VIII. Costs

Separately, for EchoStar and DIRECTV, for each of the past four years and the next two years, provide for each state, DMA, and for the United States as a whole:

a. actual or expected costs (total, variable, average total, and average variable cost) of providing MVPD service, excluding (plant, equipment, and other relevant) maintenance costs and programming acquisition costs;

The requested actual and expected costs are not available on a state or DMA basis. For total actual costs of providing MVPD service for each of the past four years, please refer to Exhibit VII-1 (EchoStar Communications Corporation Consolidated Statements of Operations for 1998-2001). For total expected costs of providing MVPD service for 2002, please refer to Exhibit VIII(a)-1 (EchoStar Communications Corporation 2002 Budget). As for actual or expected variable costs, please refer to Exhibit VIII(a)-2 (Schedule of Actual and Expected Variable Cost). No estimate of expected costs of providing MVPD service for 2003 is currently available.

b. actual or expected costs (total, variable, average total, and average variable cost) to the company of acquiring each new subscriber;

The requested actual and expected costs are not available on a state or DMA basis. For actual costs of acquiring new subscribers for each of the past four years, please refer to Exhibit VII-1 (EchoStar Communications Corporation Consolidated Statements of Operations for 1998-2001). For expected costs of acquiring new subscribers for 2002, please refer to Exhibit VIII(a)-1 (EchoStar Communications Corporation 2002 Budget). *See also* Exhibit VIII(b) (Schedule of Actual and Expected Subscriber Acquisition Cost). No estimate of expected costs of acquiring new subscribers for 2003 is currently available, although EchoStar hopes that it will decrease slightly due to more direct sales.

c. actual or expected maintenance costs (total and average);

The requested actual and expected costs are not available on a state or DMA basis. For actual maintenance costs for each of the past four years, please refer to Exhibit VII-1 (EchoStar Communications Corporation Consolidated Statements of Operations for 1998-2001). For expected maintenance costs for 2002, please refer to Exhibit VIII(a)-1 (EchoStar Communications Corporation 2002 Budget). *See also* Exhibit VIII(c) (Schedule of Actual and Expected Maintenance Cost). No estimate of expected maintenance costs for 2003 is currently available.

d. actual or expected cost of acquiring local-into-local programming, if offered, disaggregated to reflect fixed and variable costs separately;

For a summary of the actual and expected license fee component of the cost of acquiring local-into-local programming set out on a DMA basis for the 36 DMAs in which

EchoStar provides local-into-local service, please refer to Exhibit VIII(d)-1 (Local Stations License Fee Summary 2000-2003).

For a summary of the actual ground costs component of the cost of acquiring local-into-local programming prior to and after the institution of must-carry, which is set out on a DMA basis for the 36 DMAs in which EchoStar provides local-into-local service, please refer to Exhibit VIII(d)-2 (Local to Local Cost Analysis Summary for 12/31/01 and 2/28/02).

e. actual or expected costs of acquiring other programming, disaggregated to reflect fixed and variable costs separately;

The requested actual and expected costs of acquiring non-local programming are not available on a state or DMA basis. For a summary of the actual and expected cost of acquiring non-local programming for 1998-2002, please refer to Exhibit VIII(e)-1 (Non-Local Programming Costs Summary). No estimate of expected total programming costs for 2003 is presently available.

For a summary of the recurring and non-recurring uplink and satellite costs of providing both national and local-into-local service, please refer to Exhibit VIII(e)-2 (Satellite and Uplink Costs Summary). Except where specifically indicated, these costs are attributable to both national and local-into-local service.

f. actual or expected advertising costs.

EchoStar does not maintain a comprehensive accounting of its actual advertising costs on a state or DMA basis. For actual advertising costs for each of the past four years, as well as expected advertising costs for 2002, please refer to Exhibit VIII(f) (Advertising Cost Summary 1998-2002). No estimate of expected advertising costs for 2003 is presently available.

IX. Broadband Services

A. Separately for EchoStar and DIRECTV, describe in detail the following information relating to broadband service offerings currently, for each of the past four years, and projected for the next two years.[1]

1. Peak, average and worst case download speeds.

2. Peak, average and worst case upload speeds.

IX(A)(1 and 2): EchoStar began offering satellite broadband Internet service in the continental United States through StarBand in October 2000. Upload and download speeds vary depending on a number of factors, including subscriber demand, the transponder to which the subscriber is connected, the access scheme and efficiency, and the design of the satellite modem, among others.

[1] Broadband services are facilities-based, two-way services, including high-speed Internet access. Such services may resemble those offered by DSL and cable modem services.

EchoStar does not have projections of upload and download speeds. Conservative estimates of current and 2001 download and upload speeds, using TDMA and a "governor" to regulate bursting speeds, are set out in the table below:

Download	**Peak**	**Average**	**Worst Case**
2001	500 kbps		150 kbps
Current	500 kbps		150 kbps
Upload			
2001			
Current			

3. Other services, including multicasting, proprietary content, mailboxes and storage.

In addition to high-speed, two-way service, StarBand offers email, up to 10 free mailboxes, information and entertainment content, newsgroups, and 10 MB of storage. Currently StarBand does not offer any proprietary content or multicasting services. StarBand promotes its service and technology as being capable of multicasting and plans to offer streaming video and other multicasting services in the future.

4. All relevant prices, including those for usage, installation, and equipment, and any bundles of broadband and other products, including MVPD and ISP services.

EchoStar currently sells the StarBand service unbundled for $74.99 per month, with a 12-month commitment; installation costs start at $199; the receiving equipment, which includes a modem, transceiver, antenna, DBS LNBF kit, and mounting hardware, has an MSRP of $549. A subscriber whose broadband service is disconnected for any reason during the 12-month commitment period is charged a $240 cancellation fee; prior to March 1, 2002, this fee was $499.

For a subscriber who also signs up for DISH Network Television Programming, installation of the television receiving equipment is free; the combined receiving equipment, which includes a modem, transceiver, antenna, 2 DBS LNBFs and mounting hardware, has an MSRP of $549; and there is no access fee. A subscriber who signs up for America's Top 150 television programming pays only $60 per month for StarBand service. A DISH subscriber also has the option to purchase a Dish 301 standalone receiver for $99 (instead of the usual $199).

The only change in pricing since broadband service was first offered in October 2000 concerns the price of the satellite modem. With the original satellite modem, the 180 Model, the MSRP of the CPE was $449. In the second half of 2001, the 180 Model was

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discontinued and the MSRP of the CPE with the 360 Model was changed to its current level of $549.

Over the next two years, EchoStar believes that StarBand intends to continue to endeavor to reduce service, equipment, and installation prices to subscribers. However, given the scale limitations for a Ku-band broadband service, it likely will be difficult to achieve substantial reductions in price absent the merger. Echostar IX would have a Ku-band broadband capacity of approximately subscribers, not enough to achieve meaningful scale economies in manufacturing.

The StarBand business model has not been successful. It is not economically viable today and has proven to be unprofitable for EchoStar, both with respect to the sale of services and equipment.

5. Equipment required by a DBS and broadband customer.

StarBand and DISH services are completely independent and share only the antenna reflector. A DBS and broadband customer needs a single antenna, modem, transceiver, 2 DBS LNBFs, DISH set top box and mounting hardware in order to receive DBS and broadband Internet service.

6. Equipment required by a broadband-only customer.

A broadband-only customer requires a modem, transceiver, antenna, and mounting hardware.

7. Satellites used, satellite band and location, and geographic coverage.

StarBand leases FSS Ku-band CONUS transponder capacity on Americom 4 (formerly GE 4), located at 101° W.L., and Telstar 7, located at 129° W.L. Both satellites have coverage of the continental United States, Alaska, and Hawaii. While both satellites also cover the US Virgin Islands and Puerto Rico, StarBand does not currently provide services in these territories.

In 2002, EchoStar expects to launch EchoStar IX, a hybrid Ka- and Ku-band satellite currently slotted at 121° W.L. The satellite's Ku-band CONUS transponders cover the continental United States, Alaska, and Hawaii and may be used for the StarBand service. EchoStar could use the two Ka-band transponders on EchoStar IX for a number of purposes, including DBS backhaul and/or very limited broadband Internet service. However, EchoStar IX will have only modest Ka-band capacity, and if it were used for Internet service, its spot beam configuration would allow for only a noncontiguous regional service covering Seattle, San Francisco-San Jose, Denver-Cheyenne, and Phoenix.

EchoStar has recently acquired control over VisionStar with the Commission's approval. VisionStar holds a license to construct, launch, and operate a FSS Ka-band satellite system at the 113° W.L. orbital slot. The VisionStar satellite is currently designed to have 32 spot beams that would cover the continental United States. This license is conditioned on completion of construction of the satellite by April 2002, and launching the satellite by May

2002. However, VisionStar's plans regarding the use of that location have changed recently based on a need for technical redesign and other factors. Consequently, VisionStar's plans for use of that location are dependent on FCC concurrence with its revised design plans.

8. Elements of service quality, such as time with reduced download or upload speeds and outages, impact of latency in the uplink and downlink from the satellite, possible loss of signal in heavy rain, average time for a new customer to initiate service, and average time for resolution of customer complaints.

The StarBand service experiences occasional reduced transmission speeds and infrequent service outages. Heavy subscriber usage on a particular transponder, for example, can slow both upload and download speeds. In addition, the service performance can be degraded by very heavy rain and may even stop altogether for brief periods as the peak of the downpour passes between a subscriber and the satellite. Other factors that affect service include users who abuse the fair use policies and thus generate excess traffic by connecting a web server to the system or hosting peer-to-peer file sharing services, and software viruses that infect users' PCs and cause the same effect by generating extraneous traffic.

The time it takes to transmit broadband Internet signals from the ground to satellites in geosynchronous orbits, and then back to the ground, creates a latency that makes satellite broadband unsuitable for applications such as voice/video over IP, VPN services, certain online interactive games, and applications that use non-TCP/IP protocols. For other applications, latency effects are mitigated by "spoofing" the Internet protocol. Spoofing involves two components: (1) TCP protocol emulation in which the TCP protocol is converted into a more satellite-friendly protocol at the hub station and satellite modem; and (2) HTTP page acceleration in which the multiple elements of a web page that normally each open up their own TCP connection are grouped over a single TCP connection by software in the subscriber's PC and the hub station.

The average time for initiation of service is about 4 to 7 days depending on location from the time a prospective customer contacts an authorized DISH/StarBand retailer to the time at which the service is installed and operating. On average, actual installation of the antenna, whether for StarBand alone or StarBand and DBS, takes about four hours and requires a professional installation.

Approximately 95% of customer complaints are resolved by phone in less than 48 hours. Approximately 5% require a service dispatch and are generally resolved within 7 days.

B. For each satellite currently used by EchoStar or DIRECTV to provide broadband services, provide:

1. The capacity available on that satellite for provision of broadband services to the home and to small, medium and large businesses in total Gbps.

As of October 2001, StarBand leased transponders on Americom 4, located at 101° W.L., and transponders on Telstar 7, located at 129° W.L. The Americom transponders

have a total capacity of . The Telstar 7 transponders have a total capacity of .

This capacity is available for both residential and business use. EchoStar does not offer separate packages or options for business customers.

2. The geographic coverage of that satellite for the provision of broadband services.

The transponders leased by StarBand (see above) provide coverage of the continental United States, Alaska, and Hawaii, along with the U.S. Virgin Islands and Puerto Rico.

3. The number of subscribers that can be served simultaneously by that satellite with current service reliability levels.

Each of the transponders leased on Americom 4, and each of the transponders leased on Telstar 7, can serve approximately subscribers at current service reliability levels, yielding a total capacity of . StarBand is working to improve efficiency, with the goal of achieving a higher number of subscribers per transponder.

4. Any plans that will affect the capacity, geographic coverage or number of subscribers that can be served by the satellite.

StarBand and Gilat (the majority shareholder of StarBand) have publicly stated that their objective is to achieve 20,000 subscribers per transponder. This will require the introduction of a new modem that will be compatible with the use of 8PSK modulation on the forward link, contain improvements in the TCP and HTTP emulation protocols (spoofing), and other changes in order to meet this objective. EchoStar believes that this product will not be available at any time in the near future, could be further delayed due to changes in schedules or other factors at Gilat beyond EchoStar's control, and may not achieve the increase in capacity desired. Achieving the objective of 20,000 subscribers per transponder depends on a number of product changes and is further based on the assumption that the level of service for broadband subscribers will remain the same as provided today. EchoStar believes that the 20,000 subscriber-per-transponder objective remains optimistic. However, EchoStar is exploring alternative satellite designs in an attempt to increase efficiencies.

C. Describe in detail any plans for additional capacity for satellite broadband services, including any services that might be offered in the Ka-band. Include in your description the upload and download speeds that you are considering offering, pricing plans and the number of customers that can be served in each geographic region.

In addition to the StarBand/Gilat objective set forth above, EchoStar has the following plans for additional broadband capacity. These plans are modest and have not been finalized yet.

As mentioned above, StarBand may use the Ku-band payload on EchoStar IX, a hybrid Ka-and Ku-band satellite currently expected to launch to 121° W.L. in 2002. If all of those Ku-band transponders are used for Internet service, their total capacity is approximately subscribers, given current service levels, certainly not an economically viable number. EchoStar could use the two Ka-band transponders on EchoStar IX for a number of purposes. However, EchoStar IX will have only modest Ka-band capacity, and if it were used for Internet service, its spot beam configuration would allow for only a noncontiguous regional service covering Seattle, San Francisco-San Jose, Denver-Cheyenne, and Phoenix.

As explained above, plans relating to VisionStar's licensed orbital location have recently changed and are dependent on the Commission's concurrence. EchoStar also holds a license to operate a satellite at 83° W.L., but this location is too far from the core EchoStar DBS locations to allow service to be provided through a single subscriber antenna. Any plans to add capacity would assume current service levels, including upload and download speeds.

EchoStar's current pricing plan is described in the response to Interrogatory IX(A)(4). EchoStar is not presently considering any changes in pricing based on contemplated increases in capacity. EchoStar and StarBand will continue to endeavor to reduce service, equipment, and installation prices to subscribers. However, current plans are not expected to add enough capacity to achieve the scale economies necessary for material reductions in price. Based on the low number of Ka-band subscribers that could be supported by current EchoStar satellite projects, the projected costs of Ka-band customer premise equipment is expected to be significantly higher than that of Ku-band systems such as StarBand.

D. Describe any advantages that a customer might realize by receiving satellite broadband and DBS services from the same provider, and any possible disadvantages to a customer from obtaining satellite broadband and DBS services from the same provider.

An integrated satellite broadband and DBS provider is able to provide customers with significant benefits by serving as a "one-stop shop" for both video and data services. Thus, an integrated provider can offer customers the only real alternative to the combined video/cable-modem offerings that incumbent cable operators have begun to aggressively market. Obtaining broadband and DBS services from a single satellite operator provides customers with several advantages over obtaining those services separately from different providers, including: (i) the use of integrated equipment, such as a single dish; (ii) lower aggregate service, equipment and installation costs, (iii) providing and receiving a single bill; (iv) providing a single point of customer service; and (v) offering subscribers additional applications and services.

Integrating a satellite broadband provider into a DBS provider allows the DBS provider to offer customers the only real alternative to new digital cable offerings. Incumbent cable companies hold a dominant market position and their rollout of digital systems is reducing or eliminating many of the competitive advantages that DBS operators once had over cable television. Digital cable is erasing DBS firms' historical quality and channel advantages and allows cable firms to offer a video/cable-modem bundle, and true two-way Video-On-Demand services, that EchoStar and DIRECTV standing alone cannot begin to match. Integrating a satellite broadband provider with a DBS provider offers a way to respond to the competitive

threat posed by the upgrade of cable plant, and thereby offer consumers a meaningful alternative to cable.

An integrated provider allows consumers to purchase and use integrated equipment, including a single dish, at lower cost and without concerns about equipment incompatibility. For example, the DirecDuo dish supports both DIRECTV and DirecPC services. EchoStar and StarBand offer a similar one-dish solution for their services. Using a single dish also benefits the consumer, because installing separate dishes for broadband satellite service and DBS service requires additional equipment and installation costs, takes up additional roof space, results in more esthetic concerns, and poses potential line-of-sight issues in positioning multiple dishes.

An integrated provider makes the manufacture and retail of a single dish for both broadband and DBS more feasible and inexpensive, because it facilitates the design and manufacture of equipment that is compatible with both services, and the promotion of cross-service offerings and equipment sales at the retail level. Without service integration, a single dish is more expensive for the consumer because of the increased risks for the manufacturer to make and for retailers to sell. A DBS-only provider, for instance, would have less incentive to promote or subsidize the purchase of more expensive and complex single dishes that are also capable of receiving another provider's broadband services. In addition, a customer may face equipment compatibility problems as he or she seeks to obtain service from different service providers over a single set of equipment. On the other hand, an integrated provider who receives benefits from the sale of both services to the customer has an incentive to promote and subsidize single dishes, and to make sure that the equipment functions as intended.

An integrated DBS/broadband provider can also offer consumers lower total monthly service, equipment and installation charges than separate non-integrated providers likely would be able to offer. A portion of each customer's monthly service charge includes the cost incurred by the provider to acquire that customer, including advertising costs, commissions, promotions, subsidies and other sales costs. An integrated provider could lower the relative cost of customer acquisition by presenting new customers with a combined service package, rather than incurring separate acquisition costs for each service. In addition, a DBS provider who, for example, just started offering satellite broadband services, could reduce acquisition costs for that service by marketing it to its existing DBS subscriber base. Households already receiving DBS service are more likely than other households to subscribe to satellite broadband service, because those consumers are comfortable with satellite-based equipment and service, and have clear line-of-sight and equipment positioning already established. By providing satellite broadband to its existing DBS customer base, an integrated provider also could achieve economies in billing operations. In addition, an integrated provider would expect to have less churn for a combined DBS and broadband offering (its subscribers will tend to be "stickier" and less likely to switch to an alternative service provider), and thereby lower subscriber acquisition costs. These types of cost savings could be passed on to customers in the form of lower monthly service charges and higher equipment subsidies. Moreover, new customers of an integrated provider would be saved the costs of purchasing and installing equipment obtained from separate broadband and DBS service providers. An integrated provider is better able to coordinate the simultaneous installation of DBS and broadband services, thereby decreasing the cost and disruption of the installation process.

An integrated provider would also provide customers with the benefit of a single bill for both broadband and DBS service, as well as a single customer service point of contact. Both would provide the customer with an ease of use and comfort not achievable by separate service providers, and in turn result in a more attractive offering for both broadband and DBS service.

Lastly, an integrated service provider will be able to offer applications and services to their customer base that separate broadband and DBS providers might not be able to do. An integrated provider has the opportunity to offer customers access to services that bring Internet-centric content to the television, and television-centric content to the personal computer and other digital devices. For example, an integrated provider can arrange for the necessary hardware and software to be included in the provider's DBS receiving equipment to allow the receiver to access broadband Internet content from the provider's broadband network as well as DBS content. This integrated offering provides the customer with seamless access to both broadcast and two-way content (*e.g.*, a Video-On-Demand service where current titles are delivered over the broadcast network and older "library" titles are available over the two-way broadband network). If the content and supporting technology is provided by multiple entities, then the overall customer experience is likely to be complex and less satisfying than a truly integrated offering would provide.

Applicants are generally not aware of any material disadvantages to a customer that obtains DBS and broadband Internet services from the same satellite provider rather than two separate providers. Possible exceptions include the fact that if one service provider's dish or customer equipment fails, the other one may still be able to offer service to the customer, and the fact that service problems with one service may affect the customer's satisfaction level for the entire package.

E. Describe any advantages that an integrated satellite broadband/DBS provider might realize relative to two integrated suppliers of satellite broadband and DBS services.

A single integrated satellite broadband/DBS provider could realize a number of significant advantages, relative to two integrated suppliers of broadband and DBS services, many of which would benefit consumers.

DBS Related Benefits

First, as recently announced by the Applicants, a direct result of the combination of two integrated suppliers of broadband and DBS services is that consumers across the United States will have access to local broadcast channels with digital-quality television picture and CD-quality sound *in every one of the 210 television markets in the United States*. This combination will also permit greatly expanded high-definition television ("HDTV") programming, pay-per-view and Video-On-Demand services, educational, specialty, and foreign language programming and interactive services, and will create significant cost savings that will allow DBS to provide a better value to consumers and become a more effective competitor in the MVPD market.

Currently, each of DIRECTV and EchoStar duplicates the vast majority of the programming carried by the other DBS system. By ending this duplication, and thereby freeing up spectrum, the combined entity will have roughly twice the capacity for programming as each company standing alone. Because of this wasteful duplication of programming, neither EchoStar nor DIRECTV has the stand-alone capacity to provide local programming to America's smaller communities, particularly after balancing the capacity demands for local channels with the competitive necessity of offering a wide array of existing national programming as well as the importance of adding new programming, such as HDTV, pay-per-view, Video-On-Demand, interactive and educational channels.

The capacity created by the rationalization of spectrum, as well as the cost savings discussed below, make it possible for New EchoStar to significantly expand national programming and new services, plus serve every DMA – all Americans, including in rural areas – with local channel service. It will also provide rural Americans with access to digital quality pictures and CD quality sound that they have never enjoyed before and could not receive but for the merger. Indeed, a significant portion of these subscribers may not even be able to receive quality over-the-air television broadcast signals. Thus, the combination will allow New EchoStar to actually increase the number of television households in rural areas.

The enhanced ability of New EchoStar to provide more programming choices necessarily means more carriage opportunities for independent programmers who historically have had trouble gaining carriage on cable systems. To maintain its competitive edge against cable operators and other competitors, New EchoStar would have a clear incentive to differentiate itself through innovative independent programming sources.

If DIRECTV and EchoStar are to succeed, they must match the current dominance of cable operators, as well as the dire competitive threat posed by the upgrade to digital cable. Digital cable is erasing DBS firms' historical quality and channel advantages and compounds the cable companies' incumbency advantages. It allows cable firms to offer a video/cable-modem bundle, and true two-way Video-On-Demand services, that two DBS providers alone cannot begin to match. Combining the subscriber bases of DIRECTV and EchoStar produces a stronger, integrated satellite broadband/DBS provider, and a company that is better able to finance the cost of actually marketing broadband services to consumers and equipping them. Thus, the merger enhances the chance that DBS providers will be able to offer to U.S. consumers a competitive alternative to new digital cable offerings.

In addition to freeing up DBS spectrum for more programming choices, combining two integrated suppliers of broadband and DBS services will create a larger and more efficient satellite fleet. Presently, allocation of authorized spectrum requires less than optimal placement of satellites, such as DIRECTV's need to use a satellite at the 110° W.L. location even though it is only authorized to operate 3 DBS frequencies. Moreover, in locations where both EchoStar and DIRECTV have satellites, the merger will create built-in, in-orbit backups that will help prevent or reduce the impact of customer service interruptions. Thus, combining the two companies will provide a unified DBS firm with a stable and better utilized satellite fleet, and will also provide much greater flexibility to provide additional economical in-orbit backups.

Because of the economies of scale resulting from the combined DBS customer base, the Applicants anticipate significant savings in operational and manufacturing costs in providing improved equipment and services. For example, combining their operations permits utilization of a standardized set top DBS box. By increasing the volume of units ordered, substantial manufacturing cost savings could be used to reduce charges to customers. The increased potential customer base would also make more economically attractive opportunities to integrate New EchoStar equipment with other services and devices. By increasing the size of the market, companies such as television or computer manufacturers may be more interested in creating products that integrate DBS and broadband abilities directly into their products. Consolidation of the service departments of EchoStar and Hughes, such as customer service and billing operations, would allow the combined company to take advantage of the most efficient aspects of both companies to raise the level of service it would provide to customers. In addition, because of the economies of scale, it is anticipated that the cost of providing this improved service will decrease on a per customer basis. Moreover, the increased customer base will also allow New EchoStar to decrease programming costs and may be the basis for creating a new programming platform. Together, these synergies will create a dynamic company that will be able to vigorously compete with cable by offering consumers a more robust service at a cost lower than either DBS provider could achieve alone.

Similarly, the merger will allow the companies to eliminate duplicative operational practices. For example, the cost and time of programming backhaul and uplink would be halved because New EchoStar would only need to perform these functions once where today each company must perform these operations separately.

Broadband Related Benefits

To date, satellite broadband service to consumers has been inhibited by a combination of factors, including spectrum constraints, data speed, and most importantly, very high fixed costs and subscriber acquisition costs relative to competitive services, such as cable modem and DSL services. These factors, among others, have prevented satellite broadband providers from attracting a significant number of subscribers. EchoStar's current offerings through StarBand, and Hughes's through DIRECWAY, both rely on leased Ku-band transponders – a relatively expensive means of providing satellite-based Internet access. Moreover, Ku-band CONUS transponders have limited capacity for broadband service, and limited numbers are available for lease at relatively high prices. Consequently, it would be very difficult, if not impossible, for either of these satellite broadband providers to achieve sufficient scale to spread fixed costs or realize economies of scale in the manufacture of consumer premises equipment ("CPE"), such that the current services could be offered at a price that is acceptable to consumers, or competitive with terrestrial broadband providers, unless these companies incurred very high subscriber acquisition costs that (i) might not be recovered through monthly service revenues, and (ii) are difficult, if not impossible, to finance in the current economic environment.

One alternative to the current means of providing satellite broadband service is to construct and launch new satellites in the Ka-band. Although this strategy avoids some of the capacity constraints that afflict broadband services in the Ku-band, it requires the upfront investment of hundreds of millions, if not billions, of dollars in complex satellites, uplink

facilities and CPE technology. The deployment of these Ka-band satellites has taken longer, and will require more capital, than many Ka-band licensees have been able to sustain. Moreover, the use of Ka-band satellites does not have any direct effect on the high cost of CPE, and at least initially increases, rather than reduces, CPE cost, which is a significant impediment to broader acceptance of satellite broadband services.

In the Ku-band many consumers view CPE cost as unacceptably high, and Ka-band CPE will be still more expensive. A satellite modem costs approximately $225-375. A Ku-band transceiver costs $175-300, while a Ka-Band transceiver will initially cost at least $300 to $500. The antenna and mount costs are approximately $100. The average cost of a professional installation is about $150-$200. In addition, a dealer commission of about $250 is usually paid to acquire broadband consumers. As a result, up front equipment and installation costs for consumers are substantially higher for satellite broadband than for DSL or cable modem services. Unless these CPE and subscriber acquisition costs can be reduced significantly, satellite Internet will not likely grow out of a small-scale, high-priced niche in the consumer market.

Two distinct integrated DBS and satellite broadband firms would face substantial obstacles in attempting to achieve the necessary scale economies in the manufacture of equipment and acquisition of consumer subscribers that would allow them to compete effectively with cable modem and DSL services. EchoStar and Hughes estimated in the Application that at least 5 million consumer broadband subscribers would be necessary in the next five years to justify the significant up front investment and subscriber acquisition costs associated with actually marketing and deploying a ubiquitous two-way broadband service to consumers. Even given reasonably optimistic assumptions about the "take rates" at which existing or new DBS subscribers will buy satellite broadband service, the initial DBS subscriber base required to support the eventual acquisition of at least 5 million broadband subscribers is significantly greater than either EchoStar or Hughes can provide separately.

Existing Ku-band satellites have very limited scale economies due to the limited capacity of each transponder. While Ka-band satellites optimized for consumer broadband services can benefit from greater scale, they too are capable of serving only a finite number of customers, beyond which point additional satellites and spectrum resources must be added. In addition, these complex satellites require a substantial investment in new commercial technologies and significant lead times – several years – in terms of R&D, design, construction, and launch. Consequently, a firm that hopes to have the capacity to serve several million subscribers must make the substantial investment to do so well in advance of actually acquiring anywhere near that number of customers. In the meantime, the relatively small scale of the broadband business results in a price that is too high to compete effectively with cable modem and DSL services. This smaller scale forces a lesser number of subscribers to bear the very high fixed costs, and prevents the firm from achieving the economies of scale necessary to reduce both fixed and variable costs. It is these daunting economic barriers – very large initial investment in expensive satellites coupled with high up front costs to acquire new subscribers -- that have stifled continued investment in satellite Internet technology.

Moreover, neither Hughes nor EchoStar, standing alone, has enough available orbital resources in the CONUS portion of the geostationary arc to achieve the requisite critical

mass of subscribers to actually provide an economical one-dish satellite broadband service to residential users. Based on Hughes's estimates that a SPACEWAY spacecraft will be able to serve 1.0-1.3 million residential users in the U.S., in order to achieve just 5 million residential broadband subscribers, a single provider would have to launch and operate Ka-band satellites to at least four orbital locations within approximately 22 degrees of one another and within the CONUS portion of the geostationary orbital arc. Separately, each DBS firm currently has available two orbital locations within this range, and PanAmSat controls one more such location. Together, however, the companies would have sufficient satellite and spectrum resources to achieve this critical mass of broadband subscribers.

The post-merger integrated DBS/satellite broadband firm, in contrast, would have a number of advantages that would make it more likely that the necessary investment would be made and the necessary scale realized to offer competitively priced consumer broadband services.

- *Mitigation of capacity constraints.* The merger would allow New EchoStar to combine the necessary orbital and spectrum resources required to reach a critical mass of at least 5 million consumers within five years following the launch of new generation satellites, to justify an investment in ubiquitous consumer broadband deployment. Today, neither company alone has the orbital resources close enough together to achieve this subscriber base. In addition, an increased number of satellites would allow more efficient allocation of spot beam capacity, and consequently more efficient use of whatever capacity exists. As a practical matter, the merger will increase the amount of usable capacity.

- *Larger pool of DBS subscribers.* A single integrated firm would have the benefit of consolidating the DBS subscriber bases of both firms. Current subscribers of DBS services are more likely to subscribe to satellite broadband services because they know their households have a clear line of sight to the southern skies and because they have a demonstrated willingness to place the necessary satellite equipment at their homes. This larger subscriber pool can in turn be leveraged into significant efficiencies: it reduces costs in the manufacture of CPE by encouraging investment in research and development and manufacturing economies; it spreads fixed costs over a larger base; it allows for more efficient use of satellites and spectrum; and it reduces the cost of capital by lowering the risk profile of a residential satellite broadband venture. Scale is also important because each of the factors described above allows the firm to grow more quickly, and thereby achieve an efficiency feedback loop.

- *Lower costs.* The single integrated firm will have lower overall costs of providing service than two separate firms. It will also make economically justifiable future investment in research and development that would likely be needed to bring down CPE costs. Consumer equipment costs, a substantial factor that differentiates satellite broadband from competing services, remain too high (even with the substantial subsidies already offered by the satellite

broadband firms). Substantially increasing the subscriber base will result in manufacturing efficiencies and volume discounts that will reduce these consumer equipment costs. It is estimated that it will be necessary to have volumes in excess of a million terminals sold per year to achieve meaningful savings in that area.[3] Similarly, Ka-band equipment is not yet available in the mass market, but the more quickly Ka-band service can be introduced, the lower the costs will be. Such higher volumes could also lead to decreases in installation costs and dealer/retailer commissions per subscriber as installers, dealers and retailers become more amenable to lower per subscriber fees. The installation of one dish during a single visit for DBS and broadband services further decreases total costs. In addition, a consolidated firm would need fewer total backup satellites for its service; with consolidation, only a single backup satellite might be necessary. Consolidation would also permit rationalization of certain facilities such as billing, gateways, call centers, and network operations centers, all resulting in lower costs.

- *Acceptable risk profile.* The impediments faced by each company standing alone are so high that their current or prospective investors would not likely accept the risk of deploying a full-scale consumer broadband satellite service. Illustrating the high-risk profile of such projects today is the fact that none has been funded to completion and deployment. The perceived risk of a Ka-band project can be brought down to an acceptable level by virtue of the spectrum and satellite capacity efficiencies to be secured by the merger, combined with the cost efficiencies that will flow from the larger pool of DBS subscribers to whom a broadband service can be marketed.

- *Higher rate of growth.* The increased scale of the single integrated firm will result in an increased rate of growth. Rapid growth is critical to effective competition with cable-modem and DSL, both of which are expanding rapidly and are "sticky products" relative to satellite broadband due to the difficulty of changing Internet addresses and reconfiguring one's system, and the high up-front cost of satellite broadband CPE. Thus, satellite broadband not only has to achieve the necessary scale, it has to do so in the face of cable-modem and DSL providers who are building market share far more quickly than satellite providers are able to do. Rapid growth also means a more rapid return on investment, which further reduces costs and mitigates the investment risk associated with the development and deployment of satellites well before they will be called into use.

- *Enhanced marketing capabilities.* The consolidated firm would have an enhanced ability to introduce DBS users to a truly competitive satellite

[3] Experience with cable modems illustrates the benefits that real economies of scale could bring to satellite broadband CPE. As recently as 1998, cable modems cost $300 a piece, shipping approximately 500,000 units that year. This year cable modems cost about $75, with anticipated shipments of between 10 and 15 million units.

broadband service. Because customers are resistant to having two dishes, a service provider would have to supply a single dish that obtains broadband and DBS service from spacecraft in approximately a 22 degree orbital arc. A single consolidated firm could make more efficient use of the available orbital slots within this arc. The ability to effectively offer both DBS and broadband service is critical to providing effective competition with cable for several reasons. Most significantly, digital cable offers both MVPD and broadband services, and DBS will need to match this offering and provide cross-product discounts and unified billing. In addition, combining broadband service with MVPD service should result in lower churn, which decreases subscriber acquisition costs and allows the firm to take more business risk in investing in the customer.

- *Elimination of duplicative spectrum use.* There is and will be a multicasting market on the data side of the business, and consolidation would eliminate the wasteful duplication that would occur if both firms were multicasting simultaneously the same kind of information.

X. DBS Equipment

A. Provide a complete statement and interpretation of any provisions in contracts between DIRECTV or EchoStar and their equipment manufacturers/suppliers that limit the ability of the manufacturer to include particular components (e.g., high speed modems), features (e.g., electronic program guides or software programs), and functions, including the ability to access other services (e.g., terrestrial television broadcasting, cable television).

EchoStar does not have any provisions in its existing or planned contracts that limit the ability of the manufacturer to add specific capabilities into the receiver. EchoStar notes that it designs all aspects of its receivers' capabilities, and then subcontracts the receivers out to manufacturers. As a result, all control of the feature set, and all rights to the design, remain with EchoStar. Any capabilities such as those described would need to be included in the base design of the receiver systems

EchoStar does make provisions within every receiver to facilitate the integration of external signal sources. A single button on the remote allows consumers to switch between their satellite receiver, or to pass through the signal from their local cable or off-air antenna.

B. Describe the circumstances (e.g., certain programming combinations or programming and broadband services) under which a subscriber would need to access satellites in different orbital slots; the number of subscribers who currently do so; technical characteristics of the dishes required to fulfill this function; circumstances under which a subscriber would need multiple dishes to fulfill this function, or would be required to purchase a new dish; and an estimate of the number of subscribers that need multiple antennas,

along with a forecast of how the number of subscribers needing multiple dishes will change over the next five years.

EchoStar's DBS service currently uses four distinct orbital locations. While it is difficult to estimate how many subscribers receive service from each location and the number changes constantly, the relative estimated viewership for each location is set forth below

Location	Subscriber Count (est.)	Typical Content
119° W.L.		AT 50, CONUS networks, CD music, BTV
110° W.L.		AT 100 and AT150, Locals, Dish Latino, BTV
61.5° W.L.		International, HD, BTV, Locals East
148° W.L.		International and HD duplicative of 61.5° W.L., BTV, Locals West

There are roughly customers equipped with "Dish 300" hardware that is only capable of receiving one satellite location. The dish is circular, 18" in diameter, with one LNBF. These are predominantly pointed at the 119° W.L. orbital location, where the service was originally launched. EchoStar expects to complete converting these subscribers' equipment to Dish 500 hardware before the end of 2002.

In 1999, EchoStar introduced a two-satellite location dish called the "Dish 500," which is circular, 20" in diameter, with two LNBFs. That dish was designed to receive service from both the 119° and 110° W.L. locations, allowing customers to select programming offered at either location seamlessly. This is the standard hardware delivered today for a new installation. Early Dish 300 customers are being converted to Dish 500 hardware as part of an ongoing campaign to bring all customers up to a standard Dish 500 configuration, and that migration is expected to be completed by the end of 2002.

With respect to the 61.5° and 148° W.L. locations, reception of service from either slot requires a second dish similar to the original Dish 300. The second dish is required because of the angle distance between the CONUS orbital locations and these two slots. A single dish of acceptable size is not capable of receiving a signal from locations spaced so far apart. However, the second dish is also linked to the receiver for seamless operation by the consumer. At this time, the second dish is needed to receive specific international programming, High Definition broadcasts, Business Television and certain local broadcast channels.

Without the merger, EchoStar anticipates that the number of consumers requiring a second dish pointed at either 61.5° or 148° W.L. will increase as a result of the HD content that EchoStar will have to transmit from those locations. EchoStar has not made, in the normal course of business, any projections about how many consumers will need a second satellite dish over the next five years. In the event the merger is approved, the number of customers needing two dishes would depend on the manner in which New EchoStar's redeployment of its combined orbital assets. That discussion is incorporated in the bandwidth forecast detailed in Interrogatory XIV(A).

Consumers can currently obtain both Dish 500 service (the ability to receive programming from the 110° and 119° W.L. orbital locations) as well as satellite broadband from StarBand, currently offered from the 101° W.L. and 129° W.L. orbital locations. The outdoor equipment required for this service includes a 24" by 36" oval dish, two LNBFs for MVPD service and one LNBF for broadband service, as well as a transceiver broadband service.

Generally, broadband service offered from satellites in orbital locations from about 99° W.L. to 121° W.L. or 110° W.L. to 129° W.L. (the "one-dish arc") would allow for a one-dish MVPD/broadband solution like the current StarBand/DISH Network offering. In the future, without the merger, available satellite capacity in the one-dish arc may be filled, requiring use of satellites outside the one-dish arc. If so, then some consumers would require a second dish to use both MVPD service and satellite broadband. EchoStar has not made, in the normal course of business, projections over the next five years of the number of consumers who will need a second satellite dish to receive broadband service from EchoStar or its affiliates.

C. **Explain EchoStar's plans, if the companies merge, to either move to a single reception standard for all DBS customers or to continue to use two different and incompatible reception systems for DBS customers. Describe the technical differences between the EchoStar and DIRECTV systems. Also, explain why the benefits of such a single reception standard cannot be achieved by means other than merger.**

EchoStar and DIRECTV employ different digital standards, with EchoStar using Digital Video Broadcasting ("DVB") and DIRECTV generally using the DIRECTV proprietary protocol.

EchoStar and Hughes have initiated preliminary investigations into the flexibility and limitations of the hardware/software configurations of the collective fielded hardware of the two corporations. The principles underlying each company's configuration are fundamentally different, and the applicants do not believe that the companies would or could feasibly move to a single reception standard without the merger. At the same time, aided by significant similarities in their service delivery architectures, the Applicants believe that they can ensure an orderly and simple transition to the New Equipment as described above.

Differences Between EchoStar and DIRECTV in Fundamental Principles. DIRECTV has enlisted the design and production capability of a number of different recognized consumer product manufacturers (*i.e.*, HNS, Panasonic, Sony, Thomson Consumer Electronics). DIRECTV defines a basic set of capabilities that it requires, and the manufacturer designs and produces product to match those requirements. DIRECTV does not own or control the actual detailed design.

On the EchoStar side, all receiver design and manufacturing is strictly controlled by EchoStar engineering. There is therefore a certain commonality between the features and underlying technology of all of the receivers in the EchoStar family of products. Similarly, EchoStar has developed every receiver with the ability to receive a software download over the satellite. This means that every receiver in the field is capable of being completely reprogrammed without visiting the customers' locations. More recent EchoStar designs incorporate chipsets that allow for either DVB or DIRECTV format compatibility.

Service Delivery Architectures. The service delivery architectures of the two companies are very similar. Both companies receive content on digital tape (for PPV movies), from "cable" distribution satellites (for subscription channels such as CNN) and as dedicated digital backhauls from major cities (for local-into-local channels). Both companies utilize very similar broadcast centers and satellites to deliver this content to their customers. The most significant technical differences in the delivery architectures are as follows:

- Modulation Error Coding
- Encoding Transport Stream Structure
- EPG Data Transport Stream Structure
- Conditional Access Systems
- Multi-sat switching capability (DiSesc)

Both firms use MPEG 2 video and audio encoding, but DIRECTV's transmission format at the "transport" layer packetizes the information differently. The companies use different broadcast formats for their electronic program guide information and they use different suppliers and technology for their conditional access systems. For example, even though each firm uses ISO standard smart cards to control the authorization of receivers and services, the cards' embedded microcomputers are different and the smart card software is also unique to each system.

The transport layer differences of the two systems are summarized in ITU-R Recommendation No. 1294, Geneva, Oct. 1997. In this document, System A generally corresponds to the EchoStar system and System B generally applies to the DIRECTV delivery system.

The Merger Is the Only Path to a Single Standard. As described above, the companies plan, after consummation of the merger, to convert to a single standard for New EchoStar's core programming.

The benefits of a single standard in conjunction with the dual-speak receivers described above – primarily flowing from an end to duplicative use of spectrum – are not achievable outside of a merger. The investment required to move to a single standard, is justifiable only if the single standard allows spectrum sharing – both companies using the same spectrum to provide programming for which they now use different spectrum. In the absence of a merger, however, this would require one company or both to cede control over a significant part of its "crown jewels" – its core satellite and spectrum resources. The parties tried to negotiate an agreement on this issue and failed because it was unworkable.

Absent a merger, there are only three options for control of a spectrum-sharing arrangement – control by DIRECTV, control by EchoStar, or shared control with the potential for deadlock. Without its satellite and spectrum assets, neither EchoStar nor DIRECTV has a business. Control of core assets by a competitor would be ruinous, as a dispute could lead to the controlling party severely prejudicing the other's business. The controlling party would make critical decisions affecting both participants, particularly which programming was carried at which orbital location, and thus to which consumers it would be available. This would leave the non-controlling firm vulnerable to a number of risks, including: manipulation of the joint programming to favor the controlling party's customers; manipulation of the joint programming to favor content which the controlling party has more favorable contract terms, thus effectively raising the non-controlling party's costs; and less responsiveness to technical problems that affect the controlling party's customers less than others.

"Shared" control would create the problems posed by committees of two entities with often adverse interests, which are unable to effectively resolve disputes, vulnerable to brinksmanship by either side, and thus inherently unstable and at constant risk of stalemate or disintegration. (For these reasons, joint ventures with two competitors sharing their crown jewel assets are rare in any industry.) Because of the importance of the competitive decisions related to the crown jewels, only the stability and certainty of the merger provide an adequate foundation for the success of a move to eliminating redundancy. Take, for example, the need to adjust the jointly-carried programming to meet competition from cable and others. Both EchoStar and DIRECTV might agree that changes were needed, but each might have a starkly different agenda concerning the nature of the changes to be made, because of different consumer preferences, differences in contracts with programmers, or merely differences in strategy. If they could not agree, then changes could not be made and both would suffer serious competitive harm. Alternatively, disagreements or brinksmanship could cause the joint venture to fall apart.

The control and stability issues would be compounded by the need to avoid sharing competitively sensitive information between EchoStar and DIRECTV. The complicated firewall/independent decision-making system necessary to keep separate data on costs, subscribers, and programmer relationships, as well as other key information, would further impede any possibility that the joint operation could be effectively managed. The companies would likely have to coordinate pricing, promotion and manufacturing, in ways that may be significantly limited by the antitrust laws.

On the other side of the equation, the investment required in pursuit of such a volatile spectrum sharing arrangement would be very high, and would require extensive, costly and time-consuming consumer equipment changes that would be impossible to make absent the certainty of the merger. As discussed above, EchoStar's and DIRECTV's set-top boxes are largely incompatible, and customers of each company generally point their satellite dishes to different orbital locations. Thus, the companies would have to select a surviving technology or decide to make a huge investment in dual-speak receivers, and bear the significant consumer switch-out costs associated with the merger. In any event, the company whose subscriber base would require equipment switch-outs would be at a significant disadvantage caused by customer dissatisfaction. Moreover, either or both firms may need to offer consumers new satellite dishes, in order to receive signals from the shared orbital location. Given the risks that the arrangement could fall apart, the investment necessary to undertake the transition is too much of a gamble

without the stability provided by the merger. The resources needed to move to a new, third standard would be much greater still, making that course impracticable as well absent the assurance provided by merger.

Similarly, the decision on how to use each firm's satellite assets could significantly and adversely affect one firm or another in the event the agreement was terminated. Issues such as potential satellite failures and back-up plans would also be extremely difficult to address with separately owned diverse fleets of satellites. Finally, the general instability of such an arrangement would discourage investment in research and development needed to move the platform forward. Only the merger can provide the stability and decision-making process to overcome these obstacles.

Additionally, if spectrum sharing included national channels, the firms would lose a valuable promotional opportunity. As part of their arrangements with some programmers, EchoStar and DIRECTV receive blocks of programming time, *e.g.*, one minute per hour on CNN, for use in promoting their services. These are a valuable means to communicate with consumers about their business, including promotions and brand-building. It would be difficult to split this advertising time and, more importantly, neither firm would wish to allow the other to advertise to its customers. If spectrum sharing included only local-into-local programming, this problem would not arise, but the spectrum efficiencies would be severely limited, providing further reason that the investment necessary to reach them would be out of proportion with expected returns, particularly in light of the inherent riskiness of joint operation. Thus, the only viable option for attaining these efficiencies is to merge.

D. Provide all analyses, assessments, or considerations regarding the costs of converting the two incompatible DBS systems to a single compatible system. Address costs as they relate to the cost of replacing existing set top receivers with a new receiver; replacing existing satellite receive dishes; re-pointing those dishes; and adding additional dishes at existing home locations. Address any other costs both to the consumer and to EchoStar of converting to a single compatible system.

Please see response to Interrogatory X(C) above.

E. Estimate the number of set top receivers and/or satellite dishes that would be replaced if the two companies were to merge, the total dollar cost (in $millions) of the replacement of the set top receivers and/or satellite dishes.

F. Provide information on the time period that will be required to replace and/or supplement set-top boxes and satellite dishes

Number of Boxes

The number of set top boxes will primarily depend on whether EchoStar's or DIRECTV's current technology platform is chosen to survive the merger for the receipt of core programming. At least a substantial portion of the legacy platform set-top boxes will need to be replaced. DIRECTV's subscriber base,

approximately 11 million consumer households[4], is larger than EchoStar's, about 7 million. As described in response to Interrogatory X(C),

. The companies believe that some of the set-top boxes that need to be switched can be changed without a visit by a technician. Many customers feel comfortable with, and, if given the choice, would prefer, to install their own set-top box.

The number of satellite dishes (or components of them) that must be changed will depend on several factors. One is the surviving platform, as all of the satellite dishes are not compatible with all of the set-top boxes. The incompatibility arises because of different methods for the box and dish to communicate about whether the dish should receive, at a particular moment, Left Hand Circular Polarization ("LHCP") or Right Hand Circular Polarization ("RHCP"). The companies are investigating what portion of the existing satellite dishes will work with both platforms, and whether the surviving platform can be made backwards-compatible with a greater portion of the satellite dishes.

In addition, some compatible satellite dishes will need replacement or supplementation because they are not capable of receiving signals from the necessary orbital locations.

The majority of DIRECTV customers' satellite dishes are capable of receiving a signal only from the 101° W.L. orbital location.

Finally, the portion of these dishes that need replacement or supplementation will depend on the ultimate arrangement of programming among the orbital locations. All subscribers will need the ability to receive programming from the orbital location carrying New EchoStar's "core" national programming, as well as the orbital location(s) carrying the specialized and localized programming to which the consumer subscribes. If the 110° W.L. orbital location is chosen as the location for core programming, then virtually all of DIRECTV's customers will need new satellite dishes. The same will be the case for the approximately EchoStar customers who do not have the ability to receive programming from 110° W.L., and other EchoStar customers who will need to receive specialized programming from 101° W.L., such as for certain local-into-local programming. If the 101° W.L. orbital location is chosen as the location for core programming, then all of EchoStar's customers will, at a minimum, need to re-point their satellite dishes and perhaps will need new satellite dishes, as will many of those DIRECTV customers who will need to receive specialized programming from the 110° W.L. and 119° W.L. orbital locations. As part of the merger transition planning

[4] This number includes approximately 1.9 million households served by NRTC Members and Affiliates.

process, EchoStar and DIRECTV are deciding whether the core programming will be provided from 101° W.L. or 110° W.L.

Another significant factor affecting the time required to complete the transition process is the number of "truck rolls" (or technician visits to customer locations) that can be accomplished on an ongoing monthly basis. While some of the technician capability of the two companies will still be needed for its present purposes, New EchoStar plans to make the transition process more efficient by using trouble visits and customer relocations as opportunities to install new equipment while the technician is already on site.

As described in response to Interrogatory X(C), the companies plan to start selling dual speak receivers as soon as possible. Thus, new customers added to either company will be able to receive programming regardless of the ultimate platform chosen to survive the merger. As preexisting customers churn, the number of subscribers that need replacement equipment or a modification of their satellite dish will decline.

Total Time

While significant spectrum reclamation and other synergies will be achieved shortly following the merger, based on the criteria laid out above, EchoStar and DIRECTV currently estimate that the merger swap-out process will be complete in three to four years from closing of the merger, under all of the scenarios of platform options and satellite programming arrangements under consideration. A significant portion of the spectrum efficiencies gained from eliminating duplicative programming and services will be realized relatively early in the transition process. Under either scenario (DVB or DIRECTV format as the remaining platform), within the first year after EchoStar and DIRECTV merge, all Spanish-language subscribers and existing local-into-local subscribers -- -- would complete the transition process, freeing a significant proportion of the total spectrum reclaimed by the merger. As each group of subscribers from one service is migrated to the common platform, there no longer will be a need to simulcast that programming, thereby allowing New EchoStar to reclaim spectrum that previously was used redundantly and turn it to more productive use, such as serving a new market with local broadcast service or carrying a new national service.

Cost Implications

In general, assuming a three- to four-year transition period, the total cost of replacing subscribers' equipment and moving to a unified platform for the combined company's subscriber base under current planning scenarios probably will be about , depending on whether New EchoStar adopts the DIRECTV format or DVB platform, respectively. The Applicants estimate that each subscriber requiring new equipment to receive the full panoply of services offered by New EchoStar ultimately will have to obtain either a new set-top box, a new dish, or both. In many, but not all instances, the subscriber also will require an installation call. Since New EchoStar will ensure that no subscriber wishing to maintain the same level of service will have to incur any out-of-pocket expense as a result of the merger, New EchoStar will assume all customer-related transition expenses. The Applicants currently estimate that such expenses in the first year after the merger will amount to about per subscriber requiring new equipment, decreasing to about three years after the merger.

In each year following the merger, New EchoStar will execute an additional phase of the transition process described in X.C, above, requiring the replacement of customer equipment for given categories of subscribers. Applying the estimated cost per subscriber of switching equipment and providing installation as necessary under the transition options described in X.C, the following tables provide current estimates of New EchoStar's transition costs over the three years following the merger:

G. Provide all analyses, assessments or considerations of the costs and benefits and the technical and economic issues associated with providing local-into-local television broadcast retransmission services: (a) through use of the Ka band; (b) through use of terrestrial technologies, such as MVDDS; and (c) via contract with a separate vendor using these or other technologies.

Calls for documents. Please see page 1 above.

XI. Fixed Satellite Service Market

A. Provide separately for PanAmSat, for DIRECTV, and for EchoStar, the total amount of current FSS capacity and information on plans to expand FSS capacity in the next two years. Also, provide your best estimate of the total industry FSS capacity, both currently and in each of the next two years.

EchoStar has licenses for 500 MHz of Ku-band spectrum in each direction at the 121° W.L. and 83° W.L. orbital slots, 500 MHz of Ka-band spectrum in each direction at the same locations and, through EchoStar's interest in VisionStar, 1000 MHz of Ka-band spectrum in each direction at the 113° W.L. orbital slot. EchoStar has a pending application for a C-band

payload at 83° W.L., and intends to make use of that spectrum. EchoStar has no concrete plans for the final deployment of a satellite at the 83° W.L. orbital location pending the resolution of certain petitions against EchoStar's license and an extension request filed by EchoStar. EchoStar also intends to apply for a satellite system that would use the expansion DBS spectrum.

The EchoStar IX spacecraft currently under construction at Space Systems Loral is expected to be ready for launch in the fourth quarter of 2002 and is capable of providing both Ku-band and Ka-band service. Echostar IX is currently slated for launch into the 121° W.L. orbital slot. VisionStar has executed a construction contract for a Ka-band satellite for the 113° W.L. orbital slot with Lockheed Martin.

An assessment of the current industry wide Ku-band capacity over North America can be best made by referring to the Lyngsat web site or other publicly available references. The Lyngsat site shows approximately 22 satellites using about 500 MHz of Ku-band spectrum each over an arc from about 61°W.L. to about 150° W.L. At the present there are no active U.S. Ka-band FSS payloads (with the exception of the experimental ACTS payload).

Over the next 2 years, EchoStar expects that the Ku-band capacity in this region will remain relatively constant as the arc is relatively full and most satellite launches in this time frame will be used to replace existing capacity. It is extremely difficult to assess the prospects for the Ka-band, as several projects which had been announced and begun construction have subsequently been cancelled or significantly delayed.

B. Explain in detail all changes in the control/independence of PanAmSat as a consequence of its proposed sale to EchoStar.

PanAmSat Corp. is a public company that is traded on the NASDQ market. Hughes (and affiliated companies) owns 80.6% of the issued and outstanding capital stock of PanAmSat. As a public company, PanAmSat maintains an independent Board of Directors that oversees the management of the company and is bound by their fiduciary obligations to the company and shareholders.

If the merger is approved and is consummated, New EchoStar will acquire the 80.6% of PanAmSat that is currently owned by Hughes and will become the majority shareholder of Panamsat. There will be no other structural difference between the pre-merger and post-merger independence of PanAmSat. The PanAmSat Board of Directors will continue to oversee the management of the company subject to their fiduciary obligations.

If the merger is not approved and is not consummated, pursuant to the terms of a Stock Purchase Agreement between Hughes and EchoStar, EchoStar will either (i) enter into an agreement pursuant to which EchoStar would acquire all of the issued and outstanding shares of PanAmSat common stock held by Hughes or (ii) EchoStar will commence a tender offer to purchase all (and not less than all) of the issued and outstanding shares of PanAmSat. After these transactions are consummated, EchoStar will be the majority and possibly sole shareholder of PanAmSat. To the extent that EchoStar purchases only the shares of PanAmSat held by Hughes, EchoStar will be in the same position as if the merger had been completed. If EchoStar

acquires all of the issued and outstanding shares of PanAmSat, EchoStar will be the sole owner of PanAmSat.

The transition process regarding the transfer of control over PanAmSat has started with a recent initial meeting between the management of the two companies. No decisions have yet been made relating to the operations, control or independence of PanAmSat.

XII. Technical Questions

A. Is there an intent to aggregate control and uplink facilities?

The Applicants do plan to consolidate and/or aggregate the uplink facilities as well as backhaul facilities, to the greatest extent possible. This affords the opportunity to reduce costs, increase capabilities, and provide improved redundancy. However, the Applicants' "Local Channels, All Americans" plan, announced on February 25, 2002, requires a minimum of four uplink facilities – the total number of facilities that the two companies currently operate. In addition, the plan creates the likelihood that a fifth uplink facility may be required in addition to the four existing locations the two companies currently operate. This fifth location may be needed to provide adequate site differentiation for the re-use of the uplink frequencies to achieve the greatest benefit from the spot capacity. So, while the plan will likely require additional uplink investment even for the combined company, the uplink infrastructure can be secured much more efficiently for New EchoStar, as the merged company can draw on a basis of 4 uplink centers.

There are two guiding factors regarding control of the combined facilities:

1) All of the facilities must be carefully coordinated in their planning and day-to-day operations. Particularly with spot beams, every location has the potential to be communicating with every satellite. This must be done in lock step with military precision.

2) Despite the requirement for total cooperation, New EchoStar must make significant provision for redundancy/backup. Each uplink facility must be prepared to instantly stand independent of the other facilities, delivering the maximum possible content in the event one or more of the other facilities is not functional.

B. What is the actual compression ratio in each system today? What are the maximum and minimum ratios used?

The video compression ratio used in EchoStar's system varies substantially between individual transponders and satellites across the network. Prior to the implementation of the SHVIA "must-carry" rules on January 1, 2002, EchoStar normally attempted to keep the compression ratio at 8:1 or 9:1, depending on the content. This means 8 or 9 standard definition television channels[5] for each DBS channel. It was felt that this 8:1 or 9:1 compression ratio provided the optimal balance between picture quality and satellite bandwidth utilization.

[5] For other programming, such as high definition television or audio channels, the relevant compression ratios vary considerably.

As a result of "must-carry," EchoStar has been compelled to increase the compression ratios to 10:1 on most of its transponders, and 11:1 on many local market transponders. While there are still certain transponders that operate with only 8 video channels, the balance of the bandwidth of these transponders is used to support non-programming overhead uses such as DVB data transfer, software downloads, and other elements of the operating system. Likewise, there are certain transponders that are forced to operate at 12:1 today, based on the individual peculiarities of local backhaul configurations and the limitations of the upcoming spot beam footprints. Quality on these transponder, while above any regulatory requirements, routinely falls below EchoStar's acceptable minimum standard.

EchoStar has been forced to implement high compression levels as a result of must-carry that have resulted in less than the desired quality of reception. EchoStar believes that near- and medium-term future compression upgrades may improve current quality, but still not to an optimal level.

C. Based on LYNGSAT it would appear that 12:1 compression is currently used on some transponders. If 12:1 is the current level, what is the future predicted level of compression?

As noted in the response to Interrogatory XII(B) above, today's compression levels are too high to support EchoStar's historical quality levels. Anticipated upgrades to the software may improve current quality, but still not to an optimal level. Even with these software upgrades, therefore, EchoStar expects to maintain the current loading level. At this time, and for the foreseeable future, there are no additional encoding hardware changes that can be incorporated to improve the quality. All forms of signal pre-processing are already in place, and there are no new generations of silicon in development that will improve the current situation.

D. If the orbital slots of 32 channels become available, is it the intent of the operators to have a higher number of spot beams to increase capabilities? Is it your intent to build spot beam satellites in the future that will utilize the assigned 32 channels at a position?

On February 25, 2002, the Applicants filed an application for a new spot beam satellite to be launched by the combined firm, New Echostar 1, which will operate in conjunction with DIRECTV 4S, DIRECTV 7S, EchoStar VII and EchoStar VIII. Together, these five spot-beam satellites will provide the capability for a total of 28 spot-beam frequencies spread across all three DBS CONUS orbital locations. New EchoStar will use this spot-beam capability under the "Local Channels, All Americans" plan to carry local broadcast channels in the 210 DMAs across the country, along with necessary back-up and service expansion capabilities. This plan, which contemplates a mix of spot-beam and CONUS capability at each DBS CONUS orbital location, represents the latest judgment of the Applicants as to the most effective way to provide local channel service nationwide, while rationalizing the use of the DBS spectrum and the satellite assets that each of DIRECTV and EchoStar have in orbit or under construction.

For a variety of reasons, New EchoStar believes that spreading spot-beam satellites among the three CONUS orbital locations is a much superior alternative to using all 32 channels at one orbital location for spot beams. Spreading spot beam satellites among three

CONUS slots will give New EchoStar flexibility and will allow it to match geographic areas of the country with the spot beam best situated to serve them. Even more important, this approach will allow New EchoStar to make better use of existing spot-beam satellites, which, as explained in response to Interrogatory XII(F), cannot be moved between orbital locations without great loss of effectiveness. In sum, use of only one orbital location for spot beams would be inefficient and costly.

E. How many channel/transponders/spot beams/ reuses do you estimate would be required, and with what compression ratio, for one satellite to serve all local-into-local from one location?

In the Applicants' view, there is no practical way to incorporate enough of the necessary components into a single satellite at a single location that warrants serious consideration from a feasibility perspective, for a number of reasons:

- There is a tremendous risk associated with consolidating as many services onto a single chassis as would be handled by such a satellite. It is not feasible to provide for any form of redundancy in the event of catastrophic failure of the satellite.

- Such a satellite would require a vastly larger ground infrastructure to provide the physical site diversification and isolation. Cost and management of this infrastructure would be prohibitive.

- The cost of such a complicated satellite, unprecedented in the industry, cannot be warranted by the relatively small revenue generated by local channels in a given market, coupled with the need to sacrifice competitiveness and revenue from the national programming that will need to be displaced.

- Such a plan would be particularly inefficient given the firm's current investment in spot-beam satellites, as a new satellite serving all DMAs with local-into-local service would supplant and make useless existing spot-beam capability.

- The reliability of this complicated design is certain to be lower than more traditional configurations, which will translate directly into increased in orbit insurance costs.

- Overwhelming logistical problems, such as the eventual need for a swap-out of all subscriber equipment to accommodate 8PSK modulation and the lack of adequate satellite redundancy to ensure an orderly transition from existing satellites and set-top boxes.

The Applicants also incorporate by reference the Declaration of Dr. Richard J. Barnett, attached as Exhibit B to the Applicants' February 25, 2002 Opposition and Reply Comments, which discusses additional reasons why such a single orbital location "super-satellite" is not feasible.

F. Can the present spot beam satellites be collocated?

The "Local Channels, All Americans" plan contemplates that the existing and planned spot-beam satellites of EchoStar and DIRECTV will remain in their current orbital positions (Echostar VII at 119° W.L. and DIRECTV 4S at 101° W.L.) or will be launched into their planned orbital locations (Echostar VIII at 110° W.L. and DIRECTV 7S at 119° W.L.) and that a new spot beam satellite will be launched into the 110° W.L. orbital location (see discussion below).

Generally, it is technically possible to arrange the existing and planned spot-beam satellites into some other configuration, including collocating all five satellites at one location. However, moving an existing or planned satellite from its currently-contemplated orbital location could result in less than optimal utilization of the combined company's resources. First, EchoStar and DIRECTV each designed their respective existing or planned satellites to utilize all or a portion of the frequencies licensed to the respective company at a given orbital location. Thus, moving a satellite or satellites to different locations could result in overlapping frequency use, which would mean less overall available capacity for the combined firm. EchoStar VII and EchoStar VIII cannot be collocated and still provide useful spot beam operations. If one satellite is operating in the full spot beam mode (i.e. all 25 equivalent spot transponders in operation), the other satellite cannot utilize any spot transponders if at the same orbital slot. The second satellite can only operate over the remaining CONUS transponders.

Second, the spot beam coverage for each satellite is highly dependent on the geometry from the orbital location for which the satellite was originally designed. Thus, moving a satellite to a different orbital location would likely result in a misalignment of the spot beams for that satellite with the intended coverage area. This misalignment would likely result in unacceptable levels of interference between the spot beams due to distortion, and would therefore result in less available capacity.

G. Without the merger what can you do with current technologies to improve efficiencies?

Since inception of their services, both EchoStar and DIRECTV have implemented numerous techniques to improve the efficiency of their DBS systems in order to become more competitive, and to offer consumers more services and more value. Some of these efficiency-enhancing methods are currently being implemented as described in response to Interrogatories XII(B) and XII(E). However, at present, each company is close to capacity. There is almost no practical way to substantially increase the amount of national and local programming (including new services) that EchoStar and DIRECTV can offer consumers in a manner that makes any business sense and that would be acceptable to each company standing alone.

Opponents of the merger have hypothesized several technologies that EchoStar and DIRECTV might implement in their view to increase stand-alone capacity. None of these proposals is practical from a business perspective.

Spot Beam Satellites

Each of EchoStar and DIRECTV has invested hundreds of millions of dollars in spot beam satellites. These satellites allow scarce spectrum to be reused on a geographic basis, and therefore can effectively increase the available spectrum capacity, but only to the extent that different programming is demanded in different areas. Thus, at present, the primary practical use for spot beam DBS capacity is local-into-local programming.

On a stand-alone basis, each company's current and planned spot-beam satellites will allow it to meet the must-carry obligations and modestly expand primary local channel coverage. The exact number and identity of new DMAs to be served are not yet determined but will depend on several factors, including:

- The successful launch of the satellites and their ability to operate fully as planned without any limitations;
- The technical limits of planned spot beam satellites, including which DMAs the spot-beams are pointed at and can serve effectively, and the channel capacity of each spot-beam;
- The trade-offs between national and spot beam capacity, and the extent to which DIRECTV and EchoStar can each afford to give up actual or potential national capacity and therefore some competitiveness and revenues nationally in order to use that capacity to carry local-into-local programming;
- The ability of EchoStar and DIRECTV to negotiate retransmission agreements with those local broadcast stations that do not elect must-carry status;
- The on-the-ground costs of providing local-into-local service, which include the initial cost of equipment and installation in each DMA, as well as monthly costs, such as for high-capacity data lines from that location to the uplink center; and
- The number of consumers expected to subscribe to the local-into-local programming in each DMA, and expected revenues from them.

Notwithstanding the uncertainty associated with these factors, EchoStar expects that it will have the capability of offering local channel service in approximately 50 DMAs from its spot-beam satellites, in light of its satellite architecture, economic feasibility considerations and estimated redundancy needs. Although the spot-beams on EchoStar VII and VIII would have the physical capability of viewing additional DMAs (meaning all or a large portion of each DMA), that capability is meaningless: while the spot beams of EchoStar VII and VIII reach more DMAs, because of EchoStar's must-carry obligations, there is insufficient capacity in those beams to carry all of the channels for all of the DMAs within their reception areas.

For its part, DIRECTV will have the capability of offering local channel service in 51 DMAs without dramatically reducing the carriage of other national programming using

CONUS capacity. Assuming that DIRECTV 7S: (i) suffers no technical complications during construction and is not delayed; (ii) is launched successfully; and (iii) is not required to be used for backup capacity in the event that DIRECTV 4S malfunctions, then DIRECTV will have the *technical* capability with its combined fleet to serve 103 DMAs in late 2003 or early 2004. DIRECTV simply cannot serve 103 DMAs however: once again, the issue of technical capability is not meaningful unless it is considered in tandem with the economic realities of providing local channel service. At most, the DIRECTV 4S and DIRECTV 7S satellites will serve approximately 29 additional DMAs, or approximately 70 DMAs total, and DIRECTV may likely serve fewer DMAs.

Unless one of the planned satellites fails or suffers severe operational set-backs, a third spot beam satellite for either EchoStar or DIRECTV alone would not make business sense. The costs would far outweigh the benefits. Most importantly, another spot beam satellite would require the sacrifice of scarce national programming spectrum, which would therefore require losing competitiveness nationally and forgoing significant revenue. The on-the-ground costs of additional local programming would also be significant, particularly given the smaller subscriber bases of independent EchoStar and DIRECTV. Without a merger, the gains for consumers from an additional satellite would not justify these costs.

If the merger is approved, New EchoStar will construct and launch another spot beam satellite, tentatively named New EchoStar 1, which would re-use 8 DBS channels. It is expected that satellite would be located at the 110° W.L. location, though in certain circumstances the satellite might instead by operated from the 101° W.L. or 119° W.L. locations. Regardless of the location of the satellite, the result will be substantially the same efficiencies and the same increased local-into-local service for all 210 DMAs, within the same time frame as would be realized at the 110° W.L. orbital location. The "Local Channels, All Americans" plan will feature the new satellite operating in conjunction with the DIRECTV 4S, DIRECTV 7S, EchoStar VII and EchoStar VIII satellites, for a total of 28 spot-beam frequencies, to collectively provide local broadcast channels to all 210 DMAs, with necessary back-up and service expansion capabilities. For each firm standing alone, such a plan would require a totally unrealistic sacrifice of dozens of channels of national programming, and would simply not happen. The merger is the only way to ensure local-into-local service for all of the United States.

Compression

Current compression and the predicted modest changes in compression are discussed in response to Interrogatories XII(B) and XII(C).

MPEG-4

EchoStar and DIRECTV both use the MPEG-2 video encoding standard. Some merger opponents have suggested that a newer standard, MPEG-4, could increase the capacity of each company's DBS system. MPEG-4 is not practical for EchoStar and DIRECTV from a business perspective for several reasons. *First*, while MPEG-4 may offer significant capacity advantages over MPEG-2 at lower quality levels suitable for streaming over the Internet, it does not offer significant capacity advantages over MPEG-2 at the higher quality levels necessary for

EchoStar and DIRECTV to compete with cable. Second, use of MPEG-4 would require new set-top boxes for each consumer. A system-wide swap-out of set-top boxes is not practical from a business perspective given the limited – if any – consumer benefits. Third, the swap-out would be particularly expensive because MPEG-4 compatible hardware is immature.

Modulation and Turbo Coding

EchoStar and DIRECTV currently use QPSK modulation. Other forms of modulation are available for conceivable use, including 8PSK modulation. A system-wide roll-out of 8PSK modulation is not feasible from a business perspective for several reasons. *First*, the older satellites in the EchoStar and DIRECTV fleets do not have the power to transmit 8PSK signals effectively. *Second*, even with satellites that are powerful enough to broadcast 8PSK effectively, the effective capacity gain is relatively small. *Third*, 8PSK would require new, more costly set-top boxes. A system-wide swap-out of set-top boxes and launch of new, higher-power satellites is not practical from a business perspective in light of the limited benefits of 8PSK modulation. More advanced modulation would suffer these same drawbacks to a greater degree.

Turbo-coding is a means to improve the effectiveness of the error-correction that are used to allow consumers to receive adequate signals even if the DBS signal suffers from some interference. If it worked properly, turbo-coding would thus allow more real content, and less error-correction overhead, on a DBS channel. In the end, however, turbo-coding would only offer a relatively small increase in capacity. Moreover, a system-wide roll-out of turbo-coding is not practical as it would require new set-top boxes for all subscribers, increase the cost of each box, and would only offer a relatively small increase in capacity.

As discussed in response to Interrogatory XII(H), EchoStar is evaluating 8PSK modulation and turbo-coding for use in providing HDTV service and potentially Video-On-Demand, and it may prove practical for that purpose, in light of several factors including: the large amount of bandwidth consumed by each HDTV channel; the fact that HDTV and Video-On-Demand could be carried on newer, higher-power satellites; and the relatively small number of HDTV and Video-On-Demand subscribers today, thereby limiting the numbers of customers who would need new set-top equipment.

H. The application states that set-top boxes will be changed. Is it the intent to improve efficiencies such as higher modulation techniques without change-out?

At least a significant subset of customers from either EchoStar or DIRECTV will require new set-top boxes in order to take full advantage of the full array of additional programming and services that the combined company will be able to offer. As explained in response to Interrogatory X(C), EchoStar and DIRECTV will decide on which of their technology platforms will be used by New EchoStar for its core programming. Those consumers that will no longer be able to receive the programming they receive at the time with legacy equipment will need New Equipment, which will be provided by New EchoStar. As part of the process for deciding upon the post-merger technology platform and working out the details of the post-merger transition, the companies are also currently examining whether it is feasible and

economical for the new set-top boxes to include new technologies, such as 8PSK modulation and/or turbo coding, that currently are not used by either DIRECTV or EchoStar.

A number of issues make adoption of such new technologies difficult. First, only consumers with the new equipment would be able to receive programming taking advantage of the new technologies. Thus, at least initially, that programming would be available only to a subset of the combined subscribers of the company. In order to make the programming available to all subscribers, new consumer equipment would be required for all subscribers, not just for the existing base of one firm or the other. One potential way of gradually introducing such advanced boxes would be to offer new services only available to consumers with the new equipment, but that has the drawback of devoting scarce spectrum resources to programming with a necessarily limited audience. The costs of adding the new technologies may also be prohibitive.

EchoStar and DIRECTV are investigating those costs and attempting to find ways to make the deployment of such advanced boxes cost-effective.

I. Is it your intent to serve nation-wide from one location? If so, is it your intent to move the spot beam satellites to the orbital position where local-into-local would be? Would CONUS satellites be moved to the national location?

New EchoStar plans to offer consumers significantly expanded programming options, and it will not be possible for all of the national programming to be carried from one orbital location, due to the technical constraints on the number of programming channels that can be effectively squeezed into the authorized spectrum at each location. Accordingly, New EchoStar will not provide all national programming from one location.

However, the companies are considering plans whereby one orbital location would be the primary source for national programming. The two options being considered are to use either the 110° or the 101° W.L. orbital location primarily for the most popular national programming, although that location would still be used to serve some local-into-local programming. Final decisions in that regard will be made according to the process outlined in response to Interrogatory X(C). In any event, the combined existing and planned satellite fleets will provide sufficient capability to carry national programming from each orbital location, at least for all of the DBS channels that will not be used for spot beams to carry localized programming. New EchoStar currently intends to retain satellite fleets in each CONUS orbital location sufficient to use all 32 DBS channels, and to use all authorized DBS channels at each licensed non-CONUS orbital location.

J. What is the intended use for the orbital positions of 61.5° W.L., 148° W.L. and 175° W.L., since it appears that the entire country is served from central locations?

After the consummation of the merger, the orbital locations at 61.5° W.L. and 148° W.L., called the "wing slots," are intended to be used for specialized services such as niche international programming, *e.g.*, foreign-language programming for which there is a relatively small subscriber base, and business television. With respect to the 175° W.L. orbital location,

EchoStar currently intends to move its EchoStar IV satellite to the 175° W.L. orbital location upon successful launch and testing of EchoStar VII and VIII. The Applicants do not expect the merger to alter this intention. New EchoStar will most likely use that slot to transmit specialty programming to the Western portion of the United States as well as Hawaii, and to transmit programming between the U.S. and Pacific Basin Countries.

K. What do "o/e," "o" and "e" mean in the satellite deployment charts?

"Odd/even," "odd" and "even" respectively.

L. How do plans for the integration of Spaceway/Wildblue/EchoStar systems affect the scale of manufacturing when current designs utilize different access/modulation/switching methods?

EchoStar currently has only minority interests in Wildblue and StarBand. Therefore, any plans to integrate the systems of those companies into SPACEWAY will require StarBand's and Wildblue's independent approval and consent.

Approximately two thirds of the projected costs for consumer and enterprise Ka-band terminals are associated with the RF transceiver and antenna. The remaining one third is associated with the satellite modem that is connected to the users' PC or LAN. SPACEWAY and potential EchoStar Ka-band satellites can all leverage common antenna and transceiver technology. Even though the contemplated SPACEWAY system utilizes on-board processing and the other proposed or contemplated systems do not (they are bent-pipe configurations), there is enough commonality in power levels and antenna gains/patterns to serve all systems with a single set of products/vendors. This means that the combined subscriber bases of these services will likely provide the scale necessary to reduce the RF-driven portion of the CPE costs to levels below that which any single service provider could achieve (in addition to all of the other scale economies detailed above).

M. Provide information on the time frame needed to implement these technical changes.

The Applicants are uncertain as to the "technical changes" to which this Interrogatory refers. To the extent that this Interrogatory refers to any changes that may be discussed in Interrogatory XII(L), please see the response to that Interrogatory. As noted in that response, substantial scale economies for common components of the various subsystems will be available without the need for any technical changes. To the extent that this Interrogatory refers to changes that may be made to set-top boxes, please see the response to Interrogatory X(F).