SpaceCast™ customer, this transmission rate flexibility allows SpaceCast™ to adapt to technological advances, such as improvements in video compression technology. SpaceCast™ will have the flexibility, even after the satellites are operational, to allow customers to adjust their transmission rates to changing compression technology, the type of content they wish to transmit, and their intended audiences.

The SpaceCast™ constellation consists of six satellites in four different GSO orbital positions. Each satellite contains Ku-band and V-band payloads and intersatellite links that will allow a signal received by any one satellite to be routed to any beam or multiple beams, and/or relayed through other satellites.

The system will utilize spectrum at 39.5-42.5 GHz for space-to-Earth transmission and at 47.2-50.2 GHz for Earth-to-space transmission. SpaceCast™ will also use 500 MHz of Ku-band FSS spectrum for service and TT&C links. Through spot beam technology and dual polarization, each satellite will maximize use of this spectrum by reusing it up to 40 times in V-band and up to eight times in Ku-band.

Although SpaceCast™ utilizes V-band and Ku-band frequencies similar to HCI's Expressway ™ system, it is designed to provide distinctly different capabilities and services. SpaceCast™ has smaller beams than Expressway™ to enable the use of smaller user dishes that are desirable for service to homes and small businesses. Whereas Expressway™ is primarily a symmetrical system for the provision of two-way telecommunications, SpaceCast™ is primarily a one-way video and multimedia distribution system. Expressway™ and SpaceCast™, while using many of the same technical advances that have opened the V-band to commercial use,

serve decidedly different segments of the broader information and communications market.

Grant of this application will promote efficient and innovative use of the V-band spectrum, which has been unused for commercial satellite services to date, and also will meet the growing demand for access to video and multimedia distribution services.

Introduction

1. INTRODUCTION

1.1. General Description of System Operation and Services

The SpaceCast™ system is comprised of GSO satellites, an associated earth control segment, receive-only terminals, and transmit-and-receive terminals. The system provides high-capacity, flexible video and multimedia communications services. SpaceCast™ addresses the expanding video and multimedia needs of its customers by providing highly reliable, quickly set-up, affordable reception. It will enable customers who are currently unable to distribute multimedia materials through existing terrestrial or satellite based systems to do so both easily and affordably. The SpaceCast™ system offers businesses and consumers affordable broadcast services with the flexibility to distribute multimedia content to coverage areas that best meet their needs, from metropolitan coverage to multi-state coverage to national coverage and beyond. Figure 1-1 summarizes the system's key features.

The SpaceCast™ system is capable of providing a full range of services from compressed video to higher rate transmissions, such as webcasting and other applications utilizing "push" technology, to electronic cinema distribution. Its architecture allows transmission of video and data at selectable transmission rates up to 155 Mbps. Each satellite in the system will provide the capacity equivalent of up to 166,000 channels of 384 kbps compressed video (approximately 60 Gbps per satellite). The total global capacity of the six-satellite SpaceCast™ system is nearly one million video channels.

- Up to 166,000 Video Channels Per Satellite
- Uplink Capability up to 155 Mbps
- Forty Times Spectrum Reuse Per Satellite in V-band
- Eight Times Spectrum Reuse Per Satellite in Ku-band
- Capabilities
  - Local Broadcasting
  - Area Broadcasting
  - National Broadcasting
  - Point-to-Multipoint
  - Point-to-Point
- Selectable Coverage in V-band provided by 204 Narrow (0.15°) Circular Spot Beams
- Coverage in Ku-band provided by up to 16 Elliptical 1° x 3° Beams

Figure 1-1 SpaceCast™ System Key Features

The SpaceCast™ system will operate with 3.0 GHz of uplink and downlink bandwidth in each of two polarizations in the V-band and 500 MHz of uplink and downlink bandwidth in each of two polarizations in the Ku-band. Each SpaceCast™ satellite will reuse the requested V-band spectrum up to 40 times and the requested Ku-band spectrum up to eight times. V-band coverage will be provided by an antenna system that offers the ability to independently select up to 40 beams from a total of 204 narrow (0.15°), moveable beams per satellite.

Additional coverage will be provided by up to 16 elliptical 1° x 3° spot beams at Ku-band. Traffic for each of the Ku-band beams can be interconnected to the V-band beams and vice versa. Laser intersatellite links will interconnect SpaceCast™ satellites, allowing V-band and Ku-band traffic from one satellite to be interconnected to other satellites.

SpaceCast™ will use a family of terminals ranging from 45 cm and 1 meter receive-only terminals to 2.5 meter, two-way terminals. These terminals are detailed in Section 4.10.3 of this application.

1.2. POINTS OF CONTACT FOR APPLICANT

1.2.1. Name, Address, and Phone Number of Applicant

Hughes Communications, Inc.
1500 Hughes Way
Long Beach, CA 90810
Attn: Jerald F. Farrell, President
(310) 525-5010
cc: Scott Tollefsen, Vice President, General Counsel & Secretary
(310) 525-5150

1.2.2. Name, Address, and Phone Number of Contact

Gary M. Epstein
John P. Janka
Arthur S. Landerholm
Latham & Watkins
1001 Pennsylvania Avenue, N.W., Suite 1300
Washington, DC 20004
(202) 637-2200

1.3. TYPE OF AUTHORIZATION REQUESTED

HCI requests authority to launch and operate six GSO satellites at four orbital positions. The orbital positions for which HCI is requesting operating authority are 60°W, 125°W, with two satellites at each position, and 39°W and 155°E, with one satellite at each position. HCI will notify the Commission if it commences construction of this system before the grant of the system license[1].

If the V-band portion of this application is ready for Commission grant before the Ku-band portion is ready, HCI respectfully requests that the Commission grant the V-band portion. *See Hughes Communications Galaxy,* DA-97-971 (released May 9, 1997), at para. 16 (granting Ka-band portion of application and deferring Ku-band portion).

[1] No construction authority is sought because the Commission has eliminated the construction permit requirement for U.S. licensed satellites. See 47 C.F.R. § 25.113(f).

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Public Interest

2. PUBLIC INTEREST CONSIDERATIONS

Grant of the SpaceCast™ application will serve the public interest by enabling the provision of a new type of service that can neither be provided by satellite in other frequency bands today, nor be provided by other transmission means. Specifically, SpaceCast™ meets the growing demand for providing bandwidth-intensive video and multimedia applications to homes and businesses that can be targeted to the specific needs of those users.

By providing an enhanced capability to distribute video and multimedia content, SpaceCast™ will broaden the range of video and multimedia programming that can be distributed in a cost effective manner. SpaceCast™ will allow entities that are unable today, because of expense or the inability to target less than a national audience, to disseminate their video and multimedia content. Existing media businesses will also gain new and more targeted outlets for new and modified versions of their current video and multimedia content in the wideband digital video and multimedia age.

SpaceCast™ will allow broadcasters to provide a wide range of broadband digital and multimedia services, including new broadcasting formats in the nature of today's webcasting services, enhanced video distance learning, and the capability to quickly download and cache large amounts of video or multimedia content for viewing at a later time. These new video and multimedia offerings, whether created by companies heretofore confined to other media or by existing video content providers, will increase the breadth and diversity of video and multimedia programming available to the public.

SpaceCast™ will also provide entities of all sizes with access to satellite broadcasting capability. SpaceCast™'s small dishes will allow companies and institutions to broadcast video content locally and to target specialized demographic audiences with religious, ethnic, language, international, and other specialty programming. Furthermore, by facilitating an increase in the number of video and multimedia content distributors, SpaceCast™ will also foster greater competition in the video programming and distribution market.

The video and multimedia capacity that SpaceCast™ will provide will also help satisfy the burgeoning demand for video and multimedia programming. The convergence of the computer and television and the transition to digital video transmission is beginning to produce new video and multimedia applications for distribution to local and specialized audiences in addition to the more traditional national and regional video programming audiences. New Internet applications, such as PointCast, illustrate the emergence of the "push" technologies that are beginning to transform video and multimedia distribution and that will drive the need for greater video distribution capacity. SpaceCast™ will help meet this need.

Construction of the SpaceCast™ system will in large part be accomplished by HE, an American telecommunications firm. The space segment will consist of high-power satellites that will be manufactured at the Hughes Space and Communications plant in El Segundo, California. Ground terminals will be manufactured by Hughes Network Systems of San Diego, California and Germantown, Maryland, and by other U.S. suppliers. Use of U.S. manufacturing

and construction facilities to build SpaceCast™ will result in creation of many highly skilled professional jobs for Americans.

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3. MARKET FOR SERVICES

3.1. PROPOSED SERVICES

SpaceCast™ is a high-capacity international satellite system designed to provide high quality digital service that meets the increasing demand for a wide variety of multimedia applications. Three unique characteristics provide an ability to offer new services. First, users will be able to receive SpaceCast™'s transmissions through terminals as small as 45 cm (18 inches). Second, the system has been designed to receive uplink signals from small (2.5 m) antennas at any (including remote) locations, thereby eliminating the need for constructing large uplink facilities and for backhauling signals. Third, SpaceCast™'s high system capacity will enable niche-oriented and specialized broadcasts to be transmitted at affordable rates.

SpaceCast™ will support many new video and multimedia applications. SpaceCast™ will help meet the increasing video transmission needs being generated by the growth of the Internet, both domestically and internationally. SpaceCast™ will also help distribute multilingual programming to and from other countries. In addition, as commerce continues to be increasingly international, SpaceCast™ will broaden the ability of companies to offer employee training on a wide variety of topics. Finally, SpaceCast™ will enable international distance learning -- a true breakthrough in educational opportunity for people around the world.

3.2. Broadcasting Information/Webcasting

The delivery of personalized content is becoming much more important in the multimedia world of the World Wide Web. "Push technology" delivers

information to desktops without the user having to search for it. Examples of such information include video of current news events or the overnight delivery of electronic newspapers and periodicals. Push technology businesses and revenues are projected to grow at an exponential rate in the next few years.

SpaceCast™ will facilitate the evolution of the World Wide Web into a much more effective vehicle for multimedia applications and information. Advances in video compression techniques and multicasting technology will allow broadcasting over the Internet to emerge as the newest method of multimedia distribution, utilizing the latest means of video streaming and satellite networking.

The rapid growth of Internet use in the U.S. has been followed subsequently by similar growth rates in international use. As a consequence, international transport requirements for Internet traffic are expected to continue to increase dramatically. The domestic increase in video and multimedia traffic will also occur internationally. SpaceCast™ is specifically designed to accommodate the transport of international multimedia traffic to and from the U.S.

3.3 Video Programming

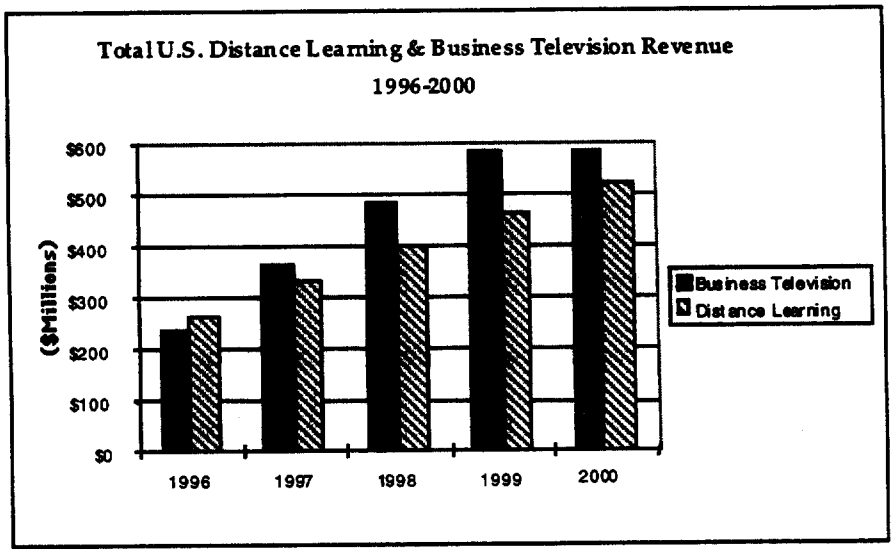
Globalization of the economy has brought about a compelling need to understand the politics, cultures, and languages of other countries. Additionally, globalization has expanded horizons and broadened entertainment tastes of consumers worldwide. Because of its increased capacity, flexibility, and international capability, SpaceCast™ will be an invaluable additional resource for meeting these requirements.

Interest in international programming is increasing domestically as well as internationally. People everywhere are becoming more aware of the array of content offerings outside of their home countries. The U.S. population is becoming more diverse, and many viewers desire information about events and views from their countries of origin or ancestry. Increasingly Americans seek real time access to sports events, travel information, and general news from other countries. SpaceCast™ will deliver original international programming to these specialized audiences.

New developments in digital television, including High Definition Television (HDTV) may strain existing capabilities for delivery of video programming by satellite. The high data rate capabilities and high capacity of SpaceCast™ will provide a video distribution capability that otherwise would not be available.

3.4 Educational and Business Video

As wide area networks and communications have become more cost-effective, distance learning and business television applications have grown significantly. It is predicted that total revenues for the U.S. distance learning market will top $519 million by the year 2000. The U.S. business television market is growing even more



Source: Market Vision, 1996

Figure 3.2.3-1. U.S. Distance Learning and Business Television Revenues

rapidly and will exceed $585 million by the year 2000. This represents growth rates of 99% and 146%, respectively, from 1995, as Figure 3.2.3-1 illustrates.

The U.S. educational system is increasingly using telecommunication technologies to educate students at multiple sites, especially sites that are remote from main campuses. Distance learning can reduce some of the financial pressures on our educational system by eliminating the high cost of physical expansion of campuses. It allows expansion of enrollment without adding instructors and facilitates the provision of an increased variety of courses to a wide audience.

Business television is experiencing rapid growth within corporate communications, because it facilitates broadcasting of corporate policies, speeches and other important employee information to disparate corporate facilities. Use of the SpaceCast™ broadcast system for corporate video will enable American businesses to communicate with many offices more easily and economically.

The training market is another rapidly growing application for SpaceCast™. From 1996 to 2000, Market Vision forecasts that this market will have a growth rate of 27%. Video training via SpaceCast™ will increase U.S. productivity and competitiveness. It will help U.S. business adapt more effectively to constantly changing technologies. SpaceCast™ will also be a powerful medium for uniting widely dispersed company operations.

Training is becoming more and more critical in fast-changing industries such as telecommunications, information technologies, and service-intensive industries where the product life cycles are shortening and services are being redefined frequently. In the environment of just-in-time manufacturing and distribution, SpaceCast™ will enable corporations to transmit product information and sales training for new products instantly.

SpaceCast™ will also contribute to the medical services sector of the economy. Health care is an increasingly critical sector, in terms of availability, quality, and cost. People want high quality care regardless of their location and do not want to be disadvantaged if they live in a remote area. SpaceCast™ can be used to educate people regarding preventive measures and to provide continuing education to health care professionals at their convenience. SpaceCast's flexibility would also

allow this information to be broadcast in specialized formats or languages for specialized audiences.

3.5 Kiosk Centers for Video Reception

There is a growing kiosk phenomenon in the U.S., which SpaceCast™ will support. Specialized video programming is being increasingly distributed to locations such as terminals, waiting rooms, and schools, designed for the particular makeup and circumstances of the audiences at these sites. These "kiosk" reception centers will increase in popularity as advertisers and content distributors take greater advantage of new technologies such as SpaceCast™.

In addition, multi-location retailers can use in-store/in-mall video kiosks to provide promotional and product information to shoppers. Video kiosks are also an efficient and cost-effective way for retailers to deliver messages and informative video content to their clientele. The same kiosks can also receive video broadcasts for employee training. In addition to the commercial applications for kiosk systems, public information is also being sent to kiosks. For example, in the aftermath of Hurricane Andrew in 1995, disaster relief officials implemented kiosks to provide needed information during the relief effort.

These and other innovative video and multimedia services will be provided by SpaceCast™. This highly flexible and cost effective system will bring many new services and benefits to consumers.

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Systems Description

4. SYSTEM DESCRIPTION

4.1. General Overview of the System

4.1.1 Spectrum

The SpaceCast™ system will utilize 3 GHz of uplink and downlink spectrum at V-band with dual polarization. It will also utilize 500 MHz of uplink and downlink spectrum at Ku-band with dual polarization. It will re-use the V-band spectrum up to 40 times per satellite and Ku-band spectrum up to eight times per satellite.

HCI acknowledges that certain portions of the Ku-band identified in Section 4.2 below are already in use at certain orbital positions that HCI has proposed for SpaceCast™. HCI expressly does not seek authority to use any portion of the Ku-band at any orbital position where that portion is unavailable.[2] The existing uses of portions of the Ku-band at different orbital positions and the differences in the allocations for these bands around the world are the reasons why HCI has specified a range of Ku-band frequencies currently allocated for the FSS of which it proposes to use 500 MHz at each orbital position (a range of 12.75-13.25 and 13.75-14.5 GHz in the uplink band and 10.7-12.75 GHz in the downlink band). While each SpaceCast™ satellite will be capable of operating across this entire range, in order to simplify

[2] The 12/14 GHz band is available for assignment at 125° W.L. as of the end of the useful life of GSTAR II. *See Assignment of Orbital Locations to Space Stations in the Domestic Fixed Satellite Service,* DA 96-713 (released May 7, 1996), Appendix.

satellite construction and provide maximum in-orbit redundancy, it actually will operate at each assigned position only on the spectrum that is available for licensing there.

4.1.2 Terminals

Customers' needs will be met by a family of small dishes, from 45 cm to 1 meter (18 - 39 inches) for receive-only operation to 2.5 meter for two-way use, as described in Figure 4.10.3-1. Receive-only terminals can be dual frequency mode or single frequency mode.

4.1.3 Coverage

The SpaceCast™ system will cover regions in North America, Europe, and Asia, as shown in Appendix C. The system will use four orbital positions: 125° W, 60° W, 39° W, and 155° E. Each satellite will cover high demand areas via up to 40 spot beams at V-band and will provide additional coverage via up to 16 large area beams at Ku-band. Laser ISLs will interconnect SpaceCast™ satellites to allow direct routing between satellites.

4.2. Frequency Plan

Figure 4.2-1 shows an overview of the frequency and polarization plan for the SpaceCast™ system. As shown in Figure 4.2-1a, V-band communications will take place in the 47.2-50.2 GHz (Earth-to-space) and 39.5-42.5 GHz (space-to-Earth) bands. SpaceCast™ can provide up to 40 V-band beams and up to 16 Ku-band beams. This achieves 40 times reuse of the V-band spectrum and eight times reuse of the Ku-band spectrum. These beams can be deployed or redeployed within the coverage

area of the satellite depending on market demand. Antenna tracking beacons will be at the lower edges of the V-bands and Ku-bands.

Figure 4.2-1b shows the frequency plan for Ku-band communications. The planned Ku-bands are used for illustrative purposes. 500 MHz of spectrum in the 12.75-13.25 GHz and/or 13.75-14.25 GHz uplink band and the 10.7-12.75 GHz downlink band will be utilized. Up to 16 elliptical beams will be used with 250 MHz of bandwidth to minimize beam-to-beam interference. The Ku-band spectrum will be reused up to eight times per satellite.

Figure 4.2-1c shows the plan for command, telemetry, ranging, and tracking beacons. All of these functions will take place at Ku-band, using approximately 2 MHz of bandwidth near the lower edges of the uplink and downlink bands.