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March 12, 2001

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VIA HAND DELIVERY

Magalie Roman Salas
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

RE: In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commissions' Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; and Application of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band
ET Docket No. 98-206, RM-9147, RM-9245

Dear Ms. Salas:

Transmitted herewith, on behalf of SkyTower Inc., is an original and eleven (11) copies of its Petition for Reconsideration with respect to the *First Report and Order,* FCC 00-418, released by the Commission in the above-captioned proceeding.

An extra copy of the filing is enclosed. Please date-stamp the extra copy and return it to the courier for return to me.

No. of Copies rec'd 0+11
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Please direct any correspondence concerning this filing to the undersigned counsel.

Respectfully submitted,

Jonathan Epstein
Counsel for SkyTower Inc.

Enclosure

WAS1 #926482 v1

Before the
Federal Communications Commission
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range;	)	
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	)	
Application of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band	)	

To the Commission:

PETITION FOR RECONSIDERATION

OF

SKYTOWER, INC.

Marvin Rosenberg
Jonathan Epstein
Holland & Knight LLP
2099 Pennsylvania Avenue, N.W.
Suite 100
Washington, D.C. 20006
(202) 955-3000
Counsel for SkyTower, Inc.

March 12, 20001

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range;	)	
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	)	
Application of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band	)	

To the Commission:

PETITION FOR RECONSIDERATION

Pursuant to Section 1.429 of the Commission's Rules, 47 C.F.R. § 1.429, SkyTower Inc. ("SkyTower"), by and through counsel, hereby petitions the Commission to reconsider certain portions of its *Report and Order*[1] in the above captioned proceeding.[2] In particular, if the Commission adheres to its decision to

[1] In the Matter of Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency Range; Amendment of the Commissions' Rules to Authorize Subsidiary Terrestrial Use of the 12.2-12.7 GHz Band by Direct Broadcast Satellite Licensees and Their Affiliates; and Application of Broadwave USA, PDC Broadband Corporation, and Satellite Receivers, Ltd. to Provide A Fixed Service in the 12.2-12.7 GHz Band, First Report & Order and Further Notice of Proposed Rulemaking, ET Docket NO. 98-206, FCC 00-418 (rel. December 8, 2000) (hereinafter "*Report & Order*").

[2] The *First Report & Order* in this docket was published as a final rule in the *Federal Register* on February 16, 2001 (66 Fed. Reg. 10601 (2001)). Hence, this Petition is timely filed.

permit the sharing of spectrum in portions of the Ku-Band, then the Commission should reconsider its decision that appears to limit the additional services that can use this Band to non-geosynchronous orbit (NGSO) satellite systems and terrestrial technologies that have already been proposed by specific companies.

SkyTower takes no position on spectrum-sharing in the Ku-Band on a non-interference basis with the primary Broadcast Satellite Service ("BSS"). However, if spectrum-sharing is to be permitted, then the Commission should permit any technology that can meet the spectrum-sharing non-interference criteria to use this spectrum.[3] Such a policy would promote efficient use of the spectrum and serve to promote further competition in the multichannel video programming distribution ("MVPD") market and in the two-way service market.[4] As currently enunciated by the Commission, however, the new rules will limit the use of the spectrum to terrestrial Multichannel Video and Data Distribution Services ("MVDDS") and NGSOs.

To foster competition and increase telecommunications services to the public, Congress and the Commission have, in recent years, often adopted technologically neutral approaches to encourage the development and deployment of new technologies. In particular, SkyTower believes that its stratospheric platforms as described in Part I.A. (using transponders mounted on solar powered aircraft flying

[3] The Commission has stated that its actions in this proceeding "will allow new advanced services to be provided to the public, as well as provide increased competition to existing satellite and terrestrial services. *Report & Order* ¶ 19; and further its actions are consistent with its obligations under Section 706 of the 1996 Telecommunications Act to encourage "deployment of advanced telecommunications capability to all Americans. . . " and to "remove barriers to infrastructure investment."

at high-altitudes) will provide a cost-effective means of providing local-into-local broadcasting or other multichannel video and data services over limited geographic regions on a non-interference basis with incumbent Broadcast Satellite Services ("BSS"), NGSOs and other MVDDS services. In fact, the SkyTower Platforms could be used by BSS, NGSO, or MVDDS services to augment their signals in particular situations. For example, in mountainous terrain or large cities, stratospheric platforms may largely avoid terrain shadowing and urban canyon concerns, reducing the need for multiple towers. Stratospheric platforms could also be used by BSS or NGSO FSS to augment signals in Alaska or other locations not well covered by existing satellite arrays.

Stratospheric platform technology is only now emerging from the experimental stage and becoming a commercially viable telecommunications architecture. SkyTower's cutting edge technology and business model only recently reached a sufficiently mature stage to permit SkyTower to participate in spectrum allocation issues. SkyTower itself was not formed until late 2000. Hence, neither SkyTower nor its parent company, AeroVironment Inc., could have meaningfully participated any earlier in this rulemaking, particularly since the rulemaking dates back to 1997.

Wherefore SkyTower believes that the Commission can, with only slight clarification of the *Report & Order*, expand its licensing regime for portions of the

---

[4] (*i.e.*, using the 12.2-12.7 GHz spectrum for high speed broadcast downlink and the user uplink would be accomplished via another path).

Ku-Band to include a broader range of technologies, including services using stratospheric platforms.

I. THE SKYTOWER PLATFORM IS WELL SUITED FOR MVPD SERVICE

As shown below, stratospheric platforms will be a new and highly efficient means for providing telecommunication services. The SkyTower Platform represents cutting edge technology, has unique advantages over both terrestrial and space-based systems, and, based on present analysis, will meet proposed non-interference standards.

A. The SkyTower Platform

SkyTower's parent company AeroVironment, Inc., together with NASA and others, has developed an unmanned, solar-electric airplane named "Helios," whose technology will be licensed to SkyTower by its parent. With 250' solar panel wings and a loitering speed of 60 mph, Helios will be capable of continuous flights up to six-months at an altitude of 60,000 feet; at this altitude, Helios will be above weather patterns and commercial air-traffic. It will fly a tight-station keeping pattern that, from the ground, will appear essentially stationary.[5] The aircraft is intended to be equipped with a payload capacity capable of providing services including direct broadcast, fixed-broadband, or third generation mobile applications. It will provide a cost-effective stratospheric platform operational year-round, scheduled to be available by 2004.

[5] *See* SkyTower Overview and Technical Description attached hereto. ("Technical Description").

While Helios has a number of potential telecommunications applications, it is particularly well suited to provide multichannel video and data services including specifically local broadcast stations over a regional area. In fact, one television broadcast licensee has already approached SkyTower about providing a local-into-local service in one or more DMAs. Under current planning, a Helios aircraft would orbit in a location north of the areas served, providing signals in shaped footprints over the areas served in the downlinked 12.2-12.7 GHz Band. SkyTower estimates service to an area encompassing a 50-mile primary Grade A signal, and 150-mile Grade B signal. A gateway transmitter to uplink the programming to the Helios could use any of the Ku-Band frequencies allocated for NGSO uplinks. *See* Technical Description.

B. The SkyTower Platform Has Advantages over Terrestrial and Space Based Systems

The Commission should recognize and encourage new technologies such as Helios, that will provide significant advantages over terrestrial and space based systems for certain applications. A stratospheric platform offers a particularly good means of delivering local or regional MVPD services.

Among the significant advantages a stratospheric platform such as the SkyTower Platform, has over satellites for many applications are: (1) deployment is likely to be significantly less expensive; (2) platforms are easily movable and are fungible with less sunk startup costs associated with acquisition or lease; (3) onboard transponder failures can easily be replaced and payloads upgraded over

time as transponder technology improves; (4) the relatively low-altitudes means minimal time-delay and lower power requirements for both transmitting and receiving; (5) an excellent way to provide local-into-local signals to augment DBS or other national MVPD provider signals; and (6) a more efficient use of spectrum for local broadcasting delivery than non-spot beam satellites.

Compared to terrestrial tower-based systems, stratospheric platforms also have a number of advantages: (1) no issue of interference problems in proximity to tower sites; (2) better coverage to television station's service areas because terrain and other masking issues are less of an issue; (3) no tower-siting environmental issues; and (4) potentially fewer fixed costs.

C. The SkyTower Platform Would Meet Technologically Neutral Non-Interference Standards

Based on its analysis, SkyTower fully expects that any proposed service using the SkyTower Platform could meet the Commission's proposed non-interference standards. *See* Technical Description. In fact, both the downlink broadcast and gateway uplink for a stratospheric platform present fewer interference concerns for BSS than do NGSO and terrestrial systems. For example, in one configuration, a SkyTower Platform could transmit southward over a well-defined footprint with such blanking zones as necessary to prevent interference with BSS broadcasts (*i.e.,* blanking northward transmissions). Hence, these signals would be received by a northward pointed antenna and would not interfere with southward pointed BSS dishes. Further, interference issues in proximity to tower locations would not be

present. Similarly, the gateway uplink to the SkyTower Platform poses few, if any, potential interference issues, as the narrow beam is aimed at the stratospheric platform, which is essentially stationary. Further, potential interference with NGSO and FSS uplinks can be avoided by locating the transmitter, so that the uplinks avoid FSS or NGSO arcs.

SkyTower believes that the Commission must implement technologically neutral interference standards that adequately protect the primary BSS providers; however, if spectrum-sharing is to be permitted, the Commission should allow maximum flexibility for new technologies to make use of the spectrum as long as they provide the required proof of non-interference. Assuming the Commission adopts its option to have a licensing window for secondary applications, *Report & Order and Further NPRM*, ¶ 327, MVDDS applicants would need to demonstrate compliance with the non-interference rules as part of the application process. Hence, if a proposed MVDDS service chooses to use stratospheric platforms as the primary broadcast platform, or to augment its service in particular areas, it would need to demonstrate such compliance.

II. THE COMMISSION SHOULD ADOPT A TECHNOLOGICALLY NEUTRAL APPROACH THAT FOSTERS NEW TECHNOLOGIES

Allowing for new technologies to utilize spectrum on a non-interference basis is good public policy. Both Congress and the Commission recognize the continuing convergence of technologies and the need to take a technologically neutral approach with respect to licensing and allocating scarce spectrum resources. In fact, the Commission's reasons for allowing the sharing of Ku-Band by new

technologies, (NGSO FSS and terrestrial MVDDS), rest on this very principle: "The Commission has consistently supported and facilitated the emergence of innovative technologies such as those that can share spectrum with existing services." *Report & Order* ¶ 259.

Recent legislation also supports a "technologically neutral" approach to increasing MVPD service. The "'Launching our Communities' Access to Local Television Act of 2000"[6] creates a Local TV Loan Guarantee Board to provide loan guarantees to assist companies in deploying MVPD or other systems that will carry local television station broadcasts to unserved or underserved areas. Congress stated its concern that limiting the loan guarantee program to specific technology would further hinder deployment of new systems. In fact, the express purpose of this legislation is "to facilitate access, on a *technologically neutral* basis and by December 31, 2006, to signals of local television stations for households located in nonserved areas and underserved areas." Act at § 1002 (emphasis added). The legislative history makes clear that Congress intended to encourage the development of various technologies that are suited to meet its goals:

> The Act is technologically neutral, meaning that it does not favor a particular technology, industry, or means by which local television signals may be delivered. This principle is especially important given the rapid change in technologies that can provide such service and the possibility that the most economically efficient delivery mechanisms in use today may be obsolete in the near future. [7]

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[6] Public Law 106-553 (Dec. 21, 2000). This bill, designated as H.R. 3615, was incorporated into H.R. 5547 (appropriations for the District of Columbia), which was eventually incorporated into H.R. 4942, one of the consolidated appropriation bills for FY 2001).

[7] S. Rept. 106-243, 106th Cong., 2nd Sess, at p. 4 (Mar. 15, 2000).

Because of their relatively large local footprint, stratospheric platforms provide a cost effective means to provide service in rural areas. Making portions of the Ku-Band available, on a technologically neutral basis, would further the intent of Congress in passing this Act, and would allow new technologies, such as SkyTower's proposed system, to be used to provide service to unserved or underserved areas.

With the continuing advances in communications technology, one of the major hurdles a new, more efficient technology may face is finding spectrum in which to operate. In fact, the uncertainty as to whether spectrum is available may adversely affect the ability to secure private financing of the very technologies that the Commission seeks to foster. Further, in expanding its rules to include other technologies, the Commission in no way negatively impacts BSS or the proposed NGSO and MVDDS services, as any new technology would need to demonstrate compliance with non-interference standards during the licensing process. In fact, as discussed above, these systems may very well choose stratospheric platforms to augment existing broadcast platforms.

By adopting a technologically neutral approach, the Commission will further the public interest by maximizing the technologies that can compete to provide MVPD services.

III. CONSIDERATION OF STRATOSPHERIC PLATFORM ISSUES CAN BE ADDRESSED IN THIS PROCEEDING

Procedurally, SkyTower is filing this Petition for Reconsideration because the *Report & Order* makes reference only to "terrestrial MVDDS" and NGSOs. However, since SkyTower believes that it can meet the interference criteria set forth in the *Report & Order & Further NPR,* its concerns can be addressed by clarifying that: (1) where in its *Report & Order,* the Commission authorizes "a new terrestrial MVDDS," such service includes other services such as those utilizing stratospheric platforms;[8] (2) by amending 47 C.F.R. § 25.146 to provide that: "The Commission may approve other secondary use of this spectrum for uplink to stratospheric platforms or downlink subject to the noninterference standards set forth in this Part;" and (3) by including stratospheric platforms in the table of frequency allocations. SkyTower is submitting separate comments in the ongoing rulemaking regarding MVDDS, which will suggest only minor changes beyond the options already being considered by the Commission to ensure that the MVDDS rules are truly technologically neutral.

CONCLUSION

In summary, it is in the public interest for SkyTower, and companies like SkyTower developing innovative technologies, to develop and provide new MVPD services. The Commission should not inadvertently foreclose SkyTower and other future technologies from making efficient use of this spectrum by limiting the

applicability of its MVDDS rules directly or indirectly to specific technologies proposed by specific companies.

Respectfully submitted,

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Counsel for SkyTower, Inc.

March 12, 20001

WAS1 #915177 v4

[8] *See, e.g., Report & Order*, ¶ 1 ("[T]he Commission concludes that a new terrestrial fixed Multichannel Video Distribution and Data Service ('MVDDS') can operate in the 12.2-12.7 GHz Band on a non-harmful basis with incumbent Broadcast Satellite Services . . . .")

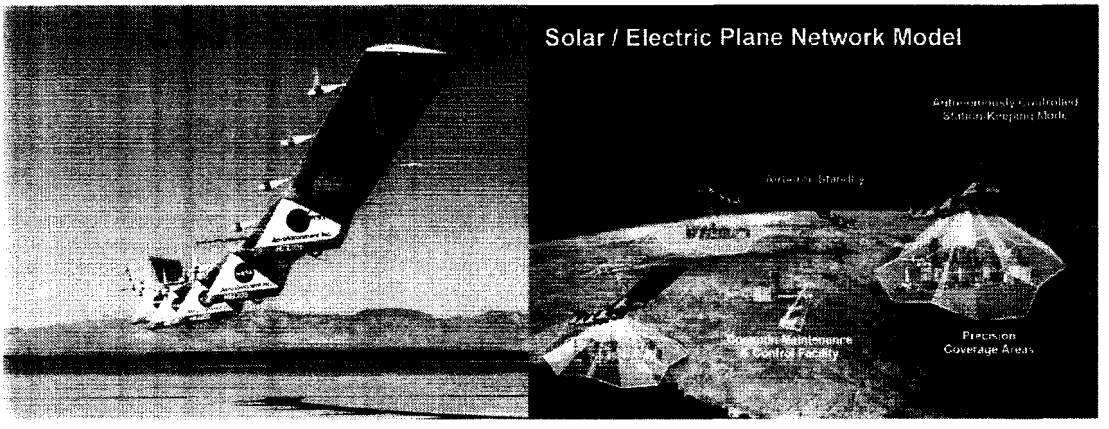
SkyTower Inc., 825 Myrtle Ave., Monrovia, CA 91016, Ph: (626) 357-9983, Fax: (626) 359-9628

SkyTower Overview and Technical Description

Introduction

SkyTower Inc. is a company that was recently formed by AeroVironment Inc. to offer commercial telecommunications services via solar-electric powered aircraft, which fly in the stratosphere and provide platforms for relaying telecommunications signals. It is anticipated that SkyTower's stratospheric platforms will provide low cost, rapidly deployable solutions for a variety of telecommunications applications including local-to-local direct broadcast and broadband local access services. SkyTower Inc. is a subsidiary of AeroVironment Inc., a high technology company founded in 1971 (refer to the summary at the end of this paper for additional information on AeroVironment).

Working with NASA in a cost-shared multi-year development program under a Jointly Sponsored Research Agreement, AeroVironment has developed an unmanned, solar-electric airplane called Helios which will be capable of continuous flight for up to six months or more at 60,000 feet in the stratosphere, above the weather and commercial air traffic. Helios will provide a telecommunications platform from this position in the stratosphere, acting as an 11-mile tall tower—hence the name "SkyTower." SkyTower solar-electric airplane based networks have many advantages that make them excellent complements to, or local alternatives for, terrestrial and satellite systems.



AeroVironment, recognized as the world leader in solar-powered flight, has been developing the technology for over 20 years, and it is only recently that the energy and payload technologies have matured to the point that telecommunications applications are now both economically and technically feasible using solar-electric aircraft.

Unique features of these solar-electric aircraft that make them optimal platforms for telecommunications applications include:

- Long flight duration of up to six months or more;

- Minimal maintenance costs due to few moving parts (*e.g.,* each motor has only one moving part);
- High levels of redundancy - most failure modes do not require any immediate response by the ground operator; e.g., the aircraft could lose multiple motors and still maintain station and land safely;
- Minimal operational costs, e.g., highly autonomous controls enabling one ground operator to control multiple aircraft, use of solar energy to minimize/eliminate fuel costs; and

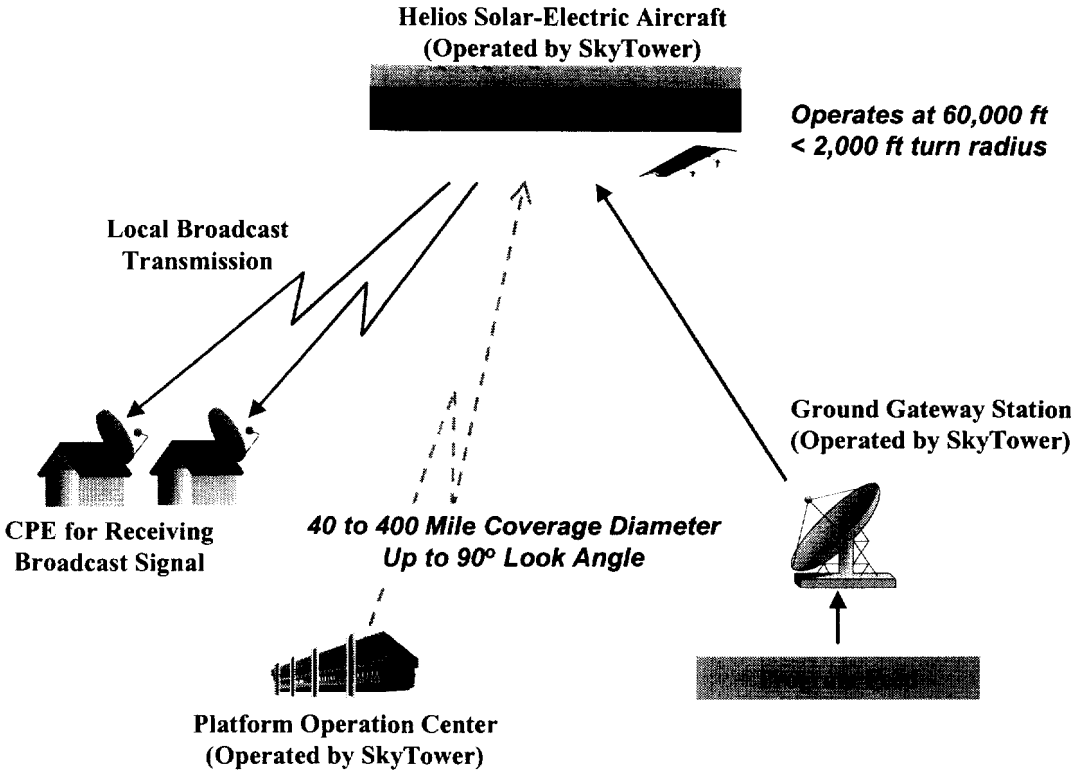
The potential telecommunications applications that SkyTower may offer include local-into-local broadcast, Multi-Channel Video and Data Distribution Services (MVDDS), and mobile telephony. More specifically, if the FCC determines that spectrum sharing of the 12.2-12.7 GHz Band is permissible for stratospheric platforms, this spectrum could be used by SkyTower to provide either local-to-local broadcast services, or the downstream portion of two-way broadband services (the user uplink would be accomplished via another path). As discussed below, the near stationary nature of Helios flight will permit it to reuse the 12.2-12.7 GHz band on a secondary basis without interfering with the primary Broadcast Satellite Services (BSS) services.

System Architecture

The basic system architecture will consist of:

- A Stratospheric Platform Station
- Primary and backup Stratospheric Platforms (Aircraft)
- A Gateway Station on the Ground
- Customer Premise Equipment
- A Flight Operations Center

SkyTower Local-to-Local Broadcast System



The Stratospheric Platform broadcast location will be an envelope in the stratosphere approximately 2000 feet in radius by 200 feet in altitude where a primary Stratospheric Platform will loiter continuously. The Helios solar-electric aircraft can station keep within this envelope due to its slow flight speed. Flying within this envelope enables the platform to appear geostationary from a ground user equipment perspective, thus allowing the use of conventional dish type receivers.

In addition to the primary Stratospheric Platform, standby Platforms will be available both in the air and on the ground to provide backup service in the event that the primary aircraft stops transmitting.

The Gateway Station will be a site on the ground where broadcast content is beamed to the Stratospheric Platform for further distribution. It will consist of a control building and the uplink antennas. The uplink antennas are very narrow beam antennas that form a point-to-point communications link to the stratospheric platform.

Customer Premise Equipment will be similar to today's direct broadcast TV receivers, consisting of an antenna, an LNA/down-converter and a set-top box.

The Flight Operations center will provide maintenance and operations support for the Stratospheric Platforms themselves. The long flight duration of the aircraft means that a very small number of flight operations centers will be necessary to support many Stratospheric Platform Stations throughout a large region. The pilots will be physically

located at the Flight Operations Center and control the platforms and communicate with air traffic control authorities remotely.

System Technical Description

Aircraft Systems

The SkyTower platforms will be based on AeroVironment's unmanned solar-electric aircraft technology that was initially developed over the past 20 years. Traditional aircraft cannot economically offer telecommunications services due to their high operational costs and limited service availability due to their short flight duration, vulnerability to weather and other operational logistics issues. SkyTower's aircraft technology overcomes these limitations because of its extremely long flight duration, minimal maintenance requirements, and ability to operate in the stratosphere. The use of solar power, highly efficient Fuel Cell Energy Storage Systems, highly reliable mechanical design, lightweight payloads, and ground based pilots will enable flights that last for up to 6 months or more between landing for routine maintenance. The high flight altitude at 60,000 feet, in the stratosphere (above all weather and commercial air traffic), and the ability to select take off and landing times, overcomes the weather impacts to operations which are commonly associated with aircraft operations.

Development of the Helios Stratospheric Platform has been evolving since the late 1970's when AeroVironment's founder Dr. Paul MacCready built the Gossamer Condor, the first airplane to fly using only human power. This led to a series of other extremely light/efficient aircraft including the unmanned, solar powered Pathfinder, the Stratospheric Platform technology demonstrator which currently holds the record as the highest flying propeller powered aircraft, having flown to 80,100 feet in a NASA program in 1998. The Helios Prototype is currently undergoing flight testing.

Communications Systems

The main benefit Helios brings to the broadcast industry is the ability to offer localized service. At an altitude of 60,000 feet, Helios platforms have a horizon-to-horizon footprint of over 400 miles in diameter. After restricting the radiation pattern to higher elevation angles in order to avoid terrain and foliage shadowing, the footprint shrinks to between 100 and 150 miles in diameter. This coverage area is very close to the size of a typical urban consumer broadcast television or FM radio market. A Stratospheric Platform, therefore, is well suited for rebroadcasting local to local television and/or radio programming.

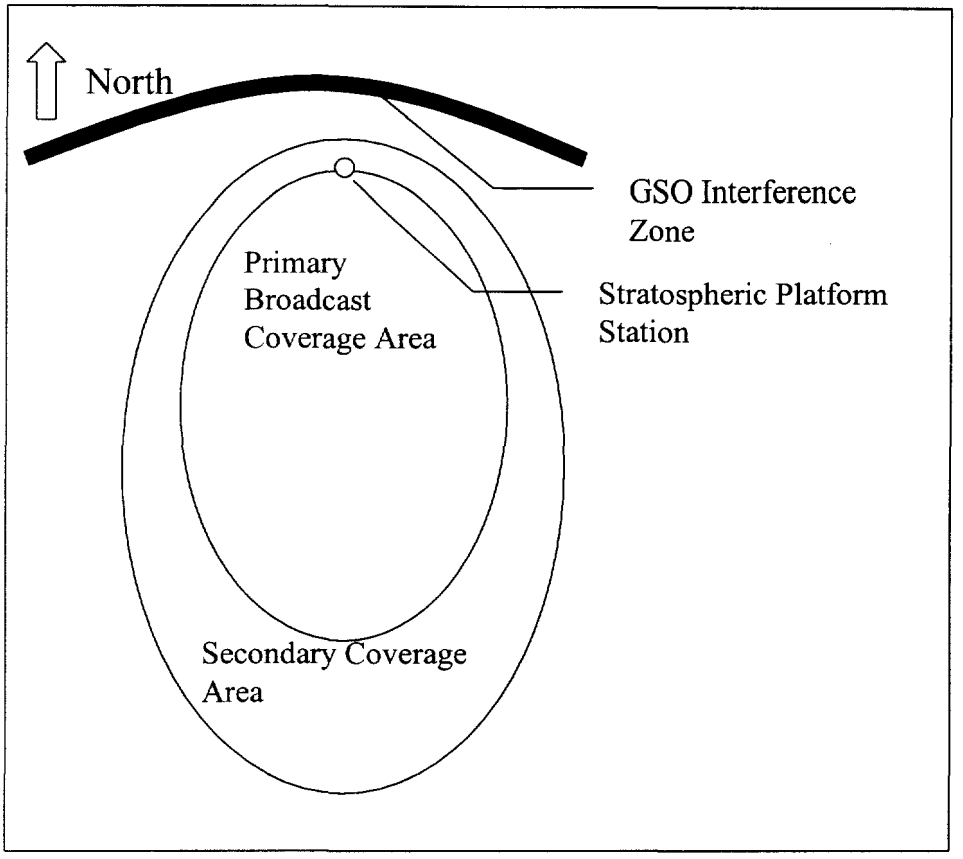
Proposed Frequency Utilization

For local-into-local or other MVDDS type services, SkyTower proposes to use 12.2-12.7 GHz Band in specific geographic areas for downlink broadcast purposes. The ability to station a Stratospheric Platform north of a city and transmit only to the south permits it to share this spectrum on a non-interference basis with the primary BSS services. Subscribers wishing to receive signals from Stratospheric Platforms would simply point their antennas north toward the Stratospheric Platform Station, while those wishing to receive signals from DirecTV or EchoStar can point to the respective satellites located generally to the south over the equator.

Several coverage areas can be defined under the aircraft where differing coverage qualities can be obtained, depending upon the distance from the Stratospheric Platform Station and the antenna gain from the transmit antenna onboard the Stratospheric Platform. In secondary coverage areas, a higher gain receive antenna will be necessary.

Since SkyTower's Platforms Stations are located at altitudes of 60,000 feet, there will not be any interference to BSS subscribers located near the transmitting platform, a problem inherent with tower based terrestrial broadcast systems reusing the BSS spectrum.

To avoid potential interference with BSS signals, the system architecture calls for establishing blanking areas covering a zone on the ground, beneath the Stratospheric Platform Station where the Stratospheric Platform and Geo Stationary Orbit (GSO) satellites are in line (*i.e.,* where the angular separation between the GSO and the SkyTower platform are insufficient to avoid potential interference). This zone is referred to as the GSO Interference Zone (GSO-IZ). By locating the SkyTower Platform North of the broadcast areas and transmitting southward, any potential interference can be avoided.



Uplink of the signal to be broadcast from the SkyTower Platform will come from the a gateway station. The gateway station will be located on the ground, nearly underneath the SkyTower Platform Station. It will use a high gain steered antenna to accurately track the SkyTower Platform as it circles about its station. The high gain antenna, in addition to providing a high data rate uplink, also provides a high degree of angular isolation at tightly controlled angles nearly vertical. Hence, this gateway uplink poses few, if any, potential interference issues. For example, SkyTower could utilize a segment of Ku-Band spectrum allocated for NGSO uplink without interfering with BSS, or NGSO uplinks or use other spectrum.

Although not an issue with broadcast applications, by using technology similar to satellite spot-beam technology, SkyTower Platforms can form a cellular type reuse pattern on the ground. This enables an extremely high degree of frequency reuse and can enable very high capacity 2-way wireless applications. The high capacity, simple deployment, and low costs make SkyTower platforms a viable means of offering competitive broadband data connectivity to residential and businesses, including under-served regions such as poor inner-city neighborhoods and rural areas where low density of subscribers makes traditional means of data delivery uneconomical.

SkyTower Deployment Plan

Investment to-date in the technology is over $80,000,000. This investment has enabled AeroVironment to demonstrate the technical viability of operating unmmaned solar-electric aircraft in the stratosphere. Additionally, telecommunications applications via SkyTower Platforms have been validated with telecommunications equipment and service providers.

SkyTower plans to launch the first commercial telecommunications service in 2004, upon completion of the remaining aircraft and communications systems development, robust validation testing of the fully integrated system, and certification of the aircraft platform. After launching the first service, the company plans to expand into other markets/applications.

As mentioned previously, if the FCC determines that spectrum sharing of the 12.2-12.7 GHz Ku-Band frequency range is permissible for stratospheric platforms, this spectrum could be used by SkyTower in the United States to provide local-to-local broadcast services, and/or the downstream portion of two-way broadband services.

Prepared By:

Stuart Hindle
Vice President of Strategy & Business Development
SkyTower Inc.

Earl Cox
Director of Communications Technology
SkyTower Inc.

March 12, 2001

WAS1 #926284 v3

AeroVironment Inc.

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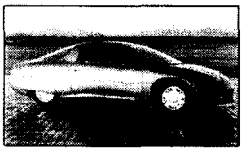
AeroVironment Inc. (AV) is a privately-held company with a minority investment by General Motors Corporation. Founded by Dr. Paul MacCready, AV is known for breakthrough technological achievements, including the first effective human-powered and manned solar-powered airplanes. The company's achievements have been recognized by the Smithsonian Institution, which has selected five AV-developed vehicles for its permanent collection:

- The Gossamer Condor, in 1977, won the Kremer prize for the first controlled, human powered airplane flight.
- The Gossamer Albatross, in 1979, won a second Kremer prize for a human-powered flight across the English Channel.
- The Solar Challenger, in 1981, achieved the first manned solar-powered flight across the English Channel.
- Quetzacoatlus Northropi (QN), in 1985, replicated the flight of the largest winged dinosaur, the 36-foot wingspan pterodactyl, for an IMAX movie.
- The GM Sunracyer, in 1987, won the first annual trans-Australian solar-powered car race in four days, which was two days ahead of its nearest rival.



AeroVironment also was responsible for the development of the GM Impact battery-powered electric car, the precursor to General Motors' EV1 production electric car. Many of these accomplishments are further proof of AV's ability to successfully develop and implement "out of the box" solutions to major industry and technical challenges thought impossible by many. Beginning in the mid-1990's, AV's strategy moved beyond innovative technology development to manufacturing and marketing engineered products and accelerating new businesses. These new products and businesses are based on core competencies in Unmanned Air Vehicle systems and advanced electric power technologies. AV's electric-powered aircraft have benefited from the company's electric vehicle and distributed energy technology breakthroughs in solid-state power electronics, controls, and energy storage systems.

AeroVironment pioneered solar-electric airplanes two decades ago, holds patents on the technology, and is recognized as the world leader in solar-powered flight. Since 1994, NASA has provided cost-shared funding support for AV's solar aircraft development efforts under a Jointly Sponsored Research Agreement. The company is skilled in the development, fabrication, and operation of unmanned aircraft systems, and has been actively developing unique proprietary technology to provide solar-electric stratospheric platform services for the telecommunications industry since the early 1990's. One of the many unique accomplishments achieved by the AV team is flying the Pathfinder Plus solar-powered airplane in 1998 to a record-breaking 80,000 feet—higher than that achieved by any propeller-powered aircraft (the SR71 spy plane is the only publicly known aircraft to sustain flight higher). Two technology development leaders of the AV's solar-electric planes, Paul MacCready and Robert Curtin, each have 20 years experience in solar aircraft, and have both been inducted into the Aviation Week Hall of Fame. In addition, AV garnered the only Total Quality Management Award made to unmanned aerial vehicle (UAV) prime contractors by the US Joint Project Office for UAV's.

AeroVironment's vision is to be the world's leading innovator of extreme-efficiency technologies that create huge economic and environmental gains in high-growth markets. Current AV businesses include:

- SkyTower solar-electric airplane-based stratospheric platforms for telecommunications applications (spin off)
- iPower Technologies generation systems for distributed energy and automotive markets (spin off)
- iCharge intelligent fast charging systems for industrial and automotive electric vehicles
- Power processing systems for fuel cell, battery and electric vehicle developers
- Micro air vehicles for reconnaissance and communications missions
- Solar-powered pump controller for irrigation, etc. in remote regions
- Customer research and development services (e.g. unmanned and specialty aircraft projects, fuel cell/energy storage system development, system integration services, etc.).