

# MediaGlobe

## Executive Summary

Watch What You Want,  
Whenever You Want.....



## INTRODUCTION

Television is the single most important mass media and has become an integral part of our society. There are more than a Billion television households worldwide, but users are generally not satisfied with the programme offerings. Despite the increasing number of available television channels there are inherent limitations in the way television is delivered to the users today. Television today means “passive” consumption of

service offers in the Direct-To-Home multimedia broadcasting arena.

All the elements of MediaGlobe’s end-to-end system have been analysed, from the market analysis to the preliminary design of all aspects. This includes the mission architecture, the business plan, the marketing strategy and implementation plan, as well as system implementation and verification plan.



*STAR Inc. is a new small company specialised in end-to-end space based services. It puts together the MediaGlobe business case, presented in this document, and presents it to a group of potential investors. The employees of STAR Inc. are delegated from several major space companies and agencies.*

*If you are interested in the MediaGlobe project please contact STAR Inc. for further details.*

*Delft, 2 July 1998*

real-time programmes. The user is confronted with several hundred simultaneously transmitted programmes out of which he may choose the one he likes more at any moment in time. He has no further control over the programmes unless he records them with his video-recorder.

The MediaGlobe project will change this situation and revolutionise the way we watch television. It will enable television users to watch the programme they want at the moment they want and put them in full control. This proposal shows how MediaGlobe will introduce innovative services in the field of satellite broadcasting and deliver them to end-users. It also explains the creative approach MediaGlobe proposes to take with respect to the traditional broadcasting value chain.

The MediaGlobe case as presented in this proposal is a financially viable business opportunity for broadcasters and investors and satisfies the need of the end-users with a unique

The MediaGlobe Final Proposal is comprised of the following Volumes:

- Volume I Executive Summary
- Volume II Technical Proposal
- Volume III Management and Financial Proposal
- Volume IV Appendices

This Executive Summary presents an overview of the topics that are covered in the remaining volumes, namely:

- Market analysis and marketing strategy
- Technical solution
- System implementation and verification
- Business and financial plan

## MEDIAGLOBE OVERVIEW

MediaGlobe provides an innovative multimedia broadcasting service that is based on a new information distribution concept. This incorporates the effective exploitation of de-facto standards for multimedia data transport (DVB/MPEG2), space based communication system and end-user equipment.

The services offered by MediaGlobe are centred on the “store and play” idea. The data broadcast via satellite are received and stored in the dedicated end-user equipment to be re-played at the users’ convenience, therefore offering a level of flexibility and convenience to the end-user that is unique.

The end-users can select the information they wish to receive among a wide range of data:

- News, sports and selected television programmes
- Movies

- Software and data in general (Web Pages etc.)

The selection can be done via the Electronic Programming Guide or a custom user profile available through the MediaGlobe integrated end-user equipment. The data are then “pushed” (via satellite broadcasting) to the user equipment and locally stored for successive view.

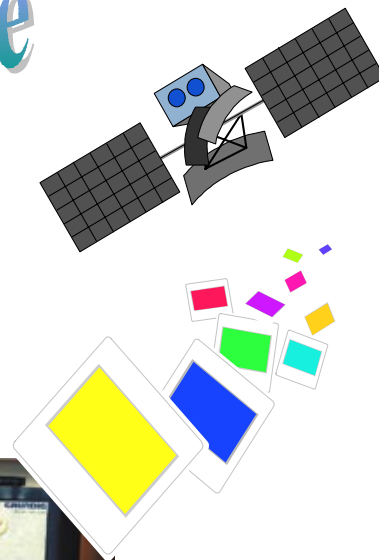
The non real-time broadcasting concept allows transmission of time-compressed data, decreasing the time to access the bouquet of information available to the user. This approach addresses the communication capabilities from a commercial viewpoint.

MediaGlobe offers to its customer (large and small broadcaster, data providers) a “global” opportunity through a single access point.

The MediaGlobe space segment consists of a constellation of three geo-stationary satellites covering three selected areas in Europe (Central and South), Asia-Pacific (Japan, Korea and part of China) and the Eastern North America). The satellites are connected via high capacity inter-

# MediaGlobe

## Watch What You Want, Whenever You Want .....



satellite links allowing the transfer of data from one of the three selected areas to any of the others, so as to improve the geographical penetration on the market of local broadcasters and data providers and to take full advantage of the Direct-To-Home broadcasting market growth.

The use of on-board multiplexing capabilities will allow local data providers to up-link their data to the spacecraft via simple and economic dedicated station, increasing the range of potential customers that would be otherwise excluded from the satellite broadcasting market.

The MediaGlobe system uses a Ku-Band up-link/down-link to take advantage of existing technology and to address a selected niche of the Direct-To-Home market that is expected to reach up to 38 Millions households in Europe by 2002.

The end-user equipment consists of a standard satellite dish (60 cm diameter), a DVB compatible integrated receiver decoder (IRD), i.e. standard digital DTH equipment, plus a MediaGlobe Storage and Ordering Box (SOB) that can be expanded with a PC interface card allowing transfer and storage of relevant data (software, web pages, etc.) directly on the user's PC.

The total cost of the end-user equipment shall be in the order of \$ 500.

The market analysis has identified a niche market of digital DTH households represented by the pay-TV users. This market segment is growing steadily and is expected to reach in 2002 some 25 million users over a total DTH households of about 38 million (Europe).

The target penetration for MediaGlobe in the European region at start of service is estimated at 5% and it is planned to grow up to 20% in about 4-5 years. On the basis of these figures MediaGlobe plans to establish a pricing policy to achieve a cost-per-view ranging from the free view (live/non real-time broadcasting of news and selected programs) up to about \$ 2.5 for the top "seller" movies.

The end-user equipment shall be offered under a rental agreement at a price of \$ 9 per month.

After 2 years the equipment becomes the property of the user and no monthly fee is paid any longer.

The competitive advantage of MediaGlobe is based on the following factors:

- Being the first service provider introducing a radically new concept of watching TV or, more generally, of "using" information content: watch or use what you want, when you want and as long as you want.
- Beating the competition on innovation and appropriate selection of the time to market: the major competitors (in Europe: SES-ASTRA, EUTELSAT, Canal Plus, Pro-Sieben Digital Media) are still focusing their marketing approach towards traditional TV broadcasting (including the pay-TV). They are still tightly linked and committed to their traditional partners and therefore unprepared to react in a timely, aggressive manner.
- Building an industrial team including major players in the multimedia broadcasting arena that are sufficiently close to either end of the value chain so as to benefit directly of the profits generated by the MediaGlobe services: TV/Information content providers, video distributors, end-user equipment manufacturers.
- Offering to the end-user a faster and convenient access to their preferred data, with higher quality (nearly SDTV quality, up to 2 Mbps for the videos) and at cheaper costs (average monthly cost for the user in the order of \$ 17 per month compared to around \$ 30 per month from the competitors).

STAR Inc. aims through MediaGlobe at becoming a major player as a multimedia broadcasting service provider with a strong commitment to the customers' satisfaction and service excellence.

## **THE STAR COMPANY**

STAR Inc. is the “virtual” company founded by the 18 participants of the Master of Space System Engineering Programme.

**Our Vision Statement:** To be the customer's first choice for innovative multimedia information broadcasting services.

**Our Goal:** To understand the needs and satisfy the requirements of our customers and end-users to maximise our mutual profits. Our success lies in our commitment to customer's satisfaction.

### **Company Profile – STAR Inc.**

- At the forefront of the innovative DVB based multimedia broadcasting service providers.
- A premier provider of advanced wireless DVB and multimedia Internet services for about 30 million customers in Europe, Middle and Eastern Asia and Northern America.

- Performs the first trials in the world wireless communications service industry in the field of the on-line flexible on demand DVB multimedia services and expects to launch this commercial service on a broad scale in 2002.
- Conducts business centred around the principles of service excellence, integrity, sincerity, honesty and productivity.
- Operates a constellation of three GEO communications satellites and the necessary ground infrastructure.
- Continues the R&D activities in space sciences, engineering sciences and information and computing sciences.

STAR Inc. launches the MediaGlobe mission aiming to become a major player as a multimedia broadcasting service provider in three selected geographical areas (Europe, Middle and Eastern Asia and Eastern North America) by offering MPEG-2/DVB based services. These services will include attractive bouquets of selected Standards Digital TV (SDTV) channels and also introduce new services such as “virtual” Video-On-Demand, information broadcasting based on the push technology and High Definition Digital Television (HDTV) broadcasting to home and business users.

## Background

STAR Inc. is an international joint venture founded in Delft, The Netherlands, in September 1997 by 18 young professionals specialising in aerospace engineering and related fields and participating in the Space System Engineering Master Programme – SpaceTech 97/98.

The team experience covers the major functions associated with the different phases of the telecommunications system development and its operation maintenance throughout all phases in order to meet the customer demands.

The participants come from some of the major European and Indonesian companies, agencies and universities, namely:

- ALENIA Aerospazio
- CNES (Centre Nationale d' Etudes Spatiales)
- DASA (Daimler Benz Aerospace)
- DASA / Dornier Satellitensysteme GmbH
- DLR (Deutsches Zentrum für Luft- und Raumfahrt)

- ESA (European Space Agency)
- EUMETSAT (EUropean organisation for the exploitation of METeorological SATellites)
- TELESPAZIO
- IKI (Space Research Institute of the Russian Academy of Sciences)
- PT-Telkom Indonesia
- TU Delft (Delft University of Technology)

STAR Inc. is supported by the mother companies, thus ensuring the availability of a broad range of proven expertise in the area of space systems design, development and operation. However, STAR Inc. offers the advantages and efficiency of a small company founded on the basis of the principle of lean management and committed to submit profitable services/business through fitting customers' needs and requirements due to the advantages of space based communications systems and contemporary technologies.



Daimler-Benz Aerospace



## **THE MEDIAGLOBE CONCEPT**

### **What is MediaGlobe?**

MediaGlobe will be the first to offer new TV and information broadcasting services where the home user has full control over the contents. This will change the way people watch television in the future. MediaGlobe is a modern satellite broadcasting system for delivering high volumes of digital contents to home users equipped with a simple and compact dish antenna terminal with high volume data storage.

### **Which services?**

MediaGlobe will deliver individual contents to home users with a quality and cost never achieved before. MediaGlobe will offer to its subscribers a personalised home videotheque and information store, which is dynamically updated according to their specific profiles and wishes. At any point in time users will be able to chose among hundreds of movies, live events, and thematic programmes which are part of the individual user's videotheque and stored on the users' MediaGlobe terminals. As for a traditional video-recorder the user is in full control of the selected contents.

MediaGlobe will also provide Intranet broadcasting services to DTO<sup>1</sup> and SOHO<sup>2</sup> users. Typical applications are business information services, software distribution and catalogue updates to closed user groups.

### **To whom is it devoted?**

Through MediaGlobe, broadcasters and information service providers will expand their service offerings and reach new customers. On behalf of their partners MediaGlobe will offer "television and information on demand" services to millions of users in three parts of the world<sup>3</sup>.

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<sup>1</sup> Direct-to-Office

<sup>2</sup> Small Office Home Office

<sup>3</sup> high gross national product areas on three continents (Eastern Asia-Pacific, Western Europe, Eastern North America)

### **How does it work?**

The MediaGlobe system comprises three geo-stationary satellites, each of which will cover one of the three service areas (see figure below). Broadcasters and information providers send their contents to the respective MediaGlobe multiplex-and up-link stations where the programme suite is assembled and up-linked to the satellite. Each MediaGlobe satellite broadcasts thousands of video and information contents to millions of users in its service area. The video data is continuously received by the MediaGlobe terminal and stored depending on individual pre-selection or automatically according to the individual user profile. The user has full control over the stored contents and from this selection of videos and TV programmes he can view what he wants and when he wants<sup>4</sup>. The user will be charged per view and will receive his bill from MediaGlobe for the usage of contents over a given period. The ordering and billing functions are implemented through terrestrial lines (toll-free) to the local MediaGlobe service centre.

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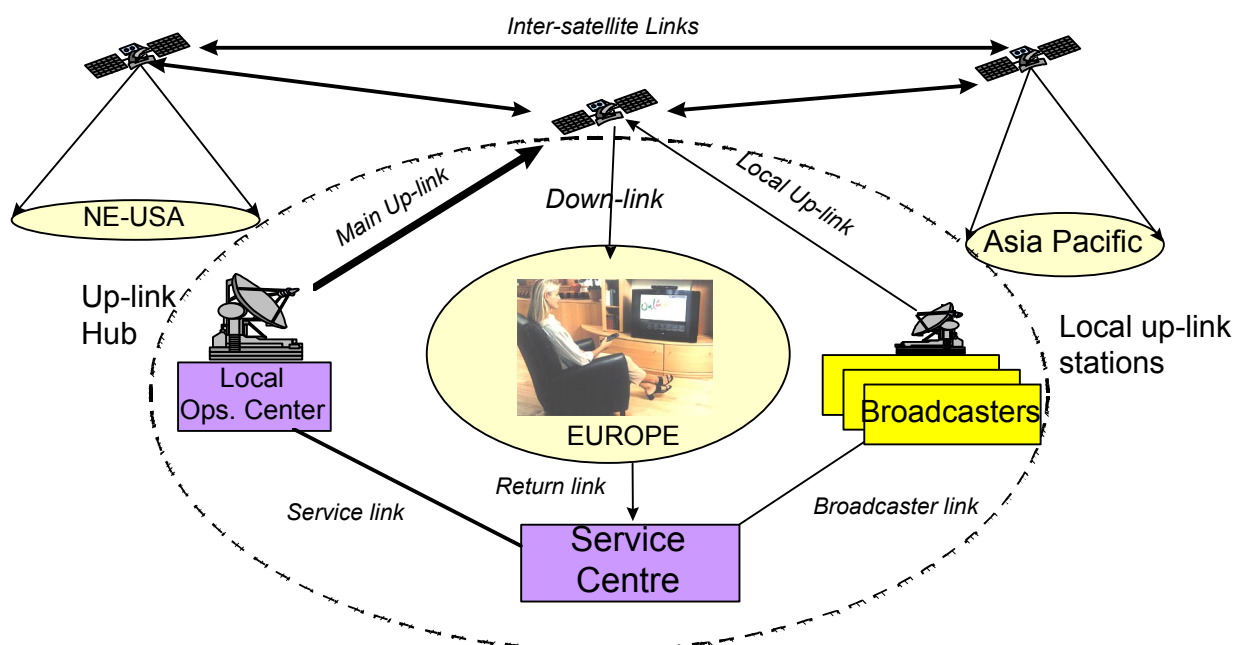
<sup>4</sup> The same applies for PC users for the data services.

The MediaGlobe satellites are interconnected via inter-satellite links in order to allow direct transmission of contents to users in all three continents without the need for dedicated contribution links.

Each satellite also has a number of on-board multiplexers, which allow small broadcasters to access directly the MediaGlobe satellites using small Earth stations. No dedicated communication links to the multiplex and up-link station is required which will allow for further cost savings and which makes the MediaGlobe broadcasting very attractive to its partners.

### When MediaGlobe?

MediaGlobe services will be introduced in 2002 when MediaGlobe terminals with large data storage will be readily available. With its new approach to television services MediaGlobe will be first to the market, and will capture an increasing share in the emerging Pay-TV markets.



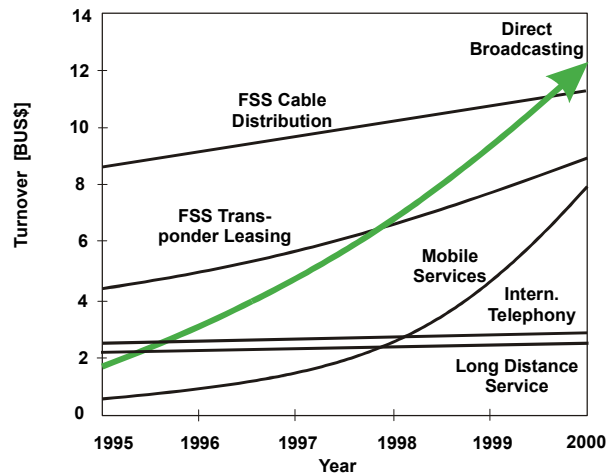
## MEDIAGLOBE MARKET

### GLOBAL GROWTH IN TELECOMMUNICATION SERVICES

Because of the strong trend towards Direct-To-Home satellite services, combined with the change from analogue to digital services, MediaGlobe has chosen to target the prospective digital Direct-To-Home Pay-TV markets in Western Europe, Asia Pacific and North America.

The global Direct-To-Home market is rapidly expanding with an annual subscriber growth rate of 37 %. For the year 2000 more than 30 million subscribers are predicted world-wide. The revenues are expected to grow up to \$ 12 Billion. In parallel, the cost of the required user equipment decreases, thus making these services globally affordable and available. This creates a high growth perspective for new multimedia applications like telebanking, homeshopping and interactive television.

The most promising growth regions are Western Europe, Eastern North America and Asia Pacific. In Europe there are two strong competitors: SES ASTRA and Eutelsat. Their revenues are high, and there is sufficient room for another 'regional'

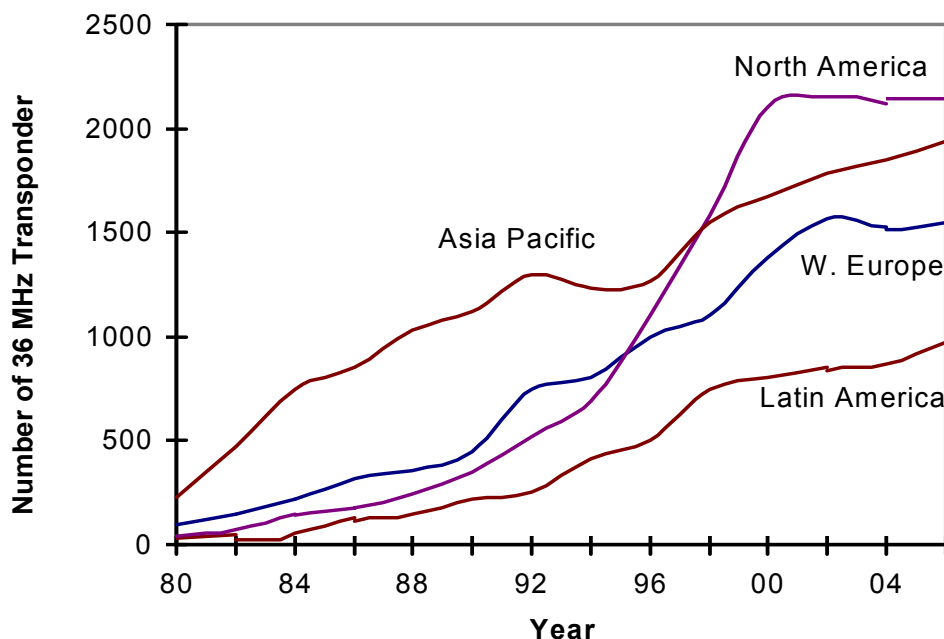


*Growth Predictions in Telecommunications Services: the Direct-To-Home market is the most promising (Source: Euroconsult 1998)*

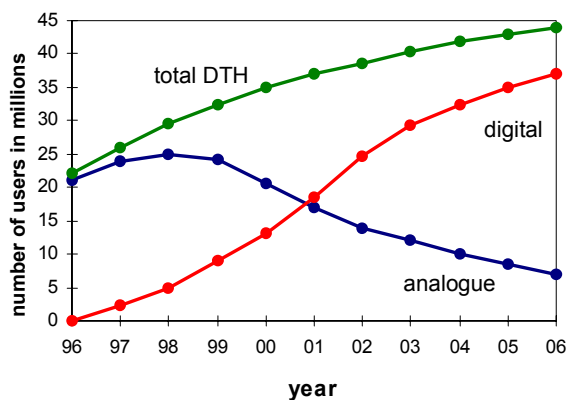
player. Other providers mainly aim at national markets. The Direct-To-Home market penetration is 19% of the total number of TV homes, and has strong growth potential. In particular Germany, Spain and Italy show high growth potential in Pay-TV subscribers.

North America is a highly competitive market with respect to Direct-To-Home services (the overall penetration is 5%). This is especially true for the Pay-TV sector.

The Asia Pacific region contains a large number



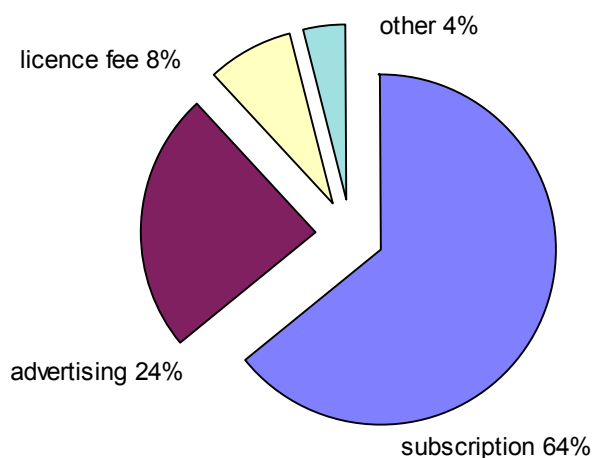
*The most promising markets for Direct-To-Home services are Europe, North America and Asia Pacific. Although the number of transponders seems to be reaching a plateau after 2000, the number of channels will still increase as the number of channels per transponder increases. (Source: Euroconsult)*



*MediaGlobe follows the trend toward digital Direct-To-Home broadcasting, taking the opportunity to offer an innovative TV-On-Demand service (Source: CIT Research).*

of broadcasters, mainly because of the variety of cultures. Since the region is composed of thousands of islands, Direct-To-Home broadcasting has a very large growth potential. This is enhanced by the current process of deregulation. Even the recent regression did not have a strong impact on the growth predictions.

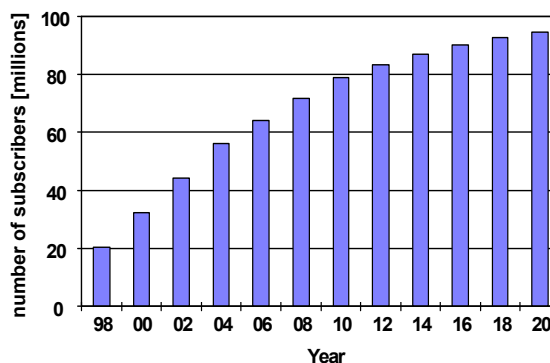
Today's television is mainly dominated by analogue transmissions. Ongoing technological progress introduces the application of digital broadcasting. This increases the transponder capacity by a factor of six. Hence, broadcasters are migrating steadily towards digital transmissions. By 2006, the number of digital TV users is expected to have increased dramatically while the analogue users will virtually have faded away.



*From the revenue sources for Digital Broadcasting market in Europe, Pay-TV (64 %) clearly has the most perspective (Source: CIT Research)*

## THE PAY-TV MARKET

The Digital Video Broadcasting market generates revenues via subscriptions, advertising and license fees from public service broadcasters. From these, the subscription fee, with 64%, is the largest: Pay-TV.

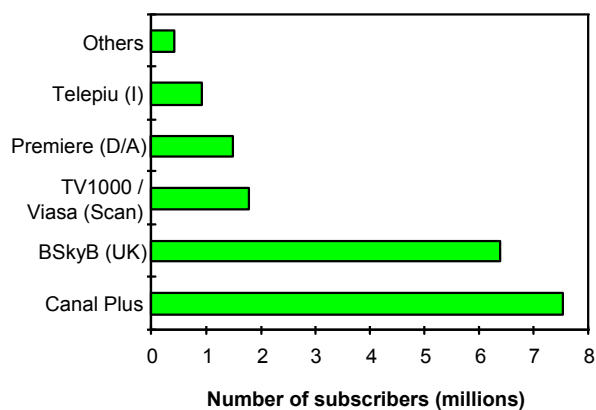


*The global Digital Pay-TV market (Source: CIT Research)*

The Pay-TV market is growing steadily since its introduction, whereas the government sponsored market has been decreasing and the advertising market is a highly competitive one. Hence, MediaGlobe has chosen to direct itself to the Pay-TV market.

## MEDIAGLOBE COMPETITORS

BSkyB and Canal Plus are the major competitors in the European Pay-TV market, joined by several smaller broadcasters. MediaGlobe approaches them with a new service and exceptionally low transponder rates.



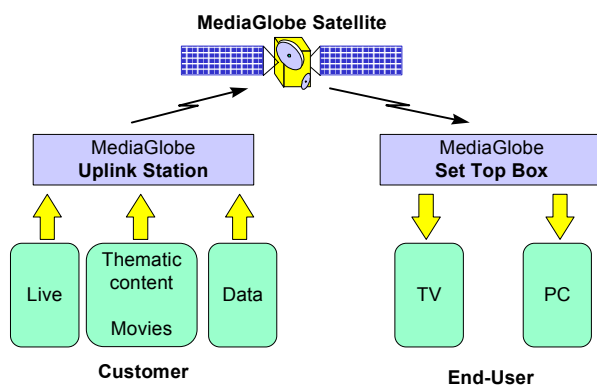
*Number of Digital Pay-TV users in Europe (1997)*

(Source: CIT Research)

## MEDIAGLOBE - ENABLING TECHNOLOGY

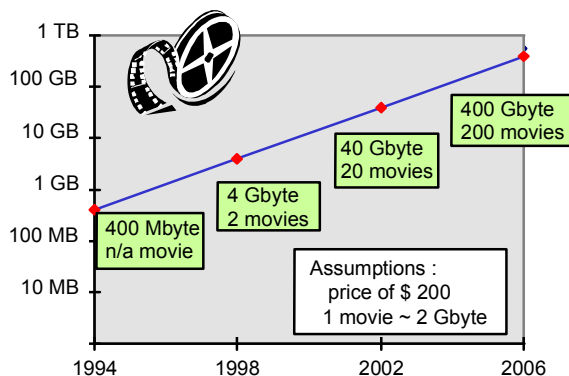
The key feature of the MediaGlobe system is that it stores the broadcasted contents at the end-user equipment. This gives the end-user full control: no more dependence on real-time programming. An intelligent user profile filters the broadcasted contents along pre-set preferences.

### MEDIAGLOBE: MAKE YOUR OWN PROGRAMME!



MediaGlobe ... The TV Revolution

The essential success factor for the MediaGlobe concept is the availability of storage capacity at an affordable price. This capacity is continuously increasing, thereby enhancing the attractiveness of the MediaGlobe service. Furthermore, this allows MediaGlobe to expand its services with memory consuming applications like High Definition TV.



The predicted growth in storage capacity makes the MediaGlobe services even more attractive in the future

## MEDIAGLOBE SERVICE ...

### ... CUSTOMER SATISFACTION

MediaGlobe offers a unique, innovative service, consisting of a large variety of high quality information that is continuously transmitted via satellite. This material is selected either via direct personal request, or via an Electronic Programming Guide. This intelligent guide updates the user profile based on the consumed contents.

### IN OTHER WORDS - YOU GET WHAT YOU WANT BY WATCHING WHAT YOU LIKE!

## MEDIAGLOBE SERVICES

### TV-On-Demand

This service broadcasts the most popular movies and thematic television contents (average ~ 45 minutes) with subjects like nature, history, science, series, etc. (much like today's Discovery channel). The quality of the movies is better than VHS, the quality of the thematic contents is SDTV. As the material is broadcasted in time-compressed packages, real-time viewing is not possible. Movies are divided in three categories, depending on user demand. Each category is transmitted several times per day, the broadcast frequency changes over the day and over the week. That in turn defines the maximum delivery time.

Category	Europe	
	Number of movies	Repetition rate per day
Top seller	20	> 80
Best seller	160	18
Basic	1700	1

The number of movie transmissions per day depends on the category which is defined by user demand

### Live Broadcasting

This service contains sets of programmes and events in Standard Digital TV (SDTV) that are interesting enough to broadcast real-time. Examples are sports, popular shows, news and

special events. The users can choose to watch these real time as they do nowadays. In addition, they can also programme their storage and ordering box (SOB) to store it for them, (even during transmission) much like today's VCR. They can even decide to watch the programme with a time delay that is shorter than the duration of the programme. Moreover, the user profile selects it automatically for them, when it is pre-programmed.

## **Data**

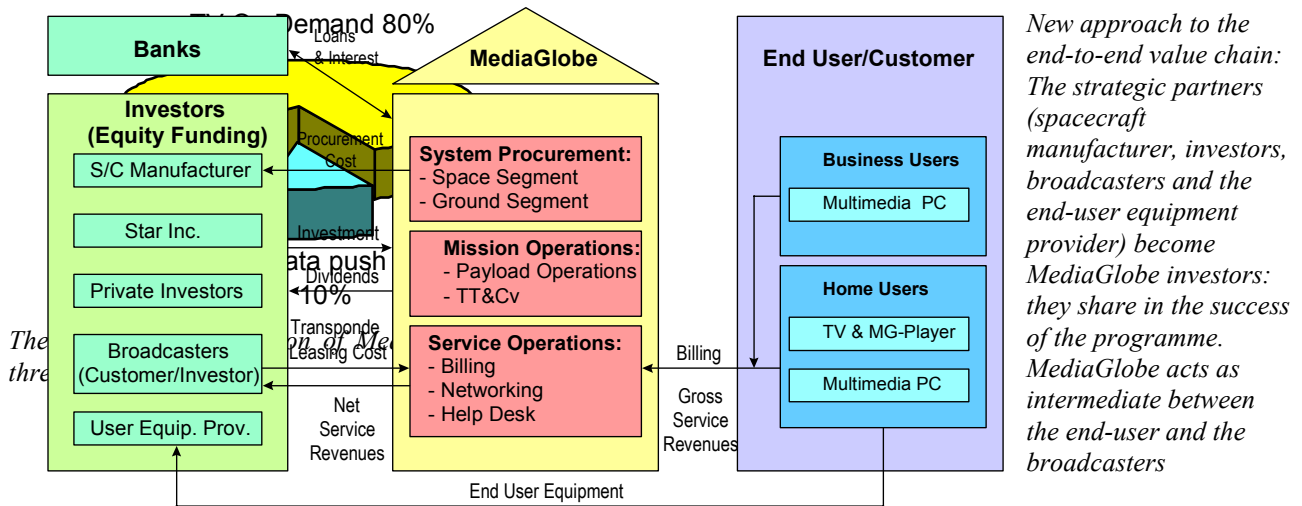
The contents of data broadcasting is software, databases, software and catalogue updates, games and Internet contents. Identified consumers are business users, like companies and teleworkers and private users. For example, software is sent to a user, allowing him to utilise it for a certain amount of time. In case of sporadic use, this is less expensive than purchasing the software. MediaGlobe obtains the contents directly from the manufacturer. Private users are expected to order computer games, catalogues and data bases like phone books whereas business users and companies will more likely concentrate on databases software and software updates.

**IN OTHER WORDS - MEDIAGLOBE WILL  
REVOLUTIONISE THE WAY YOU WATCH TV!**

## **MEDIAGLOBE COMPETITIVE ADVANTAGES**

MediaGlobe is the first to market with the full user control Pay-TV concept. Its strategic partners enable it to obtain the necessary equity.

Compared to its competitors, MediaGlobe offers more flexibility to its end-users. There is a maximum choice of contents and they have full control about it, e.g. no more commercials. Furthermore, the user profile filters the broadcasted contents exactly to their liking.



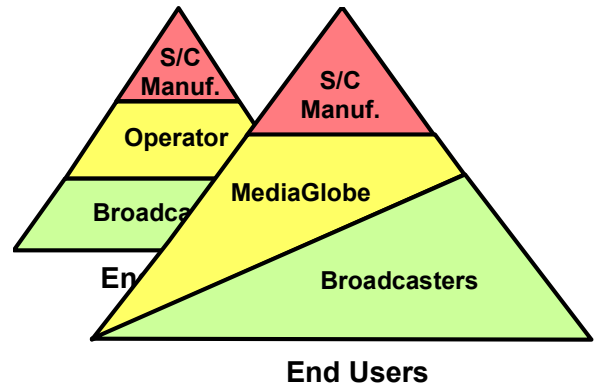
MediaGlobe offers the service providers a unique global vantage point. Furthermore they do not require to bill the end-user and they share the MediaGlobe success.

#### A NEW APPROACH TO THE VALUE CHAIN

The MediaGlobe concept offers the users access to many different broadcasters. In order to provide this flexibility and freedom of choice, MediaGlobe acts as the co-ordinating moderator. in the ordering and billing process. Hence, the end-user receives contents from many different broadcasters but pays only one bill.

In MediaGlobe's new approach to the end-to-end value chain, it takes over part of the activities that traditionally are executed by the broadcaster. Hence it descends on the value chain in the direction of the users. MediaGlobe plans to achieve this via the inclusion of strategic partnerships with all players in the end-to-end value chain, including the end-user equipment manufacturers. These partners invest in MediaGlobe and thus get a share of the revenue: they are part of the success of the MediaGlobe company.

The one end of the value chain are the private and business users and customers (broadcasters). The end-users pay for the service 'pay-per-view or per amount of data. In addition they pay a monthly fee for two years for the end-user equipment, after which they own it.



*The broadcasting revenue pyramid depicts the increase in overall revenue and the contact with the end-users.*

MediaGlobe is responsible for mission operations and procures the MediaGlobe system. Moreover, it is also responsible for the service operations, which include contents processing, data encoding and uplinking, order processing, billing, networking and provision of the help functions. This clearly distinguishes MediaGlobe from other satellite operators whose role has been limited to the provision of bandwidth to broadcasters.

The other end of the value chain contains the strategic partners. Since they invest in the system, and hence provide equity, these partners share in the success of MediaGlobe and receive part of the revenue. The banks may also provide part of the required equity. Both the participation of broadcasters and end-user equipment manufacturers is critically important to the success of the mission.

The end-user equipment manufacturers need to be involved from the beginning as the availability of the MediaGlobe set top box with its specific features is essential to the MediaGlobe service offerings and to the MediaGlobe venture. In particular the development and industrialisation of the store-and-ordering box is required which will include all of the user interfaces and control functions.

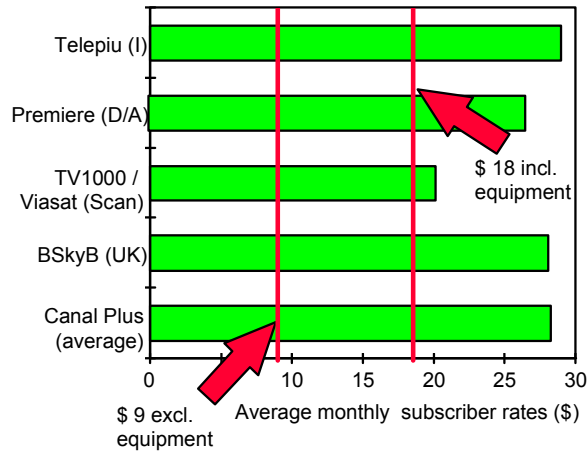
#### **MEDIAGLOBE SERVICE PRICES**

MediaGlobe has adopted an approach leading to low service prices for the three services offered. Pricing is by pay-per-view/pay-per-volume. There is a monthly contribution of \$ 9 per month for two years for the end-user equipment (dish antenna, storage and ordering box, integrated receiver and decoder). The prices for the TV on Demand service depend on the category. The price per top movie is favourable compared to other pay-TV providers and comparable to normal video store rental charges.

User Characteristics & Cost per Transmission	Price / Movie [\$]
Movies 1 (Topseller)	<b>2,5</b>
Movies 2 (Bestseller)	<b>1,25</b>
Movies 3 (Basics)	<b>0,5</b>
News & Diverse	<b>0</b>
Journals/Series/Thematics	<b>0,05</b>

*MediaGlobe movie prices are competitive with respect to competitors and video rental stores*

Based on the average Pay-TV consuming time in Europe, the price for the MediaGlobe TV-On-Demand service is \$ 9 per month excluding the fee for the end-user equipment.



Comparison of MediaGlobe prices with average monthly fees for Pay-TV in Europe. The latter range from \$ 18 to 35, depending on the bouquet offered and the country (Source: CIT Research)

Comparison with European broadcasters, especially Canal Plus and BSkyB, shows a clear advantage for MediaGlobe.

Data-push services are offered to the end-user at a price of \$ 0.1 per Megabit, independent of the number of users.

The price per movie for the live broadcasting service is set at \$ 3.

#### LOW TRANSPONDER PRICES

MediaGlobe introduces a new concept for charging the broadcaster, combining charging per transponder and a 20% of end-user 'pay-per-view'. This concept is very favourable and allow s newcomers to get to the market quickly.

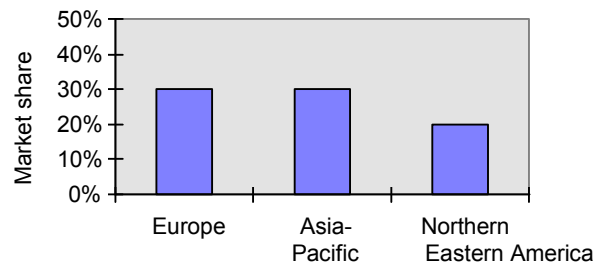
For the TV-on-Demand broadcast service, MediaGlobe charges only \$ 1 Million per transponder per year, which is close to the cost price. This is four to six times cheaper than the prices of the strongest competitors in Europe.

Charges for the live broadcasting services are at least 25% lower than for our competitors and are in the range of \$ 200-450 per hour, depending on the region.

Transponders for the data service are free.

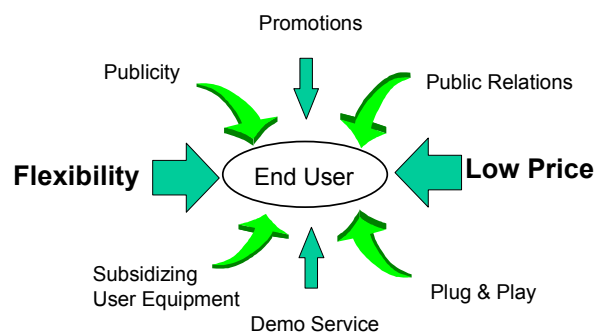
#### THE WAY TO THE END-USER

MediaGlobe targets a market share of 15 %, (about 15 million users) of the Pay-TV market within three years after start of operation. The number of subscribers in targeted areas increases from 20 million in 1998 to an estimated 90 million in 2020.



MediaGlobe aims to achieve a 5 % market penetration one year after service start and 20 % of the stabilised market after 10 years.

In order to achieve the planned market penetration, MediaGlobe accesses the user in many different ways. An extensive marketing campaign is planned, using all the unique selling points and advantages of the system. This includes advertising in media like TV, journals and magazines, promotions and comprehensive use of Internet. A demonstration service is planned three months before the start of services to prove the concept and to get potential users interested. End-user equipment is heavily subsidised in order to penetrate the market quickly.



MediaGlobe's approach towards the end-user:  
Marketing activities and unique selling points

## MEDIAGLOBE TECHNICAL SOLUTION

The Technical Solution defined in the MediaGlobe proposal consists of the preliminary definition of all the space and ground-based resources needed to implement the end-to-end data flow which characterise the MediaGlobe service concept plus the necessary infrastructure required to operate and maintain it. The data flow is depicted in the figure below.

The different services provided by the broadcaster are up-linked to the satellite either via the local up-link hub stations or directly via a dedicated up-link station at the broadcaster premises.

The data contents are selected by the end-users via their Storage-and-Ordering-Box that are connected to the different service providers via low data rate terrestrial communication link (using the Public Switched Telephone Network) for ordering and billing purposes.

The data stream is multiplexed either on ground in the case of up-link via the hub station or on board for the data which come from broadcasters using their own up-link.

The MediaGlobe satellite constellation allows to access the three coverage areas from a single point since the data are relayed to the satellite covering the target area via the inter-satellite links.

The data are received by the end-users via standard satellite dishes (60 cm) and DVB-compatible Integrated Receiver Decoders.

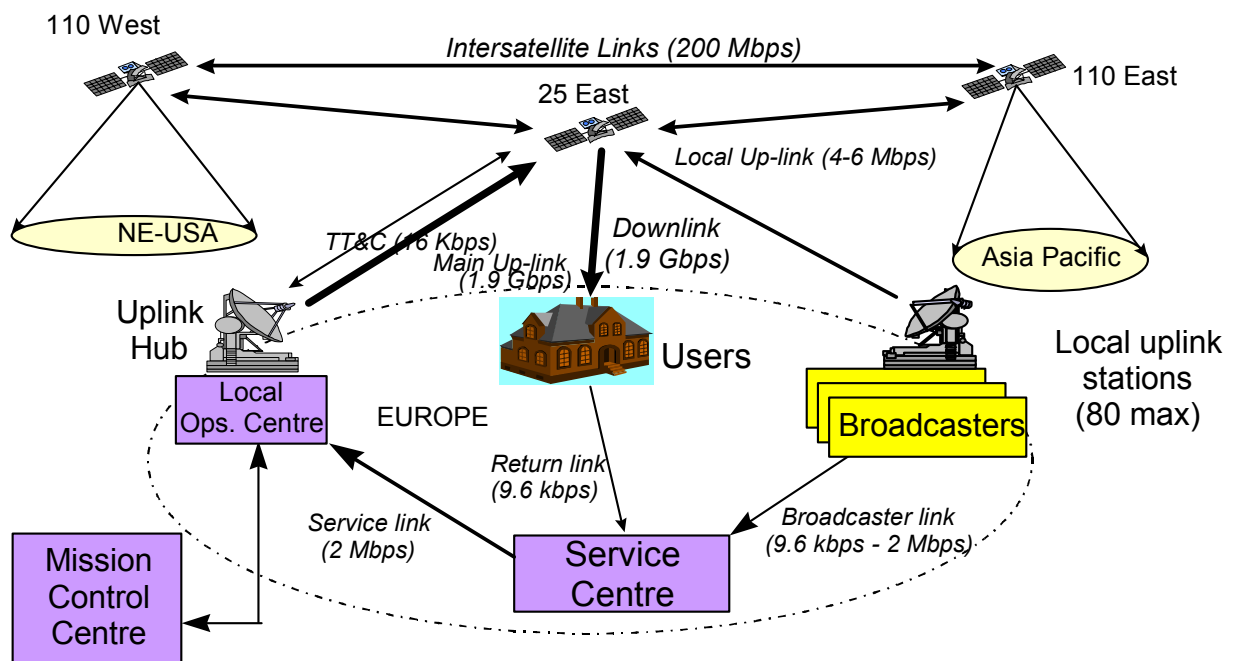
## TOP LEVEL SYSTEM REQUIREMENTS

The top level system requirements and constraints are summarised in the table on the next page.

The requirements for the payload and the end-user equipment are derived from the market analysis and the business case study.

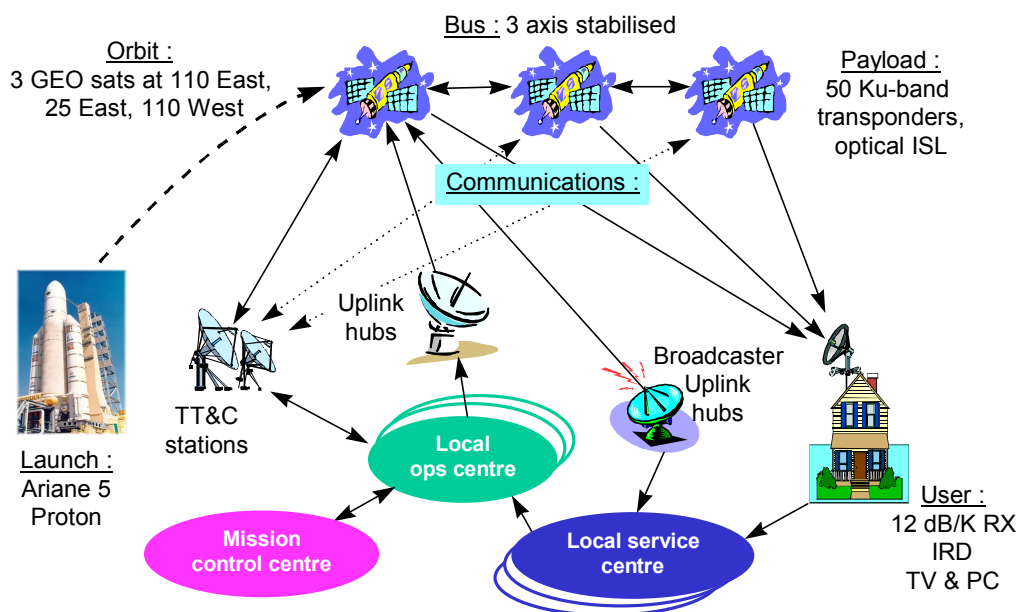
The end-user equipment storage capacity is also sized to the average use of the system that has been considered in the market study.

The orbit slot selection is based on preliminary investigations about available orbital positions.



MediaGlobe End-to-End Data Flow

<b>Functional Requirements</b>	<p><b>Performance</b></p> <ul style="list-style-type: none"> <li>• Number of transponders : 50 (+ 12 redundant)</li> <li>• Transponder Data rate : 38 Mbps</li> <li>• Transponder bandwidth : 36 MHz</li> <li>• Bit error rate (BER) : <math>10^{-10}</math></li> <li>• EIRP : &gt; 56 dBW peak</li> <li>• Receiver G/T : 12 dB/K (standard 60 cm dish)</li> <li>• Storage device memory : 40 GB</li> <li>• Equipment cost : &lt; \$ 500</li> </ul> <p><b>Coverage</b></p> <ul style="list-style-type: none"> <li>• Service regions : <ul style="list-style-type: none"> <li>• Asia-Pacific region comprising Japan, northern coastal regions of China (from Beijing to Shanghai) and South-Korea</li> <li>• Western Europe in particular with Italy and Spain as well as the German speaking countries, Benelux and France. With a lower priority also United Kingdom should be within the coverage area.</li> <li>• The Eastern part of North-America from Florida up to Newfoundland west to the Mississippi river</li> </ul> </li> </ul> <p><b>This leads to the following requirements for the orbital slots :</b></p> <ul style="list-style-type: none"> <li>• Asia Pacific satellite : 110 deg East</li> <li>• European satellite : 25 deg East</li> <li>• American satellite : 110 deg West</li> <li>• Beam coverage on surface : 4000 km x 2000 km</li> <li>• Connectivity : The satellites shall be interconnected via inter-satellite links</li> <li>• ISL data rate : 200 Mbps</li> <li>• System response time : &lt; 24 hours depending on service</li> </ul>
<b>Operational requirements</b>	<ul style="list-style-type: none"> <li>• Start of service : 2002</li> <li>• Duration : 15 years</li> <li>• Orbit : GEO</li> <li>• Availability : 99.5% during sunlight and eclipse</li> <li>• Reliability : 0.68 at end of life for overall space segment for S/C bus, 0.82 for P/L</li> <li>• Security : To deny unauthorised access data encryption to data and command channels since services are commercial in a very attractive market</li> <li>• Survivability : Capability to survive to natural / launcher induced environments No capability to survive to external wartime threats</li> <li>• Data content, form and format : DVB standard ETS 300421, ETS 301192</li> </ul>
<b>Constraints</b>	<ul style="list-style-type: none"> <li>• Schedule : Program decision: 3<sup>rd</sup> July 1998 Order launches: 1998</li> <li>• Set up industrial organisation and preliminary phase with partners by the end of 1998</li> <li>• Development phase : end 1998 up to early 2002 = 3 years</li> <li>• Regulatory issues : 1998</li> <li>• Regulation : Agreement with ITU &amp; WARC for allocation of frequencies, bandwidth and orbital slots</li> </ul>
<b>Interfaces</b>	<ul style="list-style-type: none"> <li>• Data : DVB (transparent)</li> <li>• Launcher : <b>Ariane 5</b>: max. GTO mass 6800 kg, fairing : 4.57 x 10.35 m (single launch) <b>Proton D-1e</b> : max. GTO mass 5500 kg, fairing : 3.97 x 7.3 m (single launch)</li> </ul>
<b>Development</b>	<ul style="list-style-type: none"> <li>• Development time : &lt; 3 years</li> </ul>



MediaGlobe  
Mission Concept  
and Architecture

## MISSION CONCEPT AND ARCHITECTURE

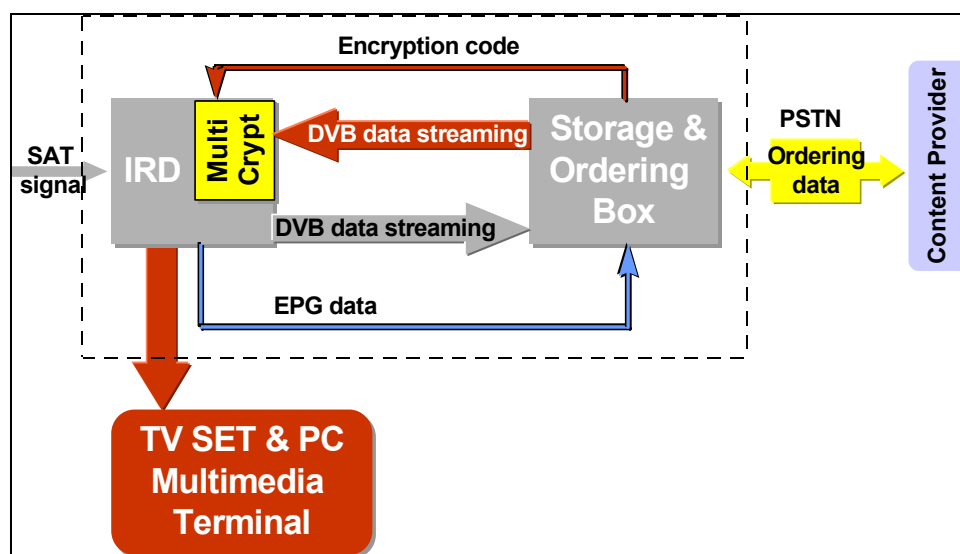
The figure above depicts the overall mission concept and the related architecture.

The **Subject** of the mission is the broadcasting of information data content to the end-users.

The **Ground Segment** consists of a central Mission Control Centre, the local up-link stations (MediaGlobe up-link hubs co-located with the operation center and the broadcaster stations), the TT&C stations (co-located with the local up-link

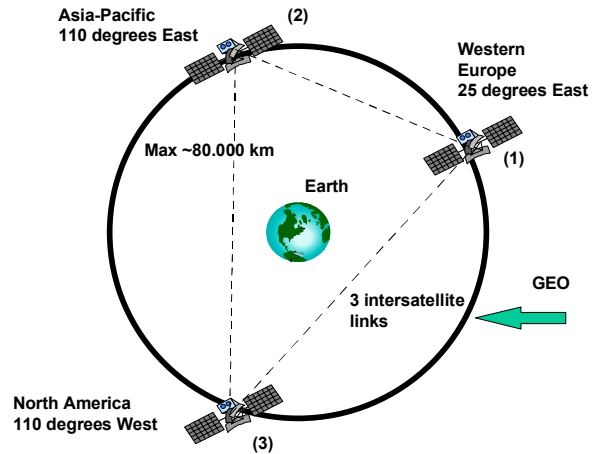
hubs) and the service centres. The different facilities are connected through a communication network offering different capacities according to the relevant data flows.

An additional element that characterises the MediaGlobe Ground Segment is the end-user equipment. The next figure shows the different components and the internal data flow:



The End-user  
Equipment

The broadcast signals are received and decoded by a standard DVB-compatible Integrated Receiver Decoder (IRD). The IRD has a DVB data streaming output for the video data to be stored in the Storage and Ordering Box (SOB) and an input for the data to be played back. The interface between the IRD and the SOB is a PCI compatible Smart-Card. The main SOB subcomponents are a micro-processor, a hard-disk with controller and a modem for transmitting the ordering data selected via the Electronic Programming Guide (EPG) to the billing centres and receiving the decryption code.



The MediaGlobe Constellation

The **command and control** of the Satellites and the TT&C ground stations is centralised in a single Mission Control Centre that is connected to three Ku-Band TT&C station located in the three coverage areas. Three additional back-up stations would be available through a service agreement with existing infrastructures for contingency situations. The back-up TT&C service shall be in S-band.

The three satellites shall be connected through inter-satellite optical links with a total capacity of 200 Mbps.

The MediaGlobe **Space Segment** consists of three geo-synchronous spacecraft to be located at 110 W (Eastern North America), 25 E (Europe) and 110 E (Asia Pacific). The constellation is depicted in the following figure.

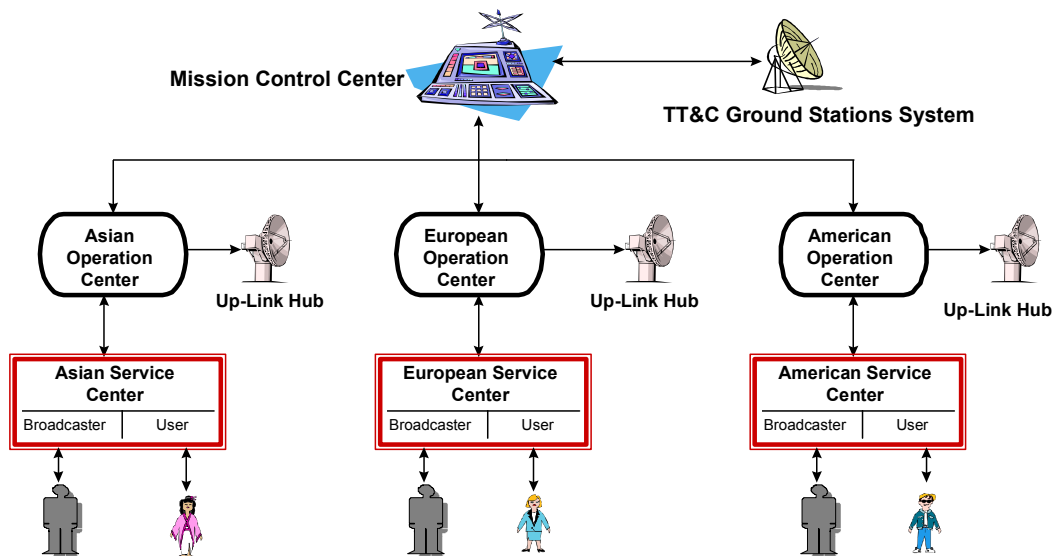
(62 in total for redundancy purpose) 36 MHz Ku-Band transponders capable of a data rate up to 38 Mbps depending on the Forward Error Correction rate selected.

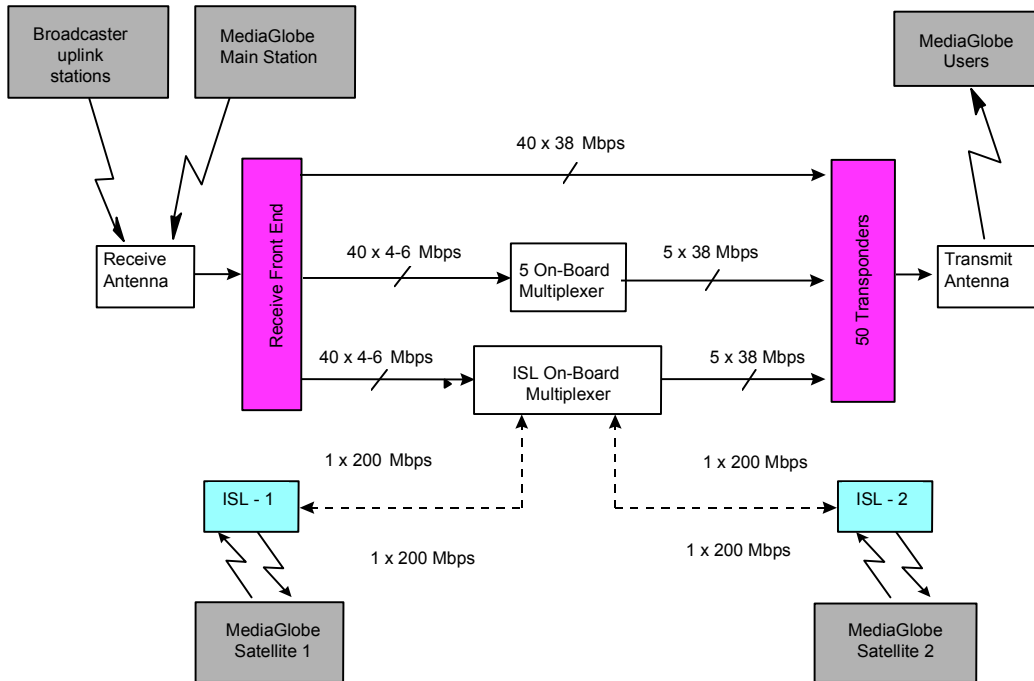
The inter-satellite communication payload consists of two optical terminals capable of about 200 Mbps data rate and requiring an input power of about 200 W. Ten transponders out of the total 50 shall be used for FDMA uplink at a data rate of 6-8 Mbps from the broadcaster local up-link stations.

The relevant data streams are multiplexed on-board and recombined in a 38 Mbps Time Division Multiplexed stream compatible with the DVB standard.

The communication **payload** consists of 50 active

Ground Segment  
Architecture of  
MediaGlobe





*The MediaGlobe Communication Payload*

The overall power required by the payload is in the order of 9.5 kW. The down-link EIRP estimate is 56 dBW (peak) to guarantee a BER in the order of  $10^{-10}$  with a figure of merit for the end-user receivers in the order of 12 dB/K.

The total payload mass is in the order of 450 kg.

The **spacecraft bus** has to carry and support the communication payload and provides all necessary housekeeping functions. From the initial payload mass and power budget it is evident that the MediaGlobe satellite shall belong to the high-end next generation communication satellites.

The driving requirements and constraints for the spacecraft bus are summarised in the following:

- Accommodation 450 kg payload and provide 9.5 kW payload power
- Payload Earth pointing better than  $0.1^\circ$  in roll/pitch,  $0.25^\circ$  in yaw
- Support of mission operations incl. data uplinks, broadcasting, ISLs
- Service provision 24 hours a day (daylight, eclipse) without interruption
- Operational on geostationary orbit (launcher type and environment)
- 15 years nominal design lifetime

- S/C functions and subsystems fully controlled (autonomously/from ground)
- Sustain environmental conditions during entire life cycle

The following figure provides an overview of the preliminary bus design.

The power subsystem is based on rigid fold-out, dual junction GaAs/Ge solar panel arrays with NiH<sub>2</sub> batteries. The solar array performance is 16 kW at EOL and the battery capacity is 13 kW-hr.

The platform is 3-axis stabilised with momentum-bias wheel for pitch control and roll-yaw stiffness, reaction wheel for momentum storage and reaction control thrusters for momentum dumping and attitude manoeuvres.

The main and secondary structure shall be realised in a composite Graphite Fibre Reinforced Plastic/Aluminium sandwich.

The baseline propulsion S/S is a liquid bi-propellant (MMH/N<sub>2</sub>O<sub>4</sub>) Unified Propulsion System (UPS) consisting of a Liquid Apogee Motor (LAM) and Reaction Control Thrusters (RCTs), providing the required delta V for orbit transfer, attitude control manoeuvres and East-West station keeping.

Ion propulsion has been selected for North-South station keeping with a net propellant mass saving

Orbit and constellation: **GEO; 110 W, 25 E, 110 E**

The spacecraft shall provide autonomy for the Attitude Determination and Control functions while Orbit Determination and Navigation shall be performed on ground via processing the tracking and ranging data.

#### MEDIA GLOBES BUSINESS CASE

MediaGlobe's business case for the three service

revenues, net profit from operations working capital and finance sources are indicated. They provide a concise overview for the start-up- and investment phase of MediaGlobe's business. Each parameter will be addressed in more detail later.

The time schedule of the financing flow is linked

Year	1999	2000	2001	2002	2003	2004	...	2017	2018	2019
Ground Segment Procurement:							...			
- Headquarters	×						...			
- Mission Control Centre			×	×	×		...			
- Local Operation Centre			×	×	×		...			
- Service Centre			×	×	×		...			
Space Segment Procurement:							...			
- Launch dates/ service start				×	×	×	...			
- Spacecraft Delivery				×	×		...			
- Spacecraft Disposal							...	×	×	×

#### MediaGlobe milestones planning

regions strongly depends on the procurement schedule for the three spacecraft and the ground segment. The table above summarises the most important milestones of MediaGlobe's service life-cycle.

directly to the procurement of the space- and ground segment forming the "investment phase" of the project. The ground segment includes the headquarters, mission control centre and the local operations and service centres.

#### INVESTMENTS

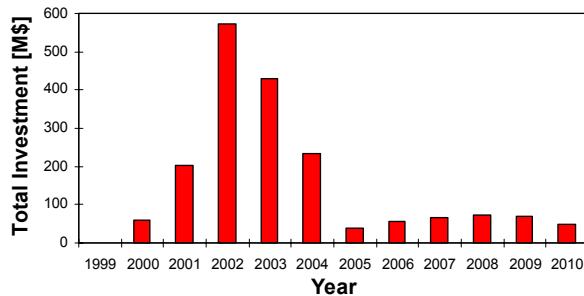
The milestones can be directly translated into investments that are shown in the next table. Beside the cash flow from investing activities the most important accounting parameters like

Overall investments for MediaGlobe amount to about \$ 1.9 Billion. Investments peak in 2002 with a total investment of \$ 570 Million after which they decrease and reach a more or less steady level of about \$ 60 Million from 2005 onwards.

Year	1999	2000	2001	2002	2003	2004	2005	2006
Revenues [M\$]	-	-	-	214	507	842	1101	1347
Capital Investments [M\$]	1	60	201	571	430	233	38	57
Net Profit after Tax [M\$]	(5)	(36)	(108)	(11)	(191)	(509)	807	1068
Working Capital [M\$]	15	22	24	42	16	21	614	1522
Short-term Debts in [M\$] (10%)	-	-	-	300	-	(300)	-	-
High Yield Bonds in [M\$] (12%)	-	-	100	-	-	-	(100)	-
Accumulated Debts [M\$]	-	-	100	400	400	100	-	-
Equity [M\$]	20	100	200	300	200	-	-	-
Accumulated Equity [M\$]	20	120	320	620	820	820	820	820
Equity Ratio [%]	100	100	76	61	67	89	100	100
Enterprise Phase 1	Foundation							
Enterprise Phase 2	Investment Phase							
Enterprise Phase 3	Operation Phase							

#### Key accounting parameters and business phases of MediaGlobe

MediaGlobe enters the market with a well adapted market strategy of which the marketing investment plays an essential role. Large investments in marketing are necessary for a fast market entry and penetration. MediaGlobe's marketing investment plan consists of three cornerstones:

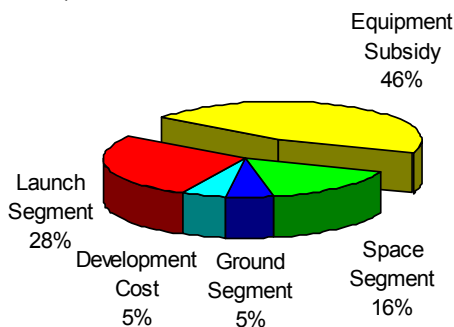


Investments peak in 2002 after which they decrease to a more or less constant level of \$ 60 Million after 2005

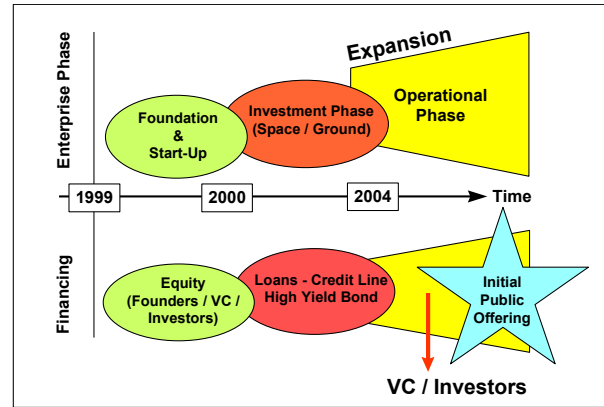
- General marketing investment in pre-operational phases
- General marketing investment in operational phase
- Subsidy of end-user equipment (Storage-and-Ordering-Box) in early operational phases

Investments for the MediaGlobe system are dominated by the end-user equipment subsidy, which amounts to more than 46% of the total investment. The equipment costs \$ 250, but MediaGlobe's strategy is to give the equipment to the users and instead ask for a fee of \$ 9 per month, for a period of 2 years.

To finance the investments, MediaGlobe seeks equity funding of 67% of the total up-front investment. The remainder is from (long and short term) loans.



End-user equipment subsidies dominate the investment costs



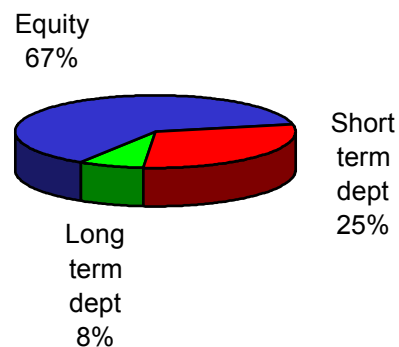
Phased enterprise financing

## MEDIAGLOBE ENTERPRISE FINANCING

The MediaGlobe project distinguishes between three different enterprise phases, the foundation and development phase, the investment phase as well as the operational phase.

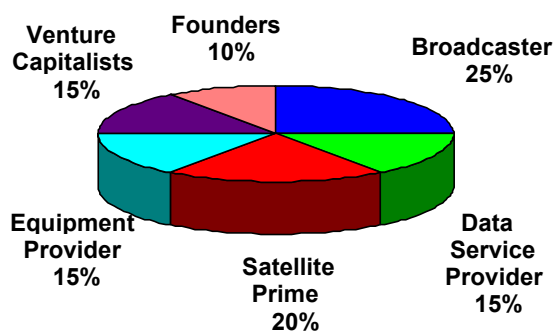
MediaGlobe enterprises is founded at the beginning of the start-up phase. The investment phase, comprising the procurement of the three satellites and the ground segment, ends with the full deployment of the space segment and feeds into the business expansion phase. Within this phase the revenue streams and the overall profitability will explode leading either to special back-payment schemes or, in-line with the current business baseline, to the initial public offering (IPO). If MediaGlobe's business develops as predicted, initial public offering could take place around the years 2006/2007.

According to the sequence of enterprise phases the major funding will be provided by equity from different finance sources to run and expand MediaGlobe's business determined in it's strategic planning.



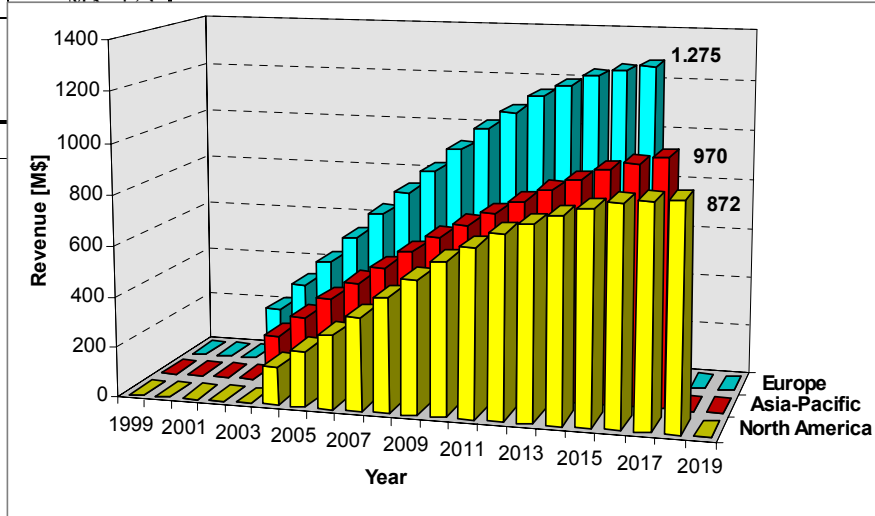
Mediaglobe is seeking for equity funding for about 67% of the total up-front investment. Initial capital to start-up the company will be provided by Venture Capitalists as well as by the founders. Following the strategic planning of MediaGlobe, also broadcasters and service providers as well as spacecraft- and equipment manufacturer will become shareholders and participate in the success of an emerging business.

A balancing of the share in equity is indispensable in order to guarantee continuous innovative products and services tailoring the actual market needs. An allocation of shares is depicted in the figure below. The shareholder's contributions as proposed herein are preliminary and have to be confirmed by future investigations.



Finance Source	
Equity (M\$ 820)	
- Founders	M\$ 82
- Venture Capitalists	M\$ 123
- Broadcaster	M\$ 205
- Data Service Provider	M\$ 123
- Satellite Prime	M\$ 164
- Equipment Manufacturer	M\$ 123
Loans (M\$400)	
- Short-term Loans	
- High Yield Bonds	
Total Up-Front Finance	

*Continuous increase in revenues*



To establish the MediaGlobe business, an overall amount of \$ 1960 Million is needed. \$ 740 Million will come from the revenues. \$ 1220 shall be financed from external sources. MediaGlobe's financing strategy is to have an equity/debt ratio  $> 3/2$  and to minimise the up-front capital cost. The following ratio has been determined for MediaGlobe.

#### INCREASING REVENUES

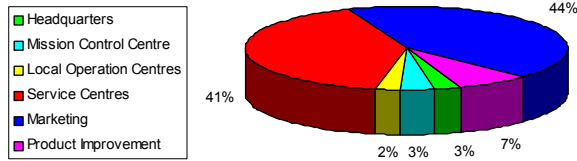
Starting from 2002, MediaGlobe's revenues show a strong growth with a 6-fold increase over the total mission life for all three regions. Total revenues over the mission life amount to \$ 31.3 Billion. Since MediaGlobe operates a total of 150 transponders on 3 spacecraft for a period of 15 years, this amounts to a revenue of \$ 14 Million per transponder per year, which is about a factor 3-7 more than current rates. The main reason for this is that MediaGlobe enters the business of service providers which is more profitable and promises larger turnover.

Considering the projected revenues for the selected regions, we find that they are highest for Europe with about 40% of the total revenue. Asia-Pacific and North America contribute 31% and 29%, respectively.

#### MEDIAGLOBE'S OPERATIONS COST

Total operations cost are \$ 4350 Million. Yearly

operations cost increase to \$ 250 Million in about 5 years, after which they stabilize (slow decrease to about \$ 200 Million in 2015).



Largest expenses for MediaGlobe are in marketing (44%) and in the Service Centres

#### BALANCE SHEET UNTIL 2006

(41%) which also comprise end-user's billing activities. The marketing cost are mainly for the sponsoring of the end-user equipment.

Broadcasters and service providers as well as spacecraft and end-user equipment manufacturer will become shareholders of MediaGlobe and participate directly in the success of our emerging business. Targeted investors and their share are outlined in the accompanying figure and table.

#### BALANCE SHEET

The balance sheet of the first years of MediaGlobe's business shows the expected growth of our company. Together with the cash flow statement indications can be derived about the current liquidity and capital in fixed assets.

#### PROFIT & LOSS ACCOUNT

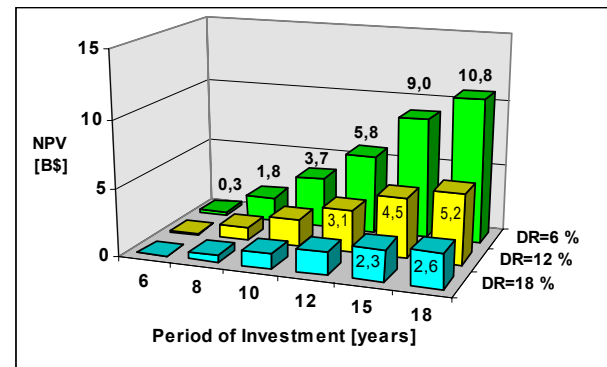
The profit & loss account of MediaGlobe's first year of business indicates the start-up activities on the operational side. Operations costs are dominated by labour costs which increases in-line with the establishment of the dedicated operation- and user support centres. Depreciation arises due

to the previous investments, mainly in space segment and subsidy of user-equipment.

The net income (net profit after tax) is derived from the operating profit by deducting the interest rates to be paid as well as taxes. It becomes clear that MediaGlobe's service operation becomes profitable 3 years after start up of service operations or 7 years after company foundation.

The profitability of MediaGlobe's business can also be expressed in terms of the Net Present Value (NPV) as the NPV is equivalent to the IRR.

As shown in the figure below the Net Present Value of the overall \$ 820 Million equity increases within 18 years of investment period to about \$ 5200 Million, assuming a discount rate of 12%. This value is also taken as baseline for all calculations herein unless specified otherwise. A discount rate of 12% reflects the inherent business risk of MediaGlobe compared to other investments.



In order to illustrate the attractiveness of MediaGlobe, the figure below indicates also the NPV for different periods of investment based on a discount rate of zero. In this case, the NPV rises

Year	1999	2000	2001	2002	2003	2004	2005	2006
Total Operating Assets [M\$]	16	86	296	727	681	358	501	983
- Fixed Assets [M\$]	1	61	262	833	1263	1496	1624	1766
- Current Assets & Receivabl. [M\$]	15	25	25	92	111	26	622	1532
- Depreciation [M\$]	-	-	(1)	(198)	(693)	(1280)	(1903)	(2539)
Total Operating Liabilities [M\$]	16	86	296	727	681	358	501	983
- Equity [M\$]	15	79	170	263	162	87	274	707
- Debt [M\$]	-	-	100	400	400	100	-	-
- Accruals/Liabilities/Creditors [M\$]	1	7	26	64	119	176	227	275

Year	1999	2000	2001	2002	2003	2004	2005	2006
Net Income [M\$]	(5)	(36)	(109)	(207)	(303)	(78)	184	431
Changes in Ops. Assets and Liabilities[M\$]	1	3	10	(1)	13	28	7	(21)
Cash Flow from Profit making Operat. [M\$]	(4)	(32)	(97)	(11)	204	538	814	1047
Cash Flow from Investing Activities [M\$]	(1)	(60)	(201)	(571)	(430)	(283)	(38)	(57)
Cash Flow from Financing Activities [M\$]	20	100	300	600	200	(300)	(100)	-
Change in Cash [M\$]	15	7	1	18	(26)	5	594	908
Accumulated Cash[M\$]	14	22	24	41	16	20	614	1522

#### Cash flow statement for MediaGlobe

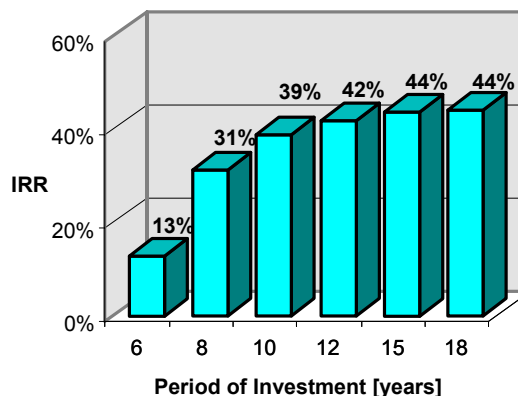
up to \$ 23.7 Billion after 18 years or, on a short-term perspective, to \$ 6.7 Billion.

*Net present value versus investment period for different discount rates (6, 12, 18 %)*

MediaGlobe offers investors risk-adequate business and profit making opportunities. The service concept of MediaGlobe differs strongly from the concepts of any other service provider or spacecraft operator. As MediaGlobe combines these activities by strategic partnerships with major players of the respective business branches the value chain defining the revenue stream and composition is distinct and more complex. More than 90% of the revenues are coming from the consumer whereas the revenues from leasing transponder capacity towards the broadcaster and service providers is less than 10% of the total sales.

#### MEDIAGLOBE - A SUPERIOR BUSINESS OPPORTUNITY

As a unique business opportunity MediaGlobe offers high rates of return. MediaGlobe is ready to offer to potential investors a 7 years equity investment with an entrance in 1999 and an exit in 2006. Taking into account the predicted annual profit before tax of \$ 900 Million averaged for the years 2007-2012, the valuation of MediaGlobe leads to \$ 4500 Million at exit time (2006). As the overall equity investment has been \$ 820 Million, the shareholders get 5.6 times their invested capital back which corresponds to an Internal Rate of Return of 45% per annum. From a company's point of view, the internal rate of return (IRR) is a function of the investment period showing that approximately 6 years after start up, MediaGlobe reaches an IRR of 13% per year. On a long term perspective (>12 years) this increases to more than 40%.



Considering the very conservative business assumptions, this rate of return reflects a really attractive business opportunity.

#### MEDIAGLOBE - A ROBUST BUSINESS

To investigate the robustness of the business case, the internal rate of return has been determined for a number of cases that are considered as threatening for MediaGlobe.

Business Case	IRR [%]
Baseline	44.3
Number of users in all service regions 30 % lower than expected	35.0
Launch delayed by 1 year each	32.4
Interest rate increases by 30 %	43.4
Movie prices drop by 30 % in all regions	38.0
End-User-Equipment price increases with 30 %	37.5
Free-of-Charge End-User Equipment	26.8
Launch 3 fails without any replacement available and leasing alternative space on spacecraft for 1 year	36.7

All cases show a moderate decrease of the internal rate of return with the worst case still giving an IRR of more than 25%.

## DESIGN AND DEVELOPMENT

Due to the short schedule for the development, assembly and delivery of the MediaGlobe satellites and in order to reduce the overall costs, the following approach is used:

- Maximum use of commercially available hardware and existing designs
- If needed, commercial hardware will be modified
- Use of the protoflight philosophy on all levels
- Subcontracting of all development, test and verification activities

In a protoflight approach, the first flight model will be submitted to protoflight testing. The following spacecraft will be submitted to acceptance testing only.

The model philosophy adopted for MediaGlobe is:

- Engineering models for newly developed equipment and for equipment that has been modified considerably
- A protoflight model for testing the entire spacecraft
- The actual flight models

For the software development an analog approach will be applied. Where possible, commercial off-the-shelf software will be used. If necessary,

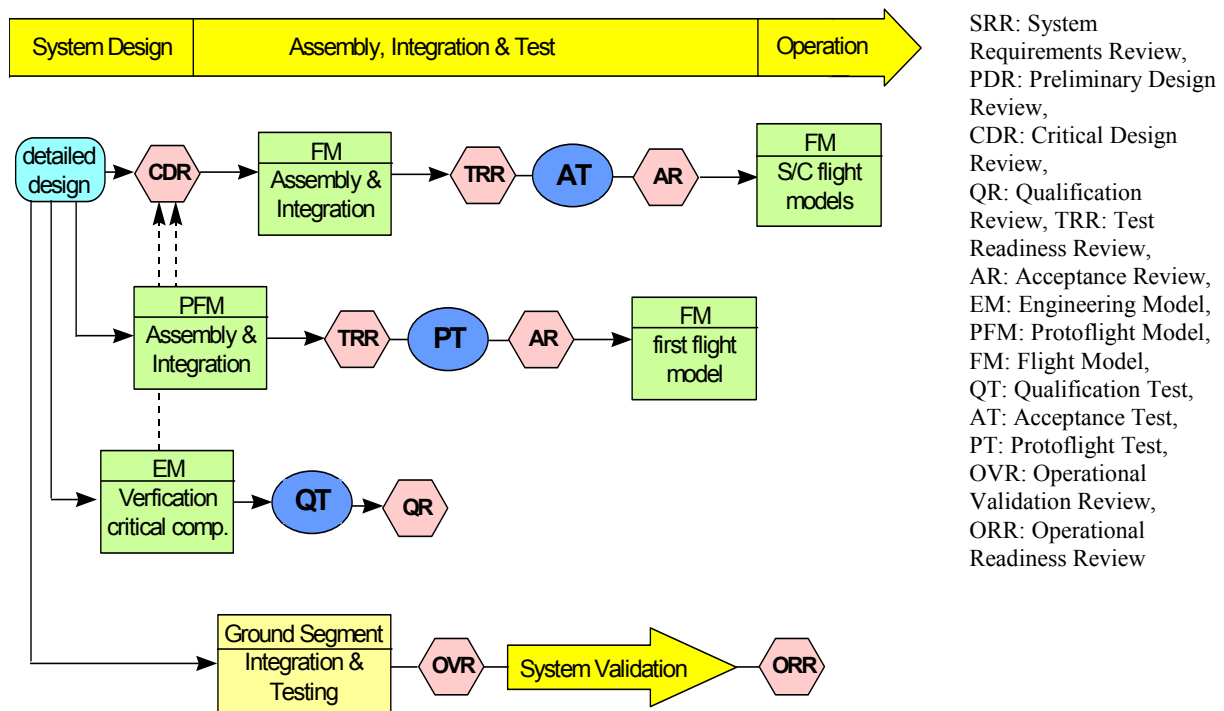
these products are tailored and enhanced.

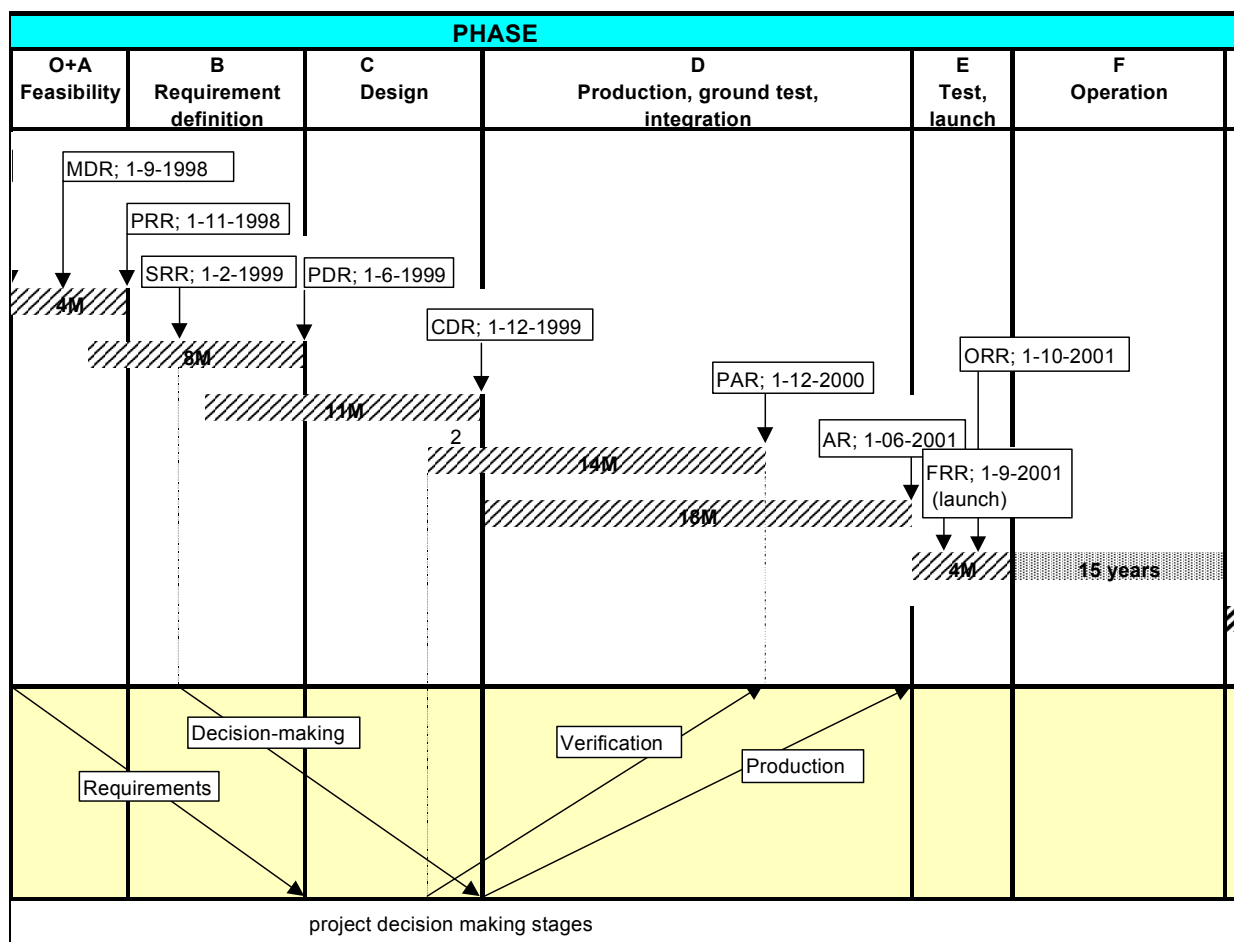
The test philosophy for the space segment can be summarised by:

- Qualification tests will be performed on completely new designed equipment or on equipment modified in a way that previously established qualification is not valid. The qualification tests are used to guarantee the correct function under the defined environmental loads. For MediaGlobe, qualification tests are performed on equipment level only.
- Acceptance tests will be performed on all commercial hardware (components or complete subsystems) used for MediaGlobe and on the flight models prior to launch.
- Protoflight tests are similar to qualification tests but with reduced durations. These test will be performed on the protoflight model to qualify it for launch.

For the ground segment acceptance tests to check the functionality and proper operation of all components. Emphasis is on the validation of all interfaces between user equipment, ground stations and satellites.

The development of a detailed assembly, integration & verification plan is a task of the subsequent detail design phase according to the development flow as indicated in the following





MediaGlobe implementation schedule

figure.

### IMPLEMENTATION SCHEDULE

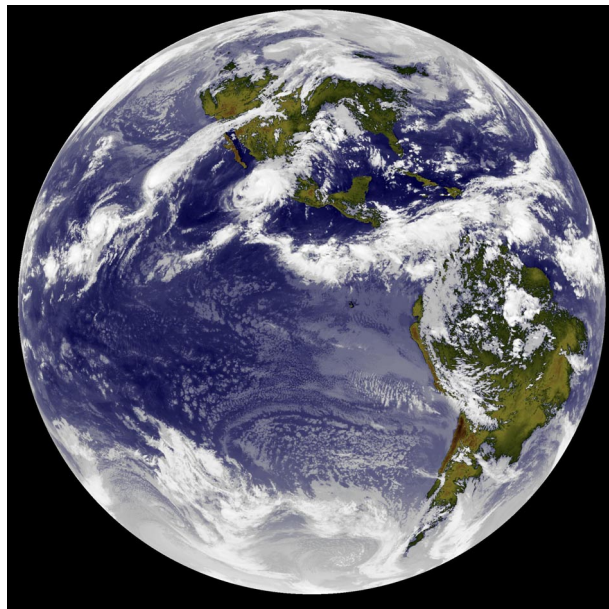
The MediaGlobe schedule is based on a 3 years implementation period starting from the system definition to the operational qualification of the first MediaGlobe spacecraft (flight model 1). The second and third flight model will be launched in consecutive years. The short timespan requires starting activities in parallel, in particular those related with the early design and manufacturing of the spacecraft and the co-ordination between the ground- and space segment to validate the complete system.

The starting point for the schedule development and phase specification is the launch date of the first MediaGlobe spacecraft in 2001 with a lifetime provided of 15 years.

The schedule for the development-launch period needed for launching flight model 1 shows the

- 1 MDR (Mission Definition Review)
- 2 PRR (Preliminary, Requirements Review)
- 3 SRR (System Requirements Review)
- 4 PDR (Preliminary Design Review)
- 5 CDR (Critical Design Review)
- 6 QR (Qualification Review)
- 7 AR (Acceptance Review)
- 8 FRR (Flight Readiness Review)
- 9 ORR (Operation Readiness Review)

various implementations phases and the time schedule.



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