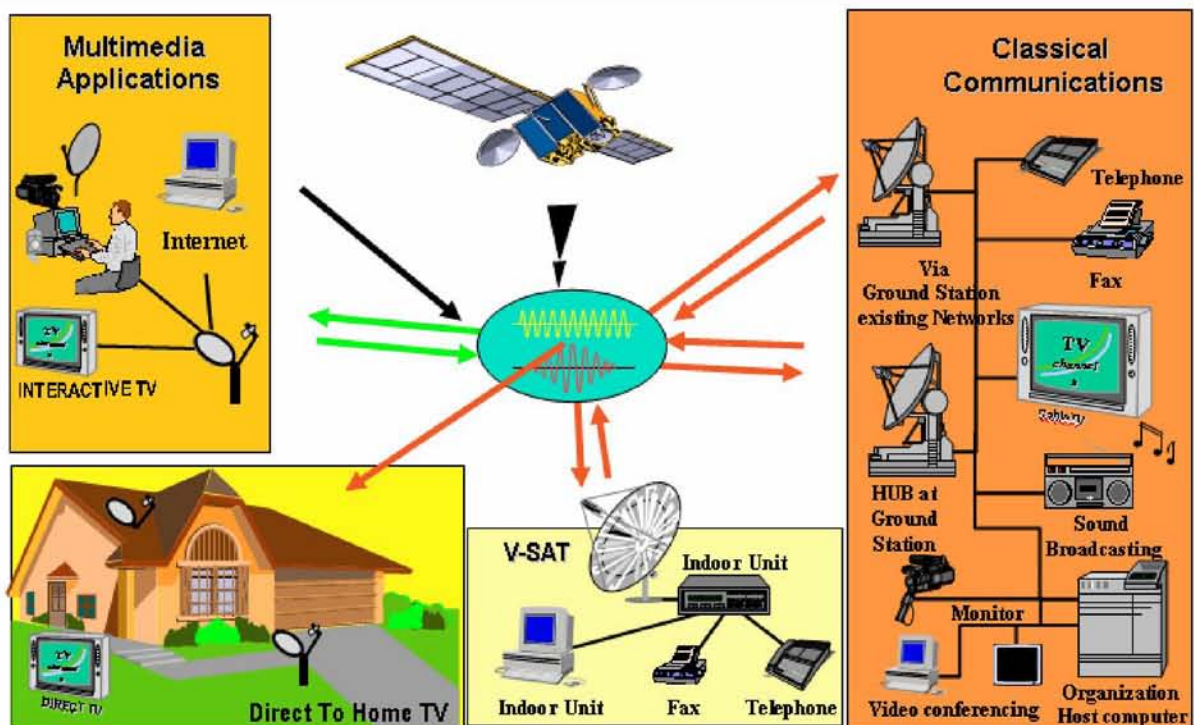
The telecommunications sector is another service market for fixed satellite systems. Voice and data communications provided from Very Small Aperture Terminal (VSAT) networks. Also telephone and internet services would reach to rural areas where the cable connection is expensive or difficult to establish. VSAT is a compatible system, supports the high capacity data transfer and suitable for interactive data applications. The application areas of VSAT are: High Speed Networks (high capacity file transfer and interactive applications), TDMA (Time Division Multiple Access), Banks application (ATM, etc), Connecting LANs, E-mail and EDI (Electronic Data Interchange), Credit Card Confirmation, Fax.

Digital services would be transmitted from fixed satellite systems which has advantage over analog technology by enabling interactive communication opportunities with attractive different applications.

IDR (Intermediate Data Rate) system provides digital voice and data communications in various speeds (from 64 Kbps to 8448 Kbps) adjustable by software without any hardware modifications.

IBS (Intelsat Business Service) has been designed for definite data transfer speed. IBS can be used either for digital data or for voice communications. IBS satellite systems which are not affected by geographical conditions, easy to operate and maintain, so served to the countrywide or countries which require relatively less channel needs and not accessible by conventional communication systems.

For telephone and data communications, IDR and IBS systems have the advantages of digital transmission over analogue transmission techniques. Some of these are: flexibility of digital systems, convenience in maintenance, increased quality and performance at point-to-point, digital transparency in satellite and terrestrial links, the possibility of mutual reception in different receivers, constant transmission quality and cost independence from the distance among the users and high immunity to the disasters.



Source: (Company Presentation)

Figure 16: Illustration of FSS services

Figure 15 shows the general applications provided by fixed satellite systems. The advantages of satellite services are: fast deployment, large coverage, adaptable and scalable solutions, low capital expenditures, complementary to terrestrial network, independent from terrestrial network bottle neck, congestions, damages or default.

5.5. Orbits and Orbital Rights

5.5.1 Orbits

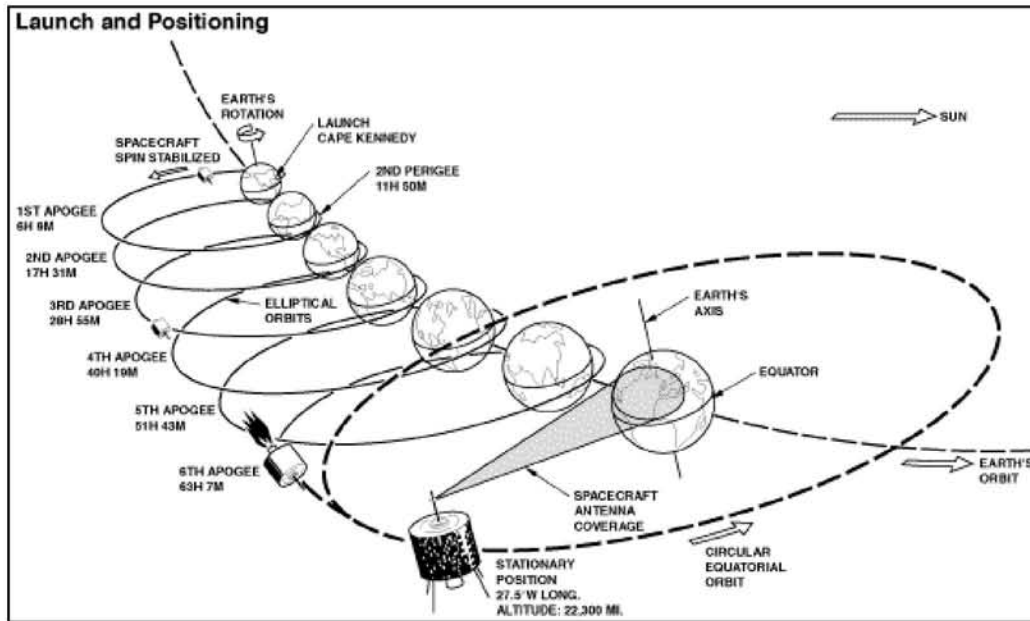
Low Earth Orbit is approximately 300 – 1.500 miles above the earth. The bouncing time for a signal between the earth station and LEO satellite is about 20 to 40 milliseconds. The constellation of LEO satellite systems is costly because a LEO satellite covers much less than a GEO satellite and the system requires more satellites to cover the world. Some LEO systems include more than 200 satellites. LEO satellites are used especially for telecommunication services such as rural conventional telephone service, global mobile service and international broadband service.

(<http://iml.jou.ufl.edu/projects/Fall99/Coffey/LEO.HTM>)

Medium Earth Orbit is approximately 5.000 – 10.000 miles above the earth. The bouncing time for a signal between the earth station and MEO satellite is about 50 to 150 milliseconds. A satellite in Medium Earth Orbit covers more area than a LEO satellite. Medium Earth Orbit Satellites are often used in conjunction with GEO satellite systems.

(<http://iml.jou.ufl.edu/projects/Fall99/Coffey/MEO.HTM>)

Geostationary Earth Orbit is 22.282 miles above the earth. The latency for the geostationary satellite signals is more than LEO and MEO satellites. It is 0.24 seconds (240 milliseconds). Geostationary orbit allows a satellite to turn simultaneously with the globe and hold a fixed position. (<http://iml.jou.ufl.edu/projects/Fall99/Coffey/GEO.HTM>) Under these conditions, the orbit of the satellite coincides with the movement of the earth in such a way that the satellite appears stationary relative to any given point on earth. Such a satellite would be within line of sight of about one-third the area of the globe. Three satellites properly positioned around the equator can provide line-of-sight coverage to all major inhabited areas. (Johnson. 1964. p. 34)

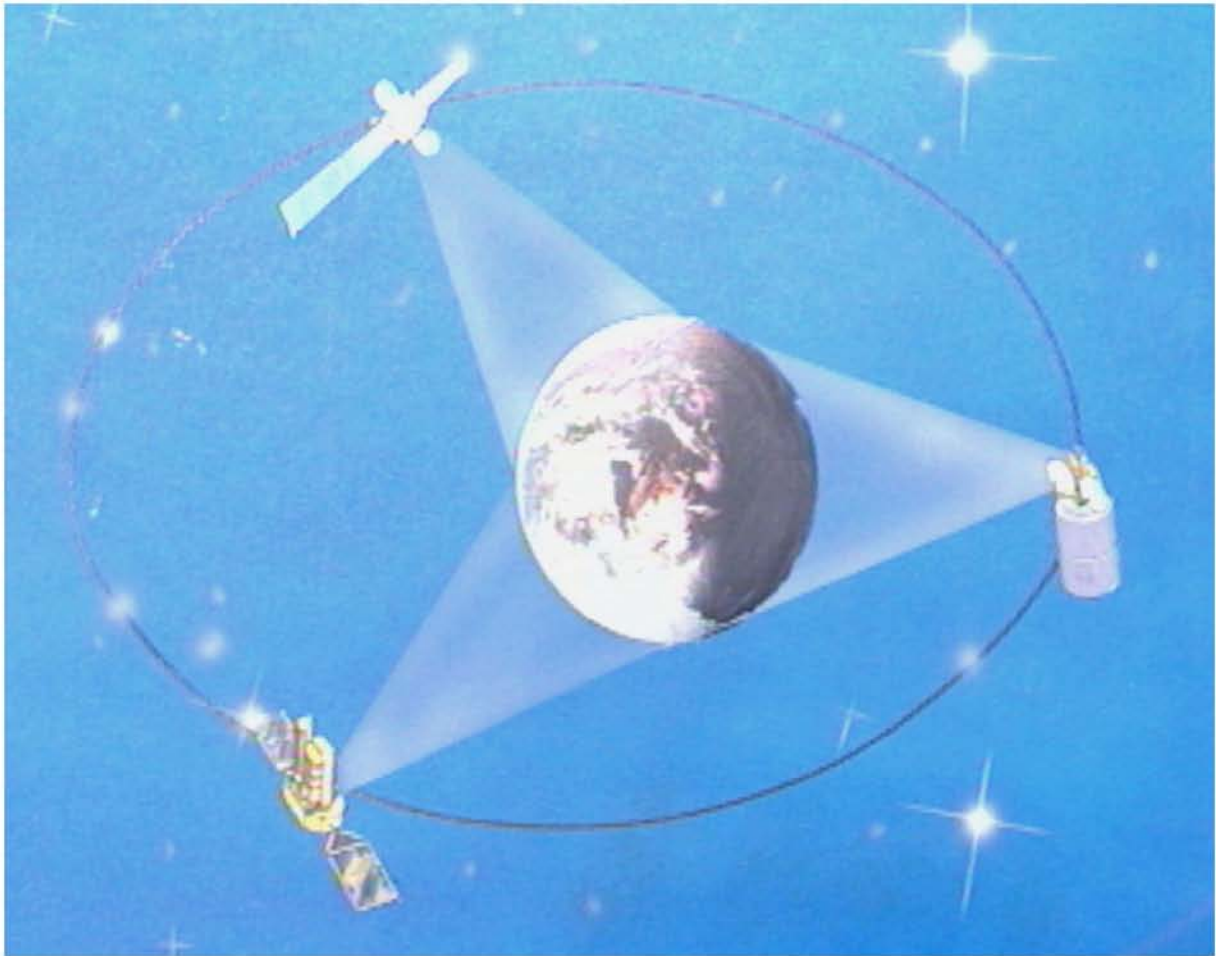


Launch and Positioning

Source: (<http://www.boeing.com/defense-space/space/bss/factsheets/376/earlybird/ebird.html>)

Figure 17: Launch and positioning of a geostationary satellite

The geostationary satellites, as mentioned before, hold the same position over the earth. They have a circular equatorial orbit 36,000 kilometers over the earth and the period of this orbit is equal to the period of the earth's one cycle. Three geostationary satellites can cover the entire world except the poles.



Source: (Company Presentation)

Figure 18: Geostationary satellites covering the world

The advantage of geostationary satellite systems is that the ground stations would stand in a fixed position. Instead of expensive tracking antennas fixed antennas used in the ground station.

Table 1: Orbits

	LEO	MEO	GEO
HEIGHT (miles)	300 – 1.500	5.000 – 10.000	22.282
LATENCY (msec)	20 - 40	50 - 150	240

5.5.2. Frequency Bands

The satellite signals, like TV or radio signals, are using electromagnetic spectrum. The electromagnetic spectrum is the range of electromagnetic radiation from waves of high frequency and short wavelengths to waves of low frequency and long wavelengths. Gamma rays, x-rays, ultraviolet radiation, visible light, infrared radiation, microwaves, and radio waves are included in electromagnetic spectrum. The communication satellites are using micro waves. The frequencies used by satellite systems are divided into bands. The most common bands that satellites use are C, X, Ku and Ka band frequencies. Ku band is the widest among these frequency bands. The original frequency allocation for satellite communication is C band. C band downlinks between 3.7 – 4.2 gigahertz and uplinks between 5.925 – 6.425 gigahertz. The portion of the electromagnetic spectrum that Ku band occupies is 11.7 – 12.7 gigahertz microwave frequencies for downlink and 14 – 14.5 gigahertz frequencies for uplink. Ka band which recently entered to satellite market is between 27.5 – 31 gigahertz for uplink and 18.3 – 18.8 and 19.7 – 20.2 gigahertz for downlink frequencies. (www.tech-faq.com)

5.5.3. Orbital Rights

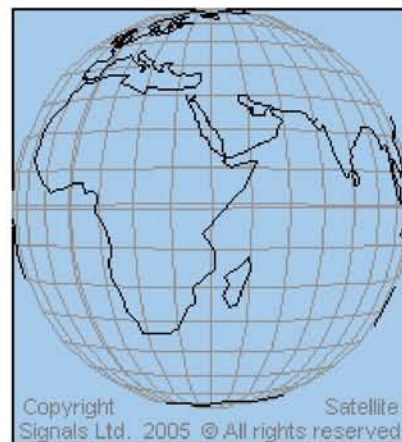
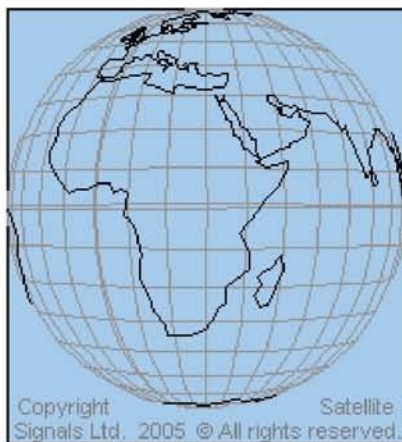
There has to be two degrees between the GEO satellites which uses the same frequency bands. This means that 180 geostationary satellites with the same frequency usage could be parked in the orbit because there are 360 meridian degrees. Otherwise interferences occur between the broadcasts of the satellites. Being on closer orbits for geostationary communication satellites using the same frequency range may cause interferences. Two or more satellites which use different frequencies may share the same orbit and broadcast to the same region. In order not to have such problems space rules and regulations established. The United Nations Agency for information and communication technology International Telecommunication Union (ITU) is the international authority for the orbital rights. ITU organizes the assignment of orbital locations and frequency intervals.

5.5.4. Regulation and ITU

The role of International Telecommunication Union for the satellite business is to manage the frequency spectrum and the orbital locations. The launches and satellite activities are organized according to ITU rules and regulations. The Radio Regulations which ITU prepared apply to the whole frequency spectrum between 9 Kilohertz and 400 Gigahertz. (www.itu.int)

5.6. Communication Satellite Market

The communication satellites had been commercialized with launch of Intelsat 1, the first commercial communications satellite. Because of being a costly technology it is difficult to enter and stay in the market. What are the conditions that a fixed satellite operator would face?



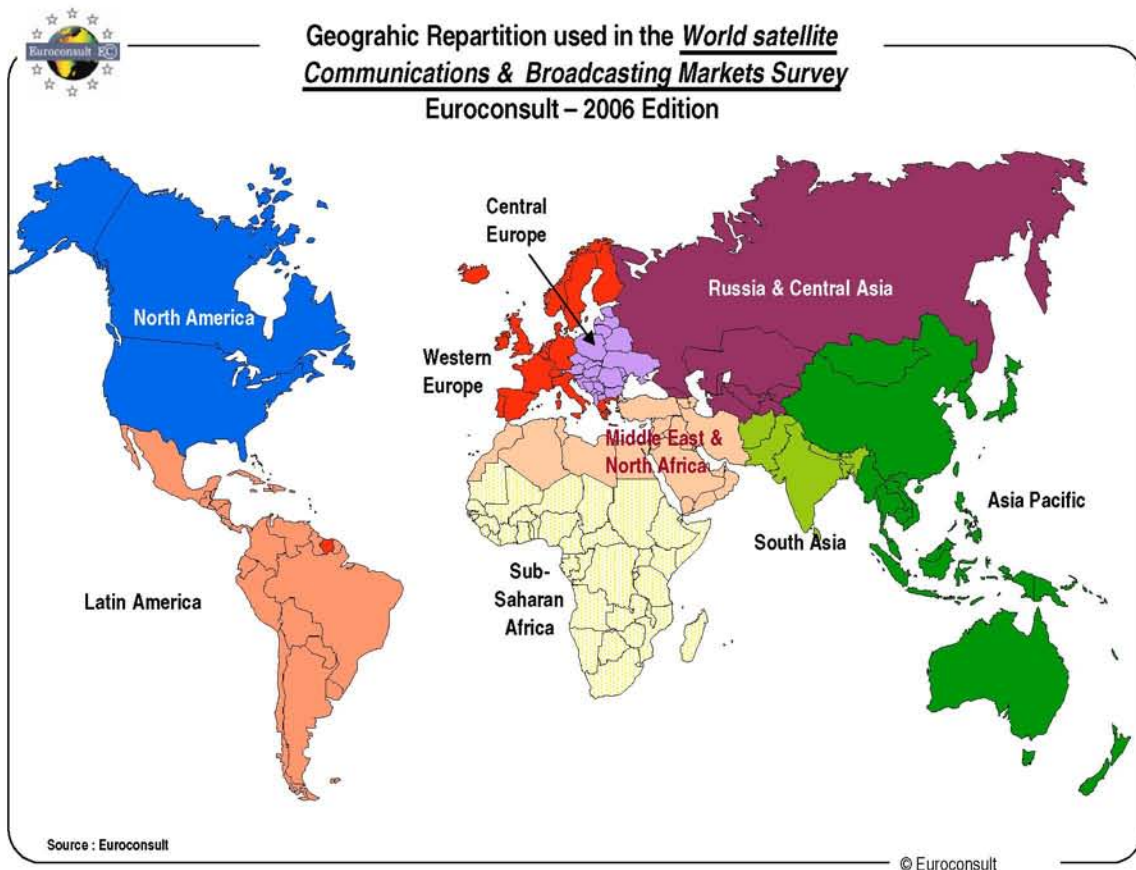
View from above 30 deg east longitude

View from above 40 deg east longitude

Source: (<http://www.satsig.net/maps/satellite-maps-0-50-east-longitude.htm>)

Figures 19-20: World views from geostationary orbits

In the above pictures the parts of the earth seen from the longitudes by the satellites are shown. According to this data a satellite at 30 East can not broadcast to Japan or the United States. In the following analysis the regions which can be seen with Turkey are considered.



Source: (Satellite Communication & Broadcasting Market Survey, Ten Year Outlook, Euroconsult)

Figure 21: Geographic regions

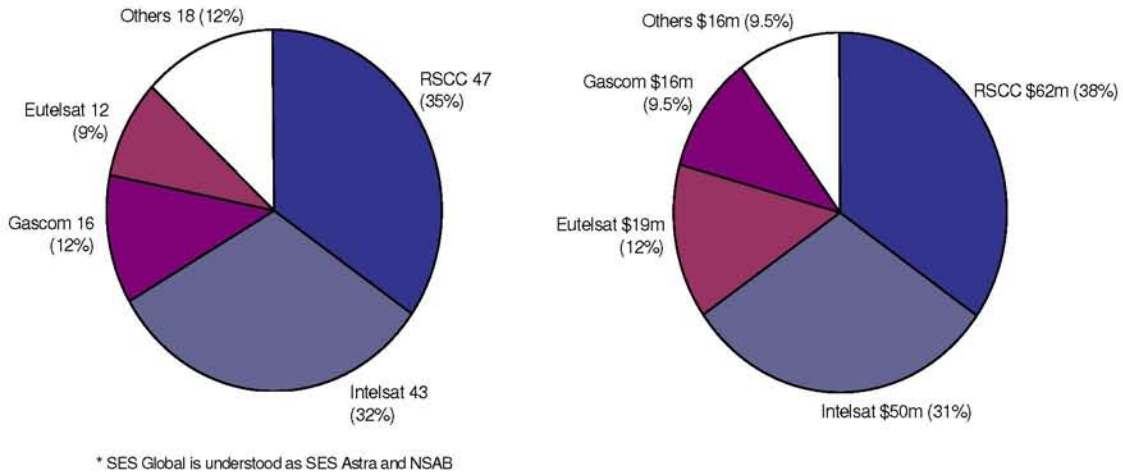
According to figures 18 and 19; a geostationary satellite over Turkey would serve in the close geography including Middle East & North Africa, Russia & Central Asia, Central Europe and Western Europe. In order the calculations and assumptions to be more accurate these geographic regions are included in the sector.



Market Share for Satellite Operators in Russia & Central Asia in 2005

136 transponders used

\$155 million in revenues



© 2006 Euroconsult

Source: (Satellite Communication & Broadcasting Market Survey, Ten Year Outlook, Euroconsult, p.262)

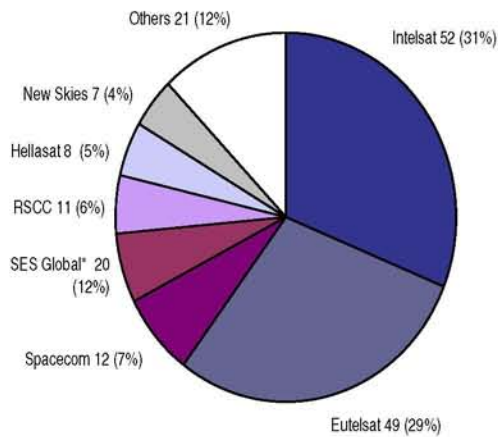
Figure 23: Market share for satellite operators in Russia & Central Asia in 2005

Being a relatively smaller market, Russia & Central Asia region is also penetrated by the global operators however because of having less local operators their portions are higher. The pricing strategies of local and global operators are similar, their market shares and revenues are equally shared. When compared to Middle East & North Africa, the prices are lower in this region because the frequency bands and equipments used by local service providers are different and cheaper technologies. However the global players' prices are more or less the same.

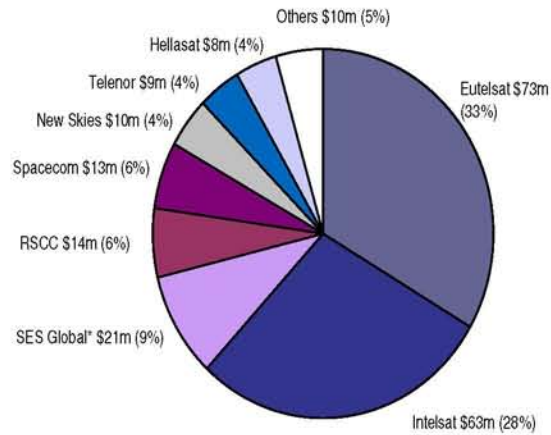


Market Share for Satellite Operators in Central Europe in 2005

167 transponders leased



\$220 million in revenues



* Includes SES Astra and SES Sirius

© 2006 Euroconsult

Source: (Satellite Communication & Broadcasting Market Survey, Ten Year Outlook, Euroconsult, p.252)

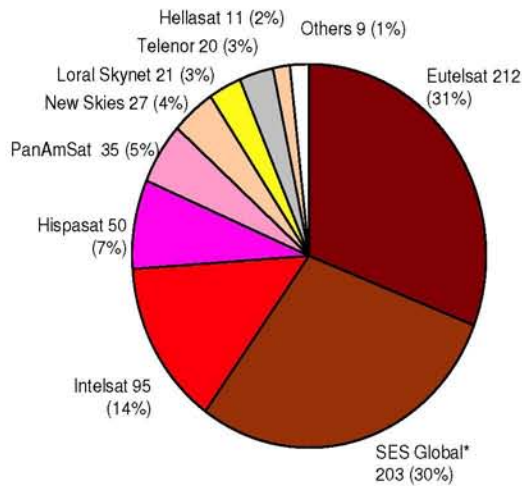
Figure 24: Market share for satellite operators in Central Europe in 2005

Central Europe is dominated by the European global satellite operators. The market shares and revenues are balanced. The satellite usage in this region is similar to Russia & Central Asia.

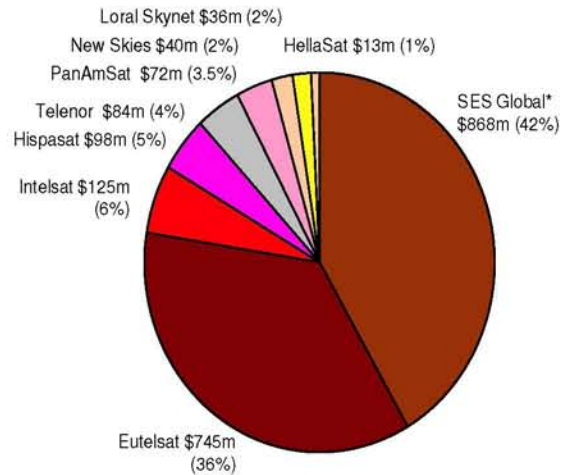


Market Share for Satellite Operators in Western Europe in 2005

683 transponders leased



\$2,083 million in revenues



* Includes SES Astra and SES Sirius

Source: (Satellite Communication & Broadcasting Market Survey, Ten Year Outlook, Euroconsult, p.239)

Figure 25: Market share for satellite operators in Western Europe in 2005

As per market size and the revenue, Western Europe is greater than the total of the previous three markets. The domination of the global operators is seen in this region also. When the revenues are compared with the previous regions the prices of Western Europe is more than twice the other regions. In satellite business the prices are not fixed; supply, demand, competition and other factors affect the capacity leases.

Table 2: Fixed satellite revenues.

<i>REGION</i>	<i>TOTAL NUMBER OF TRANSPONDERS</i>	<i>TOTAL REVENUE (MILLION USD)</i>	<i>REVENUE PER TRANSPONDER (MILLION USD)</i>	<i>REVENUE PER MHZ (THOUSAND USD)</i>
<i>MIDDLE EAST NORTH AFRICA</i>	393	536	1,363	3,155
<i>RUSSIA CENTRAL ASIA</i>	136	155	1,139	2,636
<i>CENTRAL EUROPE</i>	167	220	1,317	3,049
<i>WESTERN EUROPE</i>	683	2.083	3,049	7,059
<i>TOTAL</i>	1.379	2.994	6,868	15,899
<i>AVERAGE</i>	345	748,5	1,717	3,975

Above table shows the revenues per each region and the averages. As mentioned through the chart analysis Western Europe is the biggest and the most expensive market. This is because the satellite technology evolved in the west and later passed to east.

When the average monthly revenue is calculated for a satellite with 1.200 Megahertz capacity with 10% empty to back up failure:

$$1.200 \times 90\% = 1.080 \text{ MHz}$$

$$1.080 \times 3.975 = 4.297.320 \text{ USD/month}$$

$$4.297.320 \times 12 = 51.567.840 \text{ USD/year}$$

The expected life time of a satellite system is approximately 15 years station kept. Than:

$$51.567.840 \times 15 = 773.517.600 \text{ USD}$$

Table 3: Example of Satellite Cost

Amount in million USD		
Item ref.	Baseline Description	Prices
1	First flight Satellite ready for shipment to launch site including all documentation and analysis (excluding In Orbit Performance Payments)	78.30
2	Launch services	101.80
3	Launch Campaign, LEOP and In-Orbit Testing of the Satellite	6.90
4	Risk Management (Launch Insurance package)	41.90
5	Training and services	0.69
6	Upgrade of Satellite Ground Control Centre (Civil Works excluded)	5.41
	Total Price	235.00
7	Incentives Pool Payments (In Orbit Performance Payments)	25.00
	Total Contract Price	260.00

Above table shows the cost for a satellite system in general. When the investment compared to the revenue the profitability of the sector would be seen easily.

Table 4: Transponder Supply – Demand

REGIONS	2006		2008		2010		2012		2014	
	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand	Supply	Demand
	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)	(XPN)
ME&NA	535	430	550	465	520	500	440	535	370	575
C.Asia&Rus	320	160	380	185	350	200	320	230	300	270
C.Europe	300	180	340	205	325	215	280	245	240	255
W.Europe	950	700	1100	750	1000	800	850	850	700	860
Average	526	367	592	401	549	429	472	465	403	490

The table shows the expected transponder supplies and demands for the examined regions. This Euroconsult study also includes the future planned satellite launches. The transponder supply will be at the top at 2008 for the whole market but a dramatic decrease follows. On the other hand transponder demands are increasing. This high yield sector will be insufficient and extra capacity need will occur.

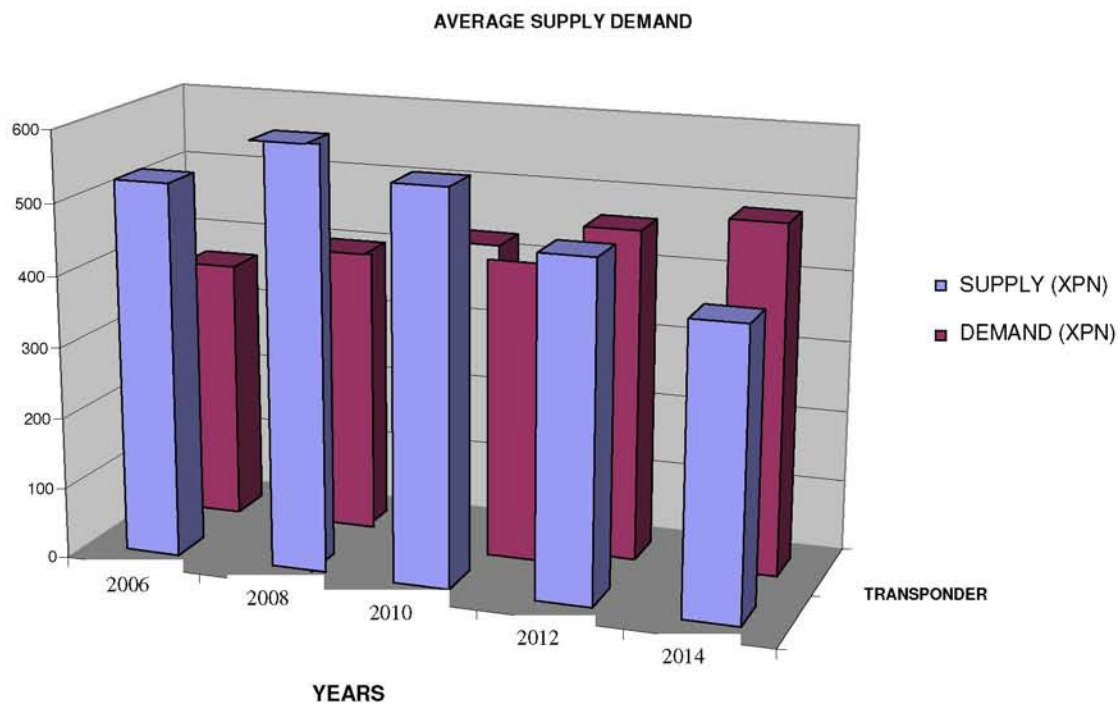


Figure 26: Average supply and demand

This extra demand expectation is another reason to invest in satellite market but satellite business requires huge investment. Than how would the firms finance these huge investments and in addition maximize their profit?

6. FINANCIAL STRATEGIES IN SATELLITE MARKET

The demand side of the space market for satellites and launch services can be divided into two dimensions as vertical and horizontal. The vertical dimension encompasses government procurement, such as Space Agency's sponsorship of domestic satellite and rocket programs of U.S. and the horizontal dimension is more commercial, characterized by a free market without preference for the national firms of the bidding agency. (Wray. 1991 – 1992. p. 467)

Because of being governmental enterprises the first satellites had been financed by governments. Then the company profiles changed as time passed. First, intergovernmental organizations established in order to pursue space and satellite programs then the shares of the governments had been sold to private investors. After these huge sales, preparing and maintaining financial models and strategies had become more crucial than ever. The following years witnessed mergers and acquisitions as a result of intense competition. Some smaller companies were acquired by global operators and in some cases a local company lacking opportunity cooperates with the global operator thereby staying in the market. As mentioned above the regulation institution ITU organizes the frequency and orbital rights and if a company operating on an orbit would leave it empty for a certain period of time then ITU reallocate that slot. In order to keep the possession of the orbital location, the orbit owner and the global satellite operator undersign an agreement. The satellite launched to the orbit is under the name of the orbit owner to protect the orbital rights and employed by the global satellite operator which wants to enhance its market share and enter new markets. Also strategic alliances occur in order to minimize the cost. A satellite operator would joint venture with a producer. This move decreases both capital and operational expenses for the satellite since the whole business steps are achieved by the joint venture. In recent years Initial Public Offerings (IPO) started to be seen in satellite market.

“In sectors such as communications, transportation, and electricity generation, a strategy to minimize the present discounted cost of investment in capacity over a future period must typically be decided upon the presence of growing demand and economies of scale.” (Snow. 1975. p. 621) Minimizing the present discounted cost of investment has to be the main financial investment aim for the satellite operator companies.

The popular financing methods in the satellite market in recent years are recourse credit facilities, project financing, export credit agency or multilateral agency supported credit facilities and manufacturer support. Recent recourse credit facilities have involved large, established, creditworthy, fixed satellite services operators. Satellite project financings have followed traditional principles for project-based structures. From the point of cash flows there has to be reliance on expected revenue from financed project to provide security for and service of project debt. Long-term, non-cancelable transponder lease or capacity agreements with creditworthy lessees are important factors in deciding the creditworthiness of the company. Also the manufacturer and the launch services provider have to be reliable for the performance of the equipments and delivery schedule. The political risk also has to be covered which includes domestic telecommunications authority approvals, international regulatory process, assurance of orbital position and radio frequencies.

Numerous satellite projects have been supported or are currently being considered for support by European and U.S. export credit agencies. These credit agencies are financing local operators experiencing shortages.

Customary payment plan for satellite manufacturers and launch services providers provides that the price is fully payable before launch. Support from manufacturers and providers may take various forms:

- Payment schedule (back loading of installments, deferral post-launch and incentives)

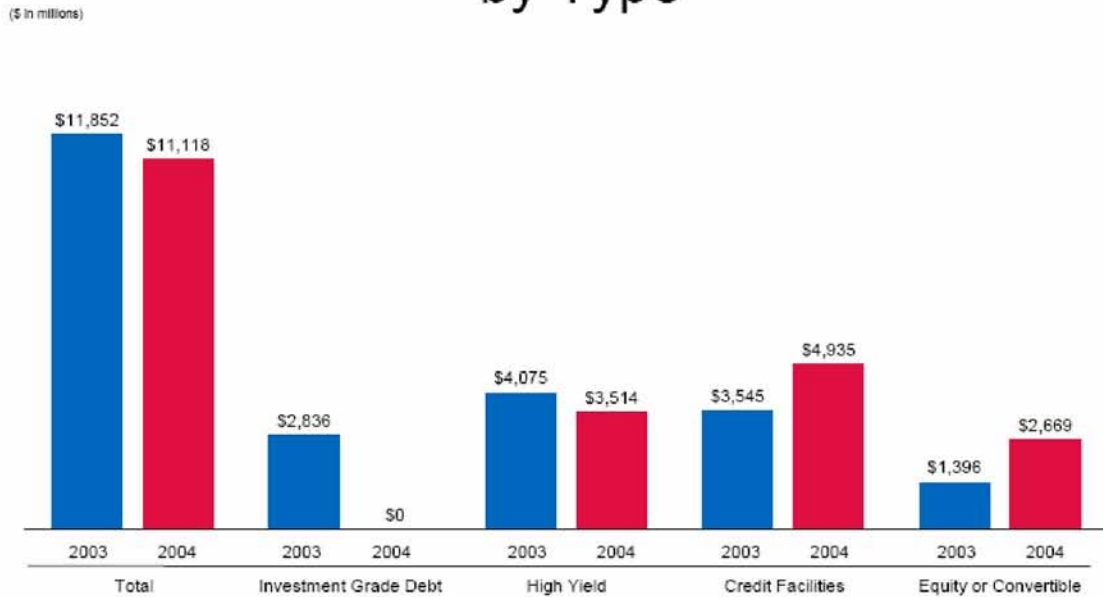
- Vendor financing

- Guarantees

- Ownership interest retention in satellite.

High yield bonds which have high risk of defaulting besides paying high yields have been commonly used in satellite financing in recent years.

2003 vs. 2004 – Major Satellite Financings: by Type



The absence of investment grade debt offerings largely reflected IntelSat's recent non-investment grade status and increased preference for bank credit facilities. Satellite operators opportunistically accessed the reinvigorated equity markets as well.

Source: Trends in Satellite Financing Commercial Space Transportation Advisory Committee

Figure 27: Major satellite financings by type

Figure 27 shows the major satellite financing methods in years 2003 – 2004. High yield bonds and credit facilities are the most popular among the financing types. Nearly 70% of the whole finance had been provided by these two financing tools.

7. CASE STUDY

Because of the confidentiality of the research the name of the company is not mentioned, instead they are represented by letters. The study was adopted according to the satellite companies operating under the laws and the conditions of Turkey.

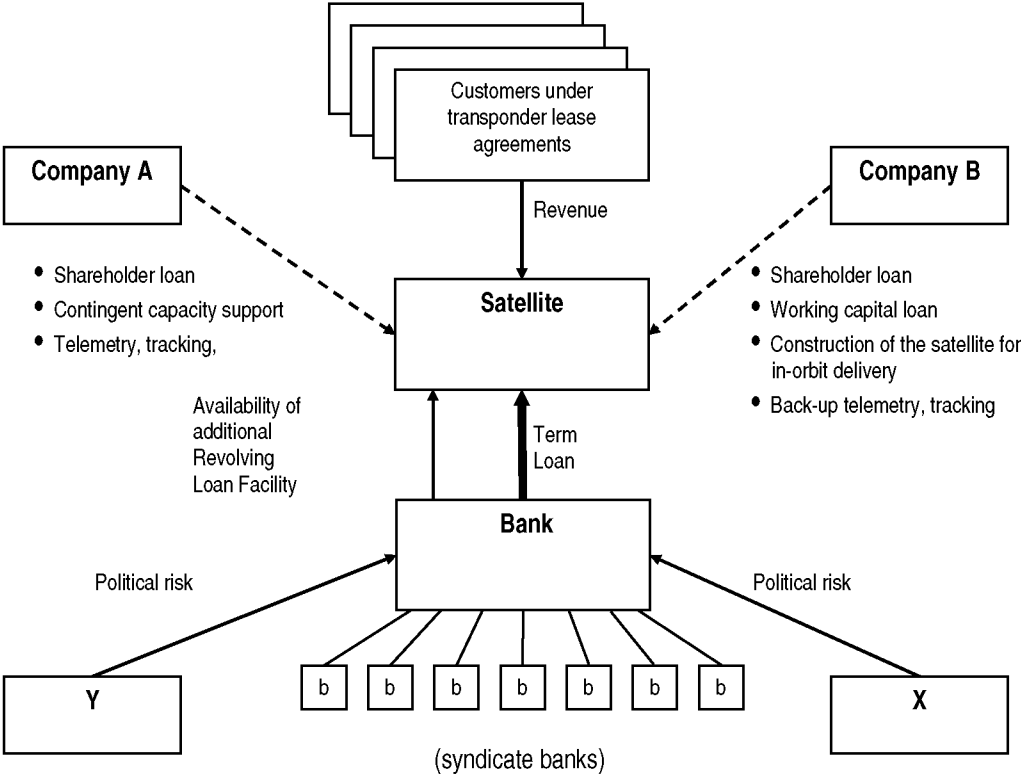


Figure 28: Case study

The mixed financing strategy of a satellite is shown in the above chart. Because the satellite expense is too high the lenders do not provide all the finance needed. Part of the cost is provided by syndicate banks under the representation of a bank because again the value is too huge to be provided by a single lender. The shareholder companies A and B pumps shareholder loans to the project. Since the operator shareholder operates and producer one produces, all the work is done internally, no profit added external costs occur. The company has a satellite at the end of its lifetime having lessees under contracts. Part of the revenue of the old satellite is also included in the financing of the new one. When the new satellite launches and the old one completes its actual life; the customers under transponder lease agreements would be moved to the new satellite. The continuity of the cash flow is increasing

the company’s credit notes. In this case joint venture, debt and equity financing methods are used together to form a working strategy.

Most of the satellite projects have been debt financed; in addition, substantial support from creditworthy shareholders, corporate guarantors or export credit agencies also required. The below tables show the production steps and the prices of a geostationary satellite system for an imaginary project.

Satellite Production Steps and Prices

Table 5: Production Step 1

	TIME	TERMS	(USD)
1	T ₀	Advance payment (3%)	\$ 4.275.000
2	T ₀ - 3 Months	System PDR (3%)	\$ 4.275.000
3	T ₀ - 4 Months	System Data Package Delivery (15%)	\$ 21.375.000
4	T ₀ - 7 Months	Antenna System PDR (7%)	\$ 9.975.000
5	T ₀ - 9 Months	Integration of system and equipments (3%)	\$ 4.275.000

In the beginning, at T₀, contractor takes advance payment. Second payment is made for preliminary design review. System data package delivery and integration of system and equipments realized in the first nine months for 44.175.000 USD.

Table 6: Production Step 2

	TIME	TERMS	(USD)
6	T ₀ - 11 Months	Antenna System CDR (3%)	\$ 4.275.000
7	T ₀ - 13 Months	System CDR (3%)	\$ 4.275.000
8	T ₀ - 14 Months	Antenna System FDR (3%)	\$ 4.275.000
9	T ₀ - 15 Months	System FDR (3%)	\$ 4.275.000
10	T ₀ - 16 Months	SM/CM Equalization (3%)	\$ 4.275.000
11	T ₀ - 17 Months	Thermal Vacuum Tests (4%)	\$ 5.700.000
12	T ₀ - 17 Months	Vibration Tests (4%)	\$ 5.700.000
13	T ₀ - 18 Months	Ground Segment PAR (7%)	\$ 9.975.000

Critical and final design reviews of antenna and systems are made till fifteenth month. The tests made before eighteenth month. 42.750.000 USD is required according to the sample production schedule for the second step.

Table 7: Production Step 3

	TIME	TERMS	(USD)
14	T ₀ - 20 Months	Satellite FMCR/SRR (3%)	\$ 4.275.000
15	T ₀ - 22 Months	Satellite Launch (20%)	\$ 28.500.000
16	T ₀ - 24 Months	IOAR (4%)	\$ 5.700.000
17	IOAR-End of life	Performance Payments (12%)	\$ 17.100.000

In the third step satellite and monitoring control systems requirements provided and than the launch happens. Finally in orbit acceptance review is done and the production process ends. The expense of the third step is 55.575.000 USD. 125.400.000 USD, the total production price for the satellite is paid fragmentary as the steps go ahead. Performance payments are done month to month in orbit life time of the satellite. It can be counted a type of insurance because in case of a partial failure the owner has the right to cut down the same amount of the payment.

Table 8: Insurance

	TIME	TERMS	(USD)
17	T ₀ - 5 Months	Pre-launch insurance	\$ 64.000
18	T ₀ - 17Months	Pre-launch insurance	\$ 89.000
19	L - L+1	Launch and 1. step	\$ 21.318.000
20	L+1 - L+2	In orbit 2. step (Start-up)	\$ 3.563.000
21	L+2 - L+3	In orbit 3. Step (Supplementary)	\$ 4.275.000
22	T ₀ - L+3	Broker Commission	\$ 1.465.000
TOTAL			\$ 156.174.000

Hence operating a satellite is a costly business the insurance should be in progress in case a failure happens within this high tech sector. Once unlike the similar technologies on earth there is no chance to recover a failure on a satellite since most of the communication satellites are 36.000 kilometers away. This makes satellite communications a risky business and the insurance concept is one of the musts of this sector.

Expected Revenues

As mentioned in the previous chapters average cost of 1 MHz capacity is 3.975 USD. The fullness ratio of a satellite is 90% which is equal to 1.167 MHz in this case. 10% of the satellite is held empty in order to back up any failure. If the whole 1.167 MHz is leased than the expected revenue equals to:

Table 9: Expected Revenues

YEAR	REVENUE
2008	\$ 55.665.000
2009	\$ 55.665.000
2010	\$ 55.665.000
2011	\$ 55.665.000
2012	\$ 55.665.000
2013	\$ 55.665.000
2014	\$ 55.665.000
2015	\$ 58.815.000
2016	\$ 58.815.000
2017	\$ 58.815.000
2018	\$ 58.815.000
2019	\$ 60.285.000
2020	\$ 60.285.000
2021	\$ 60.285.000
2022	\$ 60.285.000
STATION KEPT TOTAL	\$ 866.055.000
2023	\$ 1.450.000
2024	\$ 1.812.500
2025	\$ 1.812.500
INCLINED TOTAL	\$ 5.075.000
TOTAL	\$ 871.130.000

Revenue increase of 5,6 % in 2015 and 2,5 % in 2019 assumed. When the station kept life ends the inclination angle of the satellite starts to increase because the north south maneuvers over the satellite which consume most of the fuel omitted. In the inclined phase different services such as data transfers would be done but their costs are very low compared to TV or radio broadcasting. A total of 871.130.000 USD revenue is expected with the 90% fullness ratio which means all of the utilizable capacity is totally leased.

Operational Expense

The operational expenses such as the salaries of the employees or the ground segment operation costs would be:

Table 10: Operational Expenses.

YEAR	EXPENSE
2008	\$ 12.000.000
2009	\$ 12.000.000
2010	\$ 12.000.000
2011	\$ 12.000.000
2012	\$ 12.000.000
2013	\$ 12.000.000
2014	\$ 12.000.000
2015	\$ 14.000.000
2016	\$ 14.000.000
2017	\$ 14.000.000
2018	\$14.000.000
2019	\$ 14.000.000
2020	\$ 14.000.000
2021	\$ 14.000.000
2022	\$ 14.000.000
STATION KEPT TOTAL	\$ 196.000.000
2023	\$ 2.500.000
2024	\$ 2.500.000
2025	\$ 2.500.000
INCLINED TOTAL	\$ 7.500.000
TOTAL	\$ 203.500.000

A 16% increase in 2015 assumed regarding the increasing revenue. The expenses also decrease in the inclined phase and a total of 203.500.000 USD operational expense calculated.

Insurance Payments

Launch and first step insurance costs between 17 – 20% of the production expense of the satellite systems and 2,5% - 3% for the following years. The total insurance payments equal to 48.942.662 USD.

Table 11: Insurance Payments.

SATELLITE INSUARANCE PAYMENTS (USD)			
YEARS	NET VALUE	INSUARANCE PREMIUM	TOTAL
2008	\$ 142.500.000	17,0%	\$ 22.783.413
2009	\$ 132.533.333	2,5%	\$ 3.562.500
2010	\$ 123.066.667	3,0%	\$ 4.275.000
2011	\$ 113.600.000	2,5%	\$ 2.840.000
2012	\$ 104.133.333	2,5%	\$ 2.603.333
2013	\$ 94.666.667	2,5%	\$ 2.366.667
2014	\$ 85.200.000	2,5%	\$ 2.130.000
2015	\$ 75.733.333	2,5%	\$ 1.893.333
2016	\$ 66.266.667	2,5%	\$ 1.656.667
2017	\$ 56.800.000	2,5%	\$ 1.420.000
2018	\$ 47.333.333	2,5%	\$ 1.183.333
2019	\$ 37.866.667	2,5%	\$ 946.667
2020	\$ 28.400.000	2,5%	\$ 710.000
2021	\$ 18.933.333	2,5%	\$ 473.333
2022	\$ 9.466.667	1,0%	\$ 98.415
TOTAL			\$ 48.942.662

Table 12: Total Investment Expense.

TERMS	PAYMENT
ADVANCE PAYMENT	\$ 4.275.000
SYSTEM PDR	\$ 4.275.000
SYSTEM DATA PACKAGE DELIVERY	\$ 21.375.000
ANTENNA SYSTEM PDR	\$ 9.975.000
INTEGRATION OF SYSTEM AND EQUIPMENTS	\$ 4.275.000
ANTENNA SYSTEM CDR	\$ 4.275.000
SYSTEM CDR	\$ 4.275.000
ANTENNA SYSTEM FDR	\$ 4.275.000
SYSTEM FDR	\$ 4.275.000
SM/CM EQUALIZATION	\$ 4.275.000
THERMAL VACUUM TESTS	\$ 5.700.000
VIBRATION TESTS	\$ 5.700.000
GROUND SEGMENT PAR	\$ 9.975.000
SATELLITE FMCR/SRR	\$ 4.275.000
SATELLITE LAUNCH	\$ 28.500.000
IOAR	\$ 5.700.000
TOTAL	\$ 125.400.000
PERFORMANS PAYMENTS POOL	\$ 17.100.000
TOTAL	\$ 142.500.000

In the total expense calculation, performance payments are taken into account. When performance payments are added on to the production prices the total project price becomes 142.500.000 USD from which the payment percentages are calculated.

The following table shows the total expenses and revenues. There would be an income doubling the expenses if the satellite operates with full performance at the end of the lifetime.

Table 13: Expenses & Revenues

END OF LIFE	15 YEARS IN ORBIT + 3 YEARS INCLINED
CAPACITY	24 TRANSPONDERS/ 1296 MHZ
EXPECTED REVENUE	871,1 MILLION USD
OPEX	203,5 MILLION USD
INSUARANCE	48,9 MILLION USD
TT&C AND BACK-UP TT&C EXPENSES	30 MILLION USD
MAINTENANCE	10,5 MILLION USD
15 + 3 YEARS NET CASH FLOW	578,2 MILLION USD
INVESTMENT	142,5 MILLION USD
EXPECTED PROFIT	435,7 MILLION USD

As per the above tables and analysis; the geostationary satellite business is profitable and returns are very high compared to other sectors. However because the production and operations are costly it is also difficult to enter and stay. Above assumptions are made according to a company in the sector because a new comer may not fill all the leasable capacity.

Equity Financing

In order to find the opportunity cost of equity financing, the interest yield of the production price and the start up insurance payment was calculated as an alternative investment method. In the two years time, the production length, the investment raised to 170.393.000 USD and the interest return is 14.219.000 USD. This amount is the opportunity cost of equity financing.

Table 14: Opportunity Cost

TERMS	EXCHANGE RATE	INTEREST RATE	INTEREST	
			(000 YTL)	(000 USD)
ADVANCE PAYMENT	1,38	0,17	7.870	5.711
SYSTEM PDR	1,47	0,15	7.934	5.397
SYSTEM DATA PACKAGE DELIVERY	1,47	0,15	39.277	26.719
ANTENNA SYSTEM PDR	1,47	0,14	17.571	11.953
INTEGRATION OF SYSTEM AND EQUIPMENTS	1,47	0,13	7.305	4.970
ANTENNA SYSTEM CDR	1,47	0,13	7.169	4.877
SYSTEM CDR	1,47	0,12	6.976	4.745
ANTENNA SYSTEM FDR	1,50	0,12	7.049	4.703
SYSTEM FDR	1,50	0,11	6.937	4.628
SM/CM EQUALIZATION	1,50	0,11	6.878	4.589
THERMAL VACUUM TESTS	1,50	0,11	9.093	6.066
VIBRATION TESTS	1,50	0,11	9.093	6.066
GROUND SEGMENT PAR	1,50	0,10	15.700	10.474
SATELLITE FMCR/SRR	1,50	0,10	6.622	4.418
SATELLITE LAUNCH	1,50	0,09	42.722	28.928
IOAR	1,50	0,09	8.544	5.700
PRE-LAUNCH INSUARANCE	1,38	0,16	116	84
PRE-LAUNCH INSUARANCE	1,47	0,14	158	108
LAUNCH AND 1. STEP	1,50	0,09	32.675	21.798
IN ORBIT 2. STEP (START-UP)	1,52	0,08	5.014	3.299
IN ORBIT 3. STEP (SUPPLEMENTARY)	1,53	0,08	5.608	3.665
BROKER COMMISSION	1,50	0,09	2.246	1.498
TOTAL COST				170.393
FINANCING COST				14.219

If the company chooses other financing strategies than the opportunity cost would be saved. In order to make a better comparison the cost of debt financing calculated at the below table. When the required finance is provided with debt than the payments which are made twice in a year are as follows:

Table 15: Debt Financing

	CAPITAL PAYMENT	INTEREST PAYMENT	TOTAL PAYMENT
2007 NOVEMBER	\$ 7.808.684	\$ 1.061.973	\$ 8.870.657
2008 MAY	\$ 13.181.058	\$ 1.586.550	\$ 14.767.608
2008 NOVEMBER	\$ 13.637.085	\$ 1.553.481	\$ 15.190.566
2009 MAY	\$ 13.637.085	\$ 1.245.210	\$ 14.882.295
2009 NOVEMBER	\$ 13.637.085	\$ 818.646	\$ 14.456.731
2010 MAY	\$ 13.637.085	\$ 595.566	\$ 14.233.651
2010 NOVEMBER	\$ 15.448.700	\$ 518.646	\$ 15.967.346
2011 MAY	\$ 15.698.890	\$ 284.778	\$ 15.983.668
2011 NOVEMBER	\$ 12.372.078	\$ 193.171	\$ 12.565.250
2012 MAY	\$ 12.372.078	\$ 148.464	\$ 12.521.542
2012 NOVEMBER	\$ 12.372.078	\$ 134.988	\$ 12.507.066
2013 MAY	\$ 12.372.078	\$ 515.686	\$ 12.886.765
TOTAL	\$ 156.174.985	\$ 8.656.160	\$ 164.830.146

The sum of the interest payments at the end of six years is 8.656.160 USD. The difference between the costs of each method occurs just the same at the total costs. The same amount of investments result in different total costs.

Table 16: Financing Comparison

(USD)	EQUITY FINANCING	DEBT FINANCING
TOTAL COST	\$ 170.393.286	\$ 164.830.146
INVESTMENT COST	\$ 156.173.673	\$ 156.173.673
FINANCING COST	\$ 14.219.613	\$ 8.656.473
FINANCING COST (%)	4,55 %	1,58 %

When the result examined than the advantage of debt financing over equity financing would easily be seen under the conditions of Turkey. The cost of debt financing is 1,58% while the cost of equity financing is 4,55%.



Figure 29: Debt Financing – Equity Financing comparison

8. CONCLUSION

Satellite investment is huge and the equities are limited. The equity capital for a such huge cost high tech investment which requires technical information is the know how provided by the company. The intellectual investment is the prerequisite because financing tools needed after these scientific and technologic improvements. If there is no information and technology than no finance is required. According to the study; it would be better for companies to prefer debt financing in their satellite investments rather than equity financing however the problem is that the amount required is huge and if the company does not have adequate cash flow than the lenders would not be willing to loan. The responsibility of the investor company is to advance in their areas and to convince the leaser with a reasonable business plan. The pecking order theorem is acceptable in this situation because internal finance is insufficient and debt is preferred. On the other hand according to Modigliani – Miller theorem internal and external finance do not have any difference however in satellite business because of the huge cost the only choice becomes external finance. Because the market is imperfect company looks for the optimum debt structure in order not to harm the intellectual capital. Also when there were enough equities high interest rates in Turkey is a reason for external finance because international leaser's rates are lower. In order to invest equity might be used for interest yield which is more than the interest expense of the leased capital. This is not practible in perfect market conditions however the market is not perfect and Modigliani – Miller theorem is not applicable because it is valid under perfect market conditions which do not exist. The satellite operator companies has to use debt finance rather than equity in Turkey market conditions in order to maximize their profits.

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