SPRINT CORPORATION
CINGULAR WIRELESS LLC

August 5, 2002

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International Bureau
Federal Communications Commission
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Mr. Thomas J. Sugrue, Chief
Wireless Telecommunications Bureau
Federal Communications Commission
445 12th Street, S.W.
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Mr. Edmond J. Thomas, Chief
Office of Engineering and Technology
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: ***Written Ex Parte Communication***
Mobile Satellite Systems – Terrestrial Services
Response to Globalstar's Critique of the Telcordia Analysis
IB Docket No. 01-185; ET Docket No. 95-18

Dear Messrs. Abelson, Sugrue and Thomas:

On June 27, 2002, Globalstar, L.P. ("Globalstar" or "GLP") responded to the Telcordia Analysis that Cingular and Sprint submitted on May 13, 2002.[1] In its June 27 Response, Globalstar substantially increased its forecast of the number of handsets that an ATC network operator could serve – a figure that is 29 to 58 times higher than previous estimates it submitted to the Commission. In addition, Globalstar asserts that the Telcordia Analysis is "riddled with factual and legal errors and distortions regarding integrated MSS-ATC systems."[2] However, Globalstar's supporting "Technical Statement" takes issue with only two points in the 90-page Telcordia Analysis, and a careful reading of this Statement reveals that Globalstar never explains the errors Telcordia supposedly committed.[3]

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[1] *See* Cingular/Sprint Ex Parte (May 13, 2002), Attachment A, Dr. Jay Padgett, Senior Research Scientist, Telcordia Technologies, "Analysis of Spectrum Sharing Between MSS and Terrestrial Wireless Services" (May 10, 2002)("Telcordia Analysis"). All FCC filings cited in this Attachment were submitted in Docket Nos. 01-185 and 95-18.

[2] GLP June 27 Letter at 1.

[3] Although Globalstar states that it "explain[s] why the Telcordia Analysis is incorrect in its assessment of the MSS return link limitation," GLP June 27 Technical Statement at 8, Globalstar never identifies any return link limitation error in the Telcordia Analysis. Similarly, although Globalstar states that "Telcordia's conclusions regarding the impact on ATC capacity are not correct," *id.* at 12, it never identifies the

On March 22, 2002, Globalstar told the Commission that using the latest CDMA technology in an ATC network (cdma2000) and using its proposed dynamic frequency coordination method, it could serve a total of "between 500 and 1000" ATC handsets within one of its satellite beams (which cover a geographic area larger than the State of Texas).[4] Globalstar emphasized, however, that this was the maximum number of active ATC handsets (indoor and outdoor) that it could support within each beam:

> In this case [between 500 and 1,000 ATC handsets], an entire Globalstar satellite MSS beam will encounter interference that will render MSS service inoperable at the ATC frequencies.[5]

In stark contrast, Globalstar contends in its June 27 Response that an ATC network operator could serve "29,400 simultaneous ATC callers" within each spot beam[6] – *or from 29 to 58 times more ATC handsets than it told the Commission only two months earlier.* Significantly, Globalstar makes no attempt in its June 27 Response to reconcile these two sharply divergent sets of results.

Globalstar intends to achieve its new ATC capacity by "dedicating" MSS frequencies to ATC service, rendering the MSS beam incapable of using these frequencies for MSS service in rural areas.[7] In other words, Globalstar plans to use the very band segmentation that the Telcordia Analysis confirms is more spectrally efficient than dynamic frequency coordination sharing.[8] The Attachment demonstrates that Globalstar's newest estimates employ several faulty assumptions that Globalstar uses to inflate grossly its estimates.

Globalstar states that the Commission should not be concerned by its "dedication" of MSS frequencies to ATC use because it would "re-assign channels to MSS in full" if the frequencies are needed for MSS service.[9] According to it latest estimates, Globalstar claims that an ATC network could serve 490 ATC callers for every one MSS caller.[10] Thus, Globalstar would have the Commission believe that if the MSS spectrum it "dedicated" to ATC is later needed for MSS, it will simply deny service to 490 ATC callers (and forego revenues from 490 customers) so it can serve a single MSS caller.

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capacity error that Telcordia supposedly made. In addition, neither the Telcordia Analysis nor the Cingular/Sprint May 13 cover letter contained any legal discussion, so these materials could not have possibly been "riddled with . . . legal errors." GLP June 27 Letter at 1.

[4] GLP March 22 Technical Response at 26. Globalstar states that four of its spot beams can cover the entire continental United States. *See id.* at 11.

[5] *Id.*

[6] GLP June 27 Technical Statement at 10.

[7] *See* GLP June 27 Technical Statement at 8, 10 and 11.

[8] Given its plan to "dedicate" certain MSS frequencies to ATC service, Globalstar would not "reuse" MSS frequencies as it recently told the Commission. *See* Globalstar Ex Parte at 6 (July 19, 2002).

[9] GLP June 27 Technical Statement at 14.

[10] GLP June 27 Technical Statement at 9 and 10.

The reality is that Globalstar would never face the situation of reallocating to MSS service MSS frequencies it has dedicated to ATC. The facts are undisputed that Globalstar's MSS spectrum "is drastically underutilized."[11] Globalstar thus has vast amounts of spectrum that it could dedicate to ATC, without ever facing the risk that it would have to reassign the frequencies to MSS (even assuming it would given the different economics of ATC and MSS networks). In short, Globalstar's submissions confirm that (1) it has far more spectrum than it needs to support MSS services (thereby justifying a reallocation of some of the MSS band), and (2) band segmentation is the most spectrally efficient approach.

Globalstar recently obtained an experimental license to test ATC – although oddly it is using GSM for its ATC tests rather than the CDMA interface it has told the Commission that it would use for ATC (and all of its technical studies are based on CDMA).[12] Globalstar told the Commission of its intent to conduct "public tests" of the technology and that it would submit unspecified "additional technical information" in this docket:

> The Commission is currently considering the issues concerning ATC in IB Docket No. 01-185, and the timely presentation of additional technical information on ATC in the record of this rulemaking proceeding could be important to those deliberations.[13]

Cingular and Sprint welcome this development, since the conduct of tests will help determine which Globalstar estimate is more accurate: 500-1,000 ATC handsets in each beam (March 22), or 29,400 ATC handsets in each beam (June 27). However, given that this is a rulemaking proceeding and given that it is essential that the Commission act on a complete record, the Commission should require Globalstar to publish and submit in the public record the complete results of all ATC tests that it conducts pursuant to the experimental license. Globalstar should not be permitted to pick and choose selectively what "additional technical information" it submits to the Commission and makes available to adverse parties.

Also of significance is that in its June 27 Response, Globalstar does *not* challenge the major points that Telcordia made in its Analysis:

- *Limitations on ATC Network Capacity.* Telcordia documented that the size of any ATC network would have to be limited, because at a certain threshold, interference from ATC handsets would begin to degrade (and quickly eliminate) satellite capacity, rendering the satellite incapable of providing MSS services in rural areas. Globalstar concedes this major point:

  > As the Telcordia Analysis points out, at any given time, there will be a maximum allowable number of ATC users because of the potential for

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[11] Globalstar Creditors Committee Ex Parte at 5 (May 13, 2002).

[12] *See* Globalstar Experimental License, File No. 0104-EX-PL-2002, Call Sign WC2XXD (July 9, 2002).

[13] Globalstar Exhibit A at 2, File No. 0238-EX-ST-2002 (June 27, 2002). Globalstar recently gave a demonstration to certain members of the FCC staff. *See* Globalstar Ex Parte (July 19, 2002).

> interference into MSS. The maximum number would have to be enforced *regardless* of which entity was operating the terrestrial service.[14]

Globalstar thus concedes that its ability to provide MSS service to rural areas will be degraded once these ATC interference limits are reached.

- *Separate ATC Operators.* Telcordia demonstrated that having a separate ATC operator "is quite feasible, even with dynamic frequency coordination."[15] Telcordia further documented several ways that separate ATC and MSS operators could share the necessary data needed to implement dynamic frequency coordination.[16] Although Globalstar claims that this coordination between separate operators would "not be practical,"[17] Globalstar does not challenge in any way the demonstration that Telcordia made.

- *Spectrum Efficiency.* Telcordia documented that spectrum sharing, including the dynamic frequency assignment sharing approach, is not spectrally efficient compared to band segmentation:

  > The fundamental reason is that with sharing, the allowable MSS and ATC terminal densities are both controlled by the very large area of the MSS beam footprint, whereas with segmentation, only the MSS terminal density depends on the beam footprint.[18]

  Globalstar makes no attempt in its June 27 Response to identify any error in the Telcordia Analysis of spectrum efficiency.

In the end, Globalstar's arguments are based on smoke and mirrors. The Attachment documents that many of the statements Globalstar makes in its June 27 Letter are either unexplained or mischaracterize what Cingular, Sprint and Telcordia have stated. When Globalstar's Letter is stripped of these mischaracterizations and unsupported conclusions, it becomes apparent that Globalstar has no credible argument in support of its position – namely, that it and only it should have the opportunity to provide terrestrial services in the MSS band. To the contrary, the record evidence is undisputed that it is technically feasible to sever ATC operations from MSS operations.

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[14] GLP June 27 Letter at 7 (emphasis added).

[15] *See* Telcordia Analysis at 2 and 12.

[16] *See id.* at 77-79.

[17] GLP June 27 Technical Statement at 14.

[18] Telcordia Analysis at 76.

Pursuant to Section 1.1206(b)(1) of the Commission's rules, one copy of this letter is being filed with the Secretary's office for filing in IB Docket No. 01-185 and ET Docket No. 95-18.

Respectfully submitted,

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Attachment: Response to Globalstar's Critique of the Telcordia Analysis

cc: Marlene H. Dortch, Secretary, FCC
Robert H. Pepper, Chief, Office of Plans and Policy, FCC

Cingular/Sprint Ex Parte
Mobile Satellite Systems – Terrestrial Services
IB Docket No. 01-185/ET Docket No. 95-18
August 5, 2002

Attachment

RESPONSE TO THE GLOBALSTAR CRITIQUE Of THE TELCORDIA ANALYSIS

Cingular and Sprint below respond to the criticisms that Globalstar, L.P. ("Globalstar" or "GLP") has made concerning the Telcordia Analysis which they submitted on May 13, 2002.[1] Globalstar's critique consists of two documents submitted on June 27, 2002: (1) a 14-page letter ("GLP June 27 Letter"); and (2) a 15-page Technical Statement prepared by one of its engineers ("GLP June 27 Technical Statement"), of which only 7.5 pages address the Telcordia Analysis.[2]

This response is divided into five sections: (a) a demonstration that Globalstar's new ATC capacity estimates are grossly inflated and are strikingly inconsistent with its prior representations (pp. 2-9); (b) an identification and correction of Globalstar's mischaracterizations of the Telcordia Analysis (pp. 9-16); (c) an identification of the assertions that Globalstar does not support (pp. 16-24); (d) a demonstration that Globalstar's new technical infeasibility argument lacks merit (pp. 24-25); and (e) a demonstration that Globalstar's critique confirms rather than undermines the Telcordia Analysis (pp. 25-29).

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[1] *See* Cingular/Sprint Ex Parte (May 13, 2002), Attachment A, Dr. Jay Padgett, Senior Research Scientist, Telcordia Technologies, "Analysis of Spectrum Sharing Between MSS and Terrestrial Wireless Services" (May 10, 2002)("Telcordia Analysis"). All FCC filings cited in this attachment were submitted in Docket Nos. 01-185 and 95-18.

[2] The first seven pages of Globalstar's Technical Statement respond to an analysis submitted by AT&T Wireless and its consultant. Cingular and Sprint do not respond to these criticisms.

I. GLOBALSTAR'S NEW ATC CAPACITY PROJECTIONS ARE GROSSLY INFLATED AND ARE INCONSISTENT WITH ITS PRIOR REPRESENTATIONS

Globalstar claims in its June 27 Response that it could simultaneously serve 117,600 ATC callers – the equivalent of 3.9 million total ATC customers – if it receives authority to provide ATC service.[3] This estimate is grossly inflated, because of several faulty assumptions.

Globalstar's new ATC capacity estimate is also inconsistent with what it has previously told the Commission. On March 22, 2002, Globalstar told the FCC that with dynamic frequency assignment, it could serve a total of 500 to 1,000 ATC handsets within one of its satellite beams – an area generally larger than the State of Texas – before MSS capacity will be rendered "inoperable."[4] In stark contrast, Globalstar now claims in its June 27 Response that it could support a total of 29,400 ATC handsets in each of its satellite beams.[5] It is not surprising that Globalstar fails to explain how, in the course of only two months, the expected capacity of an ATC network increased by a factor of 29 to 58.

Globalstar's Letter, but not its Technical Statement, asserts that Telcordia's independent analysis of Globalstar's March 22 estimate contains "four serious errors."[6] Cingular and Sprint demonstrate in Part II below that these allegations lack merit, because Telcordia used the very same assumptions that Globalstar used in its March 22 estimate. What has changed is that, in its June 27 Response, Globalstar has used an entirely different methodology to compute the projected capacity of an ATC network. It is unfair to criticize Telcordia for using many of the same assumptions that Globalstar itself used in its earlier submission.

Three points bear brief mention in considering Globalstar's new analysis.

1. Globalstar's new analysis attempts to project the total number of ATC handsets within one of its satellite beams required to exhaust the uplink capacity of a single 1.25 MHz channel. Globalstar arbitrarily assumes that all ATC handsets will ex-

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[3] *See* GLP June 27 Letter at 6.

[4] GLP March 22 Technical Response at 26.

[5] *See* GLP June 27 Letter at 6.

[6] GLP June 27 Letter at 5.

perience an additional 10.5 dB attenuation to the satellite, compared to MSS handsets, but it never explains this basic assumption.[7]

This Globalstar assumption is not credible. Globalstar earlier told the Commission that only two active ATC handsets operating cochannel, outdoors and at full power would degrade the capacity of its spot beam.[8] With dynamic frequency assignment, Globalstar's analysis demonstrated that it could serve no more than 17 to 34 outdoor handsets within one of its beams before satellite capacity would be degraded.[9] Cingular and Sprint submit that Globalstar's assumption – 35 ATC customers in a spot beam the size of Texas will never attempt to use ATC service while outdoors – is not realistic and accordingly, not reasonable.

2. The estimates Globalstar provides (and that are discussed below) are the total number of ATC callers before MSS capacity is exhausted in the affected channels and beam (*i.e.,* MSS capacity is no longer available to serve any rural customers on the affected channel, using the affected beam). The better (and more general) approach would be to calculate the total number of ATC callers corresponding to a given fractional capacity reduction of the MSS uplink for the affected channel and beam.

3. Even if one were to assume the accuracy of Globalstar's latest assumptions and estimates, the fact remains that an independent ATC operator would be able to achieve the same results, as explained elsewhere in this paper.

A. Globalstar Uses Several Questionable Assumptions

The key factor underlying Globalstar's new ATC capacity estimates is its assertion that "interference of 490 simultaneous ATC callers [is equivalent] to that of a single MSS caller."[10]

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[7] *See* GLP June 27 Technical Statement at 10.

[8] *See* GLP March 22 Technical Response at 8.

[9] *See* Cingular/Sprint May 13 Letter at 13 and n.40.

[10] GLP June 27 Technical Statement at 10. Globalstar states that it can support 60 MSS callers in a single 1.25 MHz CDMA frequency band, which, according to Globalstar, is the equivalent of 29,400 ATC callers in a single spot beam (490 x 60 = 29,400). Globalstar generally has four beams covering the

It is important to understand how Globalstar arrives at this "490 ATC callers = one MSS caller" ratio.

Globalstar states that the average EIRP of one of its MSS terminals is 22.4 dBm.[11] It assumes that the average EIRP of a ATC handset would be 10 dBm, for a difference in EIRP of 12.4 dB.[12] Globalstar then reduces this 12.4 dB by another 14.5 dB for a total dB difference between the EIRP of an ATC handset and a MSS terminal of 26.9 dB.[13] The additional 14.5 dB reduction in the ATC's EIRP is appropriate, Globalstar says, due to three factors:

- 10.5 dB excess path loss as calculated using the Hata Model;
- 1 dB reduction for ATC antenna gain; and
- 3 dB reduction for polarization.

These three factors are discussed below.

1. Globalstar's Use of the Hata Model Is Unexplained and Inappropriate. In its most recent Technical Statement, Globalstar asserts that it could serve 490 terrestrial handsets for each MSS terminal – that is, in terms of satellite capacity, one MSS call is the equivalent of 490 ATC calls. Globalstar arrived at its "490 ATC caller = one MSS caller" equivalency ratio through use of the Hata Model, which Globalstar used to calculate "the required separation distances to avoid interference."[14] Based on this Model, Globalstar obtained an "average propagation environment attenuation factor of 10.5 dB":

> This 10.5 dB is the average propagation loss from an active ATC unit to the satellite.[15]

Globalstar does not, however, explain how it arrived at this 10.5 dB figure from the Hata Model.

Continental United States, enabling it to claim the ability to serve 117,600 ATC callers simultaneously (29,400 x 4 beams).

[11] *See* GLP June 27 Technical Statement at 9.

[12] *See id.*

[13] *See id.* at 10.

[14] GLP June 27 Technical Statement at 2.

[15] *Id.* at 10.

Globalstar's use of the Hata Model is inappropriate. As is well known throughout the wireless engineering community, the Hata Model was developed to represent the median path loss between a terrestrial mobile handset and a *terrestrial* base station – *not* between a terrestrial handset and a *satellite.*[16] Indeed, Globalstar readily acknowledges this limitation of the Hata Model:

> The "Hata" model, which is given in ITU-R Recommendation P529-3, is used to model propagation of *terrestrial mobile signals.* The Hata model indicates that mobile signals are attenuated in proportion to the distance between the transmitter and the receiver raised to the 3.4 power.[17]

It is inappropriate to use a model designed specifically for the land mobile propagation environment (terrestrial handsets and terrestrial base stations) for an entirely different arrangement: propagation losses between a terrestrial handset and a satellite.

The FCC has held that even in a terrestrial-only environment, use of the Hata Model is inappropriate when the distance between a mobile terminal and a terrestrial transmitter is greater than 20 kilometers:

> We do not believe the Hata model is suitable for general PCS-to-microwave interference calculations. It is based on short-range data, i.e., less than 20 km; it does not take into consideration long-term signal variations.[18]

If, as the FCC has held, it is inappropriate to use the Hata Model to predict the propagation loss between a terminal and terrestrial transmitter at a distance of 20 kilometers, it is certainly inappropriate to use that Model to predict the propagation loss between a terrestrial handset and a satellite at a distance of 1,400 or more kilometers.

Globalstar arrived at its "490 ATC callers = one MSS caller" ratio by assuming a total propagation loss of terrestrial handsets of 26.9 dB EIRP, of which 10.5 dB was allotted for the results of the Hata Model (the equivalent of a 11.2 multiplier).[19] When this unexplained 10.5 dB excess path loss is removed from the equation (and assuming the validity of all of Globalstar's other assumptions), Globalstar would serve a total of 44 terrestrial handsets for each MSS termi-

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[16] *See* Masaharu Hata, *Empirical Formula for Propagation Loss in the Land Mobile Radio Service*, IEEE Transactions of Vehicular Technology, Vol. VT-29, No. 3 (Aug. 1980).

[17] *See* GLP June 27 Technical Statement at 2 (emphasis added).

[18] *Second PCS Order,* 8 FCC Rcd 7700, 7772 n.128 (1993).

[19] *See* GLP June 27 Technical Statement at 10.

nal, rather than the 490 ATC handsets claimed. This correction alone would reduce Globalstar's analysis from 29,400 ATC handsets per beam to 2,625 ATC handsets per beam.

2. Globalstar's Inclusion of 1 dB for Terrestrial Handset Antenna Power Is Unfounded. Globalstar's calculations assume a 1 dB reduction to account for terrestrial handset antenna pattern – a factor Globalstar did not consider in its March 22, 2002 papers. Globalstar states that "[g]iven the nominal positioning of the ATC unit antenna and its radiation pattern, there will be a gain pattern roll-off with increasing elevations, with a null at zenith":

> In contrast, the Globalstar MSS MET antennas are designed with a cardioid pattern to enhance gain in the upper hemisphere and minimize gain at the horizon.[20]

Terrestrial handsets typically use short (quarter-wave) monopole ("whip") antennas, which also have a cardioid pattern, with a maximum gain of about 2 dBi in the direction perpendicular to the antenna axis. While such an antenna will indeed have a "null at zenith" if it is vertically-oriented, this is seldom the case when the handset is in use, as most PCS and cellular subscribers know. In fact, both the orientation of the ATC antenna and the elevation of the satellite can be viewed only as random. If the antenna pattern is averaged over variations in antenna orientation and satellite elevation, the average gain will by definition be 0 dBi. It therefore is unreasonable to reduce arbitrarily the EIRP of the ATC handset by 1 dB on the basis of antenna directivity.

3. GLP's Inclusion of a 3-dB Polarization Loss Is Inconsistent with its Earlier Calculations, and Is Unsupported by Any Analysis In the calculations of its March 22 Technical Statement, GLP stated: "Polarization losses (2 to 3 dB) were not taken into account. . . ."[21] However, the calculations in Globalstar's June 27 Technical Statement include polarization loss, stating: "Statistically, a group of ATC callers will have an average polarization loss to the left hand circular polarization satellite antenna of 3 dB."[22] However, this claim is unsupported with any models or calculations, and appears to be based on some idealized assumptions. Accounting for real-world propagation factors such as polarization cross-coupling due to scattering effects from the ground and objects near the terminal, the polarization loss will likely be less.

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[20] GLP June 27 Technical Statement at 10.

[21] GLP March 22 Technical Response at 8.

4. Globalstar Did Not Appear to Consider the Effect of Speech Activity. Globalstar states the average EIRP of one of its MSS terminals in the direction of the satellite is 22.4 dBm.[23] Globalstar does not indicate whether this average EIRP figure includes the effect of speech activity. If the figure includes this factor, then the total EIRP from 60 MSS terminals is $22.4 + 10\log 60 = 40.2$ dBm, or 10.2 dBW. On the other hand, if Globalstar's average EIRP does not include consideration for speech activity, then the total EIRP from the 60 terminals, allowing for a speech activity factor of 0.5, is 3 dB less, or 7.2 dBW.[24]

As noted above, Globalstar's claimed "490 ATC handsets = one MSS terminal" ratio should actually be "44 ATC handsets = one MSS terminal" when adjustments are made to exclude the unexplained 10.5-dB excess path loss. However, if Globalstar did not consider the effects of speech activity, then the equivalency ratio would be "22 ATC handsets = one MSS terminal."

B. With Appropriate Adjustments, Globalstar's ATC Capacity Projections Using Its Latest Methodology Become More in Line with Its Original Representations and the Telcordia Analysis

Globalstar's June 27 calculations can be readily modified to remove or adjust the questionable factors that Globalstar introduced in its new analysis. Using an average terrestrial transmit power of 11 dBm, based on a 100-mW maximum transmit power and factors of 6 dB and 3 dB to account for average power reduction due to power control and speech activity, respectively, an average ATC antenna gain of 0 dBi, and a polarization loss factor of 2 dB (which was intentionally neglected in Globalstar's March 22 Technical Response), the net difference between the EIRP of a MSS terminal and an ATC handset, as seen by the spacecraft, is 13.4 dB, or a factor of about 22. Multiplying this by 60 gives 1,320 ATC terminals. This means that 1,320 active, outdoor terrestrial handsets within the area of a spot beam would exhaust the ca-

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[22] GLP June 27 Technical Statement at 9.

[23] *See* GLP June 27 Technical Statement at 9.

[24] The Telcordia Analysis calculated that a total ATC handset EIRP of 9 dBW would exhaust the MSS uplink capacity. *See* Telcordia Analysis at 9, Figure 3. This is within the values corresponding to the new Globalstar analysis: 7.2 dBW and 10.2 dBW, depending on whether Globalstar's 22.4 dBm average MSS terminal EIRP included the effect of speech activity. This new Globalstar information thus helps confirm the validity of the uplink model and parameters used in the Telcordia Analysis.

pacity of the MSS uplink channel. This is a small number of terrestrial handsets, considering that the coverage area of a Globalstar spot beam is on the order of 500,000 to one million square kilometers.

This calculation assumes that the 22.4 dBm average MSS terminal transmit power cited by Globalstar includes the effect of speech activity gating of the transmitter. If it does not, then the net difference between the MSS and ATC transmit power levels must be reduced by 3 dB, to 10.4 dB, or a factor of about 11. In that case, only 660 active outdoor terrestrial handsets would exhaust the capacity of the MSS uplink channel.

It bears emphasis that these results are consistent with the results in the Telcordia Analysis. In equation (29),[25] the fractional capacity reduction of the MSS uplink is given as:

$$\frac{\Delta\Lambda}{\Lambda_0} = \frac{K_{ATC}}{80.7} \cdot \frac{1}{F_{PC} F_{TA} L_{EX}}$$

where K_{ATC} is the number of active ATC handsets within the MSS spot beam, F_{PC} and F_{TA} are the power control and transmit activity factors, and L_{EX} is the excess loss. Setting L_{EX} to 2 dB (a factor of 1.58) to account for the assumed average polarization mismatch loss and $\Delta\Lambda/\Lambda_0 = 1$ gives $K_{ATC} = 1023$ active outdoor ATC terminals, which again is bracketed by the results given above based on the approach used in Globalstar's June 27 Technical Statement. Without the 2-dB polarization loss (which was not included in the Telcordia Analysis), $K_{ATC} = 645$ active outdoor ATC handsets per spot beam.

It is also significant these calculations are consistent with results that Globalstar reported in its March 22 Technical Statement, where Globalstar stated:

> In the forward band sharing operation, a fairly small number of "uncoordinated" ATC handsets (tens to hundreds) within a Globalstar satellite return link (L-band) beam can produce unacceptable interference to the MSS spacecraft receiver. However, when coordinated (i.e., the MSS operator is also operating the ATC service), the number of ATC handsets can be between 500 and 1000. In this case,

[25] *See* Telcordia Analysis at 22.

> an entire Globalstar satellite MSS beam will encounter interference that will render MSS service inoperable at the ATC frequencies.[26]

The important point to note about this statement is that Globalstar is discussing *not* the number of ATC handsets required for a 6% noise floor increase at the MSS uplink receiver, *but rather* the number of in-beam cochannel ATC handsets required to *completely exhaust the capacity of the satellite uplink.* The contrast between Globalstar's results – 500 to 1000 ATC terminals (March 22) vs. 29,400 ATC terminals (June 27) – is striking. Globalstar has not attempted to explain this inconsistency, probably because it fails explanation.

II. GLOBALSTAR'S CHARACTERIZATIONS OF THE TELCORDIA ANALYSIS ARE NOT ACCURATE

Many of Globalstar's characterizations of the Telcordia Analysis are not accurate and, accordingly, are in need of correction.

Globalstar Mischaracterizations No. 1:

> "The Terrestrial Carriers correctly point out that the terrestrial and satellite components of an integrated MSS-ATC system cannot operate co-frequency in the same geographic location. No one disputes that conclusion. . . . All agree that the channels assigned for ATC cannot be used for the satellite components in the specific geographic areas where the frequencies are in use for ATC."[27]

Response: Neither the Telcordia Analysis nor Cingular/Sprint made this claim. The Telcordia Analysis rather acknowledged that the cochannel sharing approach was technically feasible but at the cost of reduced MSS uplink capacity.[28] This is a point Globalstar concedes in its June 27 Letter: "co-channel sharing can occur even within the same beam."[29]

Globalstar Mischaracterizations No. 2:

> "The Terrestrial Carriers incorrectly claim that use of separate channel assignments in the terrestrial and satellite modes of an integrated ATC-MSS system

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[26] GLP March 22 Technical Response at 25-26.

[27] GLP June 27 Letter at 3.

[28] *See, e.g.,* Telcordia Analysis at 1.

[29] GLP June 27 Letter at 4.

> within the same geographic area supports segmentation of the MSS spectrum for unaffiliated terrestrial and satellite service providers."[30]
>
> "However, that conclusion [Mischaracterization No. 1 above] alone does not justify segmenting MSS spectrum bands for separate satellite and terrestrial service providers."[31]
>
> "The Terrestrial Carriers have advocated their simplistic conclusion that the inability of two mobile services to operate co-frequency in the same geographic location *requires* the creation of a separate terrestrial service."[32]

Response: These statements confuse two separate issues: integrated vs. separate operators, and segmented vs. shared spectrum. Cingular and Sprint do favor band segmentation and auctioning of the terrestrial component over the other two alternatives (cochannel sharing and dynamic frequency assignment sharing), but *not* for the reason that Globalstar says. Cingular and Sprint rather favor band segmentation because the Telcordia Analysis documented that such an approach would be far more spectrally efficient compared to the cochannel and dynamic frequency assignment sharing approaches.[33] Globalstar has not even attempted to challenge this Telcordia demonstration.

Cingular and Sprint further believe that segmentation is appropriate, because all available facts suggest that more spectrum has been allocated to MSS than is needed to support the market needs for MSS service. In this regard, Globalstar has acknowledged that its MSS system is designed to provide service in areas "not served by wireline or cellular services," that the extension of terrestrial networks "has reduced demand for Globalstar service," and that terrestrial networks have been "built more quickly than Globalstar anticipated; therefore demand for Globalstar's service is expected to be reduced sooner than Globalstar assumed in formulating earlier business plans."[34]

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[30] GLP June 27 Letter at 3. In support of this assertion, Globalstar cites "Cingular/Sprint Letter at 7-8." *Id.* at 3 n.2. However, the Cingular/Sprint Letter does not make the assertion that Globalstar attributes to it.

[31] GLP June 27 Letter at 3.

[32] *Id.* at 4 (emphasis in original).

[33] *See* Telcordia Analysis at 73-76.

[34] Globalstar Form 10Q, at 28 (May 15, 2002).

Globalstar Mischaracterization No. 3:

> "The Telcordia Analysis makes four serious errors. First, it erroneously assumes that all ATC terminals are in clear line of sight to the satellite."[35]

Response: This assertion is not accurate, and it is not surprising that Globalstar does not add a page citation to support its assertion. The Telcordia Analysis explicitly treated excess loss (to account for non-line-of-sight conditions) as a parameter.[36] Cingular and Sprint find noteworthy that this assertion is not contained in the Technical Statement, which was prepared by a Globalstar engineer.

Globalstar Mischaracterization No. 4:

> "The Telcordia Analysis makes four serious errors. . . . Second, the Telcordia Analysis incorrectly assumes that all ATC terminals are transmitting at maximum power (100 mW). All digital cellular systems use power control, and so would ATC. As a result, the average transmit power is 10 mW."[37]

Response: This assertion is also not accurate, and Globalstar again fails to cite a page reference to the Telcordia Analysis to support its assertion. The Telcordia Analysis explicitly included factors to account for reduction of the average power due to transmit power control (6 dB) and speech activity (3 dB), resulting in an average ATC terminal transmit power of 11 dBm (12.6 mW) – very close to the 10 mW that Globalstar claims that Telcordia should have used (although Globalstar used a less refined analysis than Telcordia).[38] This assertion is not contained in the Technical Statement, which was prepared by a Globalstar engineer. In addition, in the Technical Response attached to Globalstar's March 22, 2002 Comments ("GLP March 22 Technical Response"), it was assumed that each ATC terminal was transmitting at a full power of 100 milliwatts.[39]

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[35] GLP June 27 Letter at 5.

[36] *See, e.g.,* Telcordia Analysis at 22, equation (29) and 26, Figure 11.

[37] GLP June 27 Letter at 5.

[38] *See* Telcordia Analysis at 22, equation (29).

[39] GLP March 22 Technical Response at 7-8.

Globalstar Mischaracterization No. 5:

> "The Telcordia Analysis makes four serious errors. . . . Third, the Telcordia Analysis incorrectly assumes that MSS and ATC use the same polarization."[40]

Response: This assertion is not accurate because Telcordia did not assume that MSS and ATC would use "the same polarization." It is true that the Telcordia Analysis did not consider polarization effects, but this was because Globalstar's March 22 papers explicitly ignored polarization effects,[41] and Telcordia adopted many of the same assumptions and parameters as Globalstar to provide for consistency with Globalstar's analysis. It is unreasonable to assert that Telcordia committed a "serious error" for not considering polarization effects, when Globalstar choose to ignore these effects in its earlier FCC submissions. This assertion, like many others, is not contained in the Technical Statement, which was prepared by a Globalstar engineer.

Globalstar Mischaracterization No. 6:

> "The Telcordia Analysis makes four serious errors. . . . Fourth, the Telcordia Analysis makes the erroneous assumption that MSS and ATC use the same antenna patterns."[42]

Response: This statement is not accurate because the Telcordia Analysis made no assumptions concerning antenna patterns. Globalstar's March 22 FCC submission did not discuss antenna patterns, and the Telcordia Analysis used the same effective gain for the ATC terminal antennas that Globalstar utilized in its March 22 submission (0 dBi).[43] Thus, if there is a "serious error," it also applies to Globalstar's own analysis. Regardless, as discussed above, a 0 -dBi average antenna gain towards the satellite is likely the appropriate value, given the random orientation that tends to characterize the use of handheld mobile terminals. Finally, this assertion is not contained in the Technical Statement, which was prepared by a Globalstar engineer.

Globalstar Mischaracterization No. 7:

> "The Terrestrial Carriers have never attempted to explain how multiple terrestrial service operations, licensed by geographic regions, could coordinate with, for ex-

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[40] GLP June 27 Letter at 5.

[41] *See, e.g.,* GLP March 22 Technical Response at 8 ("Polarization losses were not taken into account.").

[42] GLP June 27 Letter at 5.

[43] *Compare* Globalstar March 22 Technical Statement at 3 (table 1-2) *with* Telcordia Analysis at 21.

> ample, the eight MSS licensees at 2 GHz to provide a unified, dual-mode service, using the limited spectrum in that band."[44]

Response: Cingular and Sprint "never attempted to explain" the licensing/service rules for a dynamic frequency assignment sharing approach because such details become relevant only if the FCC decides to pursue this approach, as opposed to band segmentation. The Telcordia Analysis documented that band segmentation is far more spectrally efficient than dynamic frequency assignment.[45] It was for this reason that Cingular/Sprint have recommended that the FCC adopt band segmentation and auction of the terrestrial component in the MSS band – an approach that would require no coordination between ATC and MSS operators. Cingular and Sprint have not examined the licensing and service rules that might be appropriate if the FCC instead decides to forsake segmentation in favor of dynamic frequency assignment.

Globalstar Mischaracterization No. 8:

> "Cingular/Sprint incorrectly claim that the CDMA air interface will not support dynamic frequency assignment."[46]

Response: Cingular and Sprint did, in fact, express skepticism about the implementation of dynamic frequency assignment if a group of terrestrial cells is routinely required to change frequencies every six to fifteen minutes.[47] The Telcordia Analysis noted that it "seems questionable . . . whether ATC service quality could be preserved, if the ATC networks were to be routinely required to change frequencies at the behest of the MSS network."[48] This comment actually focused on the ICO implementation, with an assumed spot beam ground speed of about 100 km/minute. For Globalstar's system, the orbital period is shorter (114 minutes vs. about 360 minutes for ICO) and the spot beam ground speed accordingly higher, on the order of 300 km/minute.

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[44] GLP June 27 Letter at 8.

[45] *See* Telcordia Analysis at 73-76.

[46] GLP June 27 Letter at 9.

[47] Cingular/Sprint May 13 Letter at 6.

[48] Telcordia Analysis at 12.

Globalstar's argument in its June 27 letter is that its proposed CDMA air interface supports "hard" handoffs of CDMA calls.[49] However, hard handoffs are intended to serve a single handset at a time, not an entire cell. Moreover, hard handoffs are intended to support a transition as the handset moves from a cell with a weakening pilot to another cell, on a different frequency, for which the pilot is growing stronger. The hard handoff mechanism is not designed to support the frequent change of an entire cell including all active handsets, to another frequency. With a ground speed of 300 km/minute, a given point on the spot beam antenna pattern would cross the area of a terrestrial cell in two seconds, assuming a five kilometer cell radius. Thus, the frequency transition would need to take place fairly quickly for the ATC network. Globalstar has not provided any operational details on how this would be done. Accordingly, Cingular and Sprint will remain skeptical regarding feasibility of rapid frequency changes for an entire group of ATC cells until Globalstar can provide a plausible technical explanation of how it will be accomplished without regularly dropping customer calls in progress.

Globalstar Mischaracterization No. 9:

> "Based on their analysis of ATC, Cingular and Sprint conclude that ATC will reduce the amount of MSS spectrum available for MSS."[50]

Response: In fact, the Cingular/Sprint conclusion was based on, and is consistent with, Globalstar's own analysis:

> Based on the data it submitted, Globalstar calculates that it could tolerate simultaneously between 17 and 34 outdoor ATC handsets, depending on the range to the spacecraft, within each of its spot beams. One of Globalstar's spot beams covers an area larger than the State of Texas. Thus, according to Globalstar's own calculations, it could not serve 35 handsets operating outdoors in the State of Texas without beginning to degrade the capacity of its satellite (*i.e.,* inhibit its ability to serve remote and rural areas).[51]

As discussed above, rather than criticize its own calculations, Globalstar submitted on June 27, 2002 an entirely different approach in calculating the number of ATC handsets it claims it could serve.

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[49] *See* GLP June 27 Letter at 9.

[50] GLP June 27 Letter at 12.

[51] Cingular/Sprint May 13 Letter at 12-13 (supporting footnotes omitted).

Globalstar Mischaracterization No. 10:

> "The analysis submitted by Cingular and Sprint claims that intrasystem interference would limit ATC capacity on the Globalstar system so severely that the traffic volumes could not justify construction and operation of ATC networks. As explained in the Technical Statement, this conclusion is based on a flawed analysis and is completely unjustified."[52]

Response: The arguments Cingular and Sprint made in their May 13 Letter were based on the estimates Globalstar submitted on March 22, 2002. Rather than demonstrate that Cingular's and Sprint's supplemental analysis is incorrect, Globalstar instead abandons its March 22 Technical Response, deciding to start over using an entirely different analysis.

It is significant that Globalstar chose not to challenge in its June 27 Response Cingular's and Sprint's statement that a terrestrial carrier could build and operate an ATC network cheaper than a MSS licensee because a terrestrial carrier could take advantage of existing infrastructure, such as towers, switches and other facilities, as well as experienced engineering and service personnel.

Globalstar Mischaracterization No. 11:

> "The Terrestrial Carriers chose to ignore . . . the geographic separation principle that is integral to their own systems."[53]

Response: This comment has no direct relevance to the question of band segmentation. It is true that the Telcordia Analysis did not explicitly discuss the "geographic separation principle" in the context of CDMA. It is inappropriate, however, for Globalstar to assert that Telcordia "ignored" the principle because, as discussed below, the principle has no applicability to CDMA terrestrial networks like that proposed by Globalstar. Even so, the geographic separation of terrestrial CDMA cells, which are roughly the same size as each other, serves to control the inter-cell interference, supporting high capacity. The geographic separation provides isolation over the terrestrial propagation path. Any significant interference is confined to adjacent cells. On the other hand, MSS uplink receivers would "see" ATC terminal transmissions over a very large area, due to the size of the MSS beam footprint and the fact the received interference is deter-

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[52] GLP June 27 Letter at 5.

[53] GLP June 27 Letter at 4.

mined by an earth-to-space propagation path, rather than a terrestrial path. It is precisely this inability to isolate "geographically" ATC transmissions from the MSS uplink that leads to the large difference in spectrum efficiency between shared and segmented spectrum.[54]

Finally, non-CDMA terrestrial systems do in fact use both band segmentation and geographic separation; the fundamental principle of frequency reuse, which was used to implement the original analog cellular systems nearly twenty years ago, divides the available spectrum into frequency groups. Adjacent cells use different frequency groups to prevent excessive cochannel interference, which cannot be tolerated by non-CDMA air interfaces. Thus, since there is not adequate "geographic separation" (between the adjacent cells), band segmentation (separate frequencies) is used. Likewise, because the ATC uplink transmissions cannot be "geographically separated" from the MSS uplink receiver, band segmentation is necessary.

III. GLOBALSTAR'S ASSERTIONS ARE NOT EXPLAINED OR SUPPORTED AND CANNOT BE ANALYZED AS A RESULT

Globalstar makes several sweeping statements in its June 27 letter that it does not explain or support in any way. By not explaining or supporting these assertions with facts, Cingular, Sprint and Telcordia are precluded from analyzing the validity of Globalstar's assertions.

Globalstar Unsupported Assertion No. 1:

> "An integrated MSS-ATC system can dynamically assign frequencies to satellite and terrestrial calls to maximize spectrum use in ways that cannot be accomplished if ATC is severed from the MSS component. In any event, there are significant technical, economic and practical barriers to successful intrasystem cooperation in a network comprised of independent MSS and ATC providers."[55]

Response: Globalstar provides in its letter no facts in support of these assertions. It also does not identify the "technical, economic and practical" factors that it claims would constitute a "barrier" to having separate MSS and ATC operators.

Nor does Globalstar's Technical Statement support these assertions. The Globalstar engineer who prepared the Technical Statement did not say that having separate operators would be

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[54] *See* Telcordia Analysis at 73-76.

[55] GLP June 27 Letter at 2.

infeasible. He instead stated that having separate operators would be "not . . . practical" – an opinion he did not support.[56]

The Telcordia Analysis demonstrated that "severing operations is quite feasible, even with dynamic frequency coordination":

> However, either cochannel sharing or dynamic frequency assignment could be implemented with either integrated or separate operators. The basic limitations on sharing would be the same, and the questions about the physical-layer impact of abruptly changing the operating frequency of an entire CDMA ATC network remain the same, although the signaling and information exchange necessary to do so are the same for separate operators as for an integrated operators. Functionally, there seems to be no difference.[57]

The Telcordia Analysis included an extended discussion of how an independent operator of a terrestrial network using the MSS band could implement dynamic frequency assignment.[58] Notably, Globalstar's June 27 Response makes no attempt to demonstrate that this Telcordia Analysis is erroneous in any way.

Globalstar Unsupported Assertions No. 2:

> "Grant of ATC authority will improve the financial standing . . . of MSS systems and will aid rather than impair service to rural and underserved areas."[59]
>
> "Granting MSS systems the flexibility to provide ATC will significantly enhance the economic viability of these systems and enhance their availability to rural and underserved areas and public safety organizations."[60]
>
> "On the other hand, by segmenting MSS spectrum or authorizing an unaffiliated person to use the MSS spectrum for terrestrial services, the Commission would undermine the viability of the MSS business in the U.S., but would not improve the lot of rural and underserved areas or public safety organizations."[61]

Response: Globalstar provides no facts in support of these assertions. Although it has argued that ATC would enable it to generate additional revenues with ATC service, Globalstar

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[56] GLP June 27 Technical Statement at 14. .

[57] Telcordia Analysis at 2 and 12.

[58] *See* Telcordia Analysis at 77-79.

[59] GLP June 27 Letter at 2.

[60] *Id.* at 14.

[61] GLP June 27 Letter at 14.

has never quantified these revenues, nor has it identified the costs it would incur to build and operate an ATC network.[62] Globalstar, thus, has not demonstrated that the provision of ATC services in the extremely competitive CMRS marketplace would be a profitable enterprise for it, such that profits could be used to subsidize MSS service in rural areas.

With respect to its claim that ATC would "aid rather than impair service to rural . . . areas," Globalstar has acknowledged the central point of the Telcordia Analysis: "at any given time, there will be a maximum allowable number of ATC users because of the potential for interference into MSS."[63] Therefore, Globalstar concedes that MSS capacity will be degraded once these interference limits are reached – meaning that its satellites would be incapable of supporting MSS service to persons in rural areas.

Globalstar Unsupported Assertion No. 3:

> "As GLP demonstrated in its supplemental comments in this proceeding filed March 22, 2002, and in the attached Technical Statement, an integrated MSS-ATC system can assign channels to the satellite and terrestrial modes to achieve efficiencies and maximize spectrum usage that would not be feasible if separate providers were assigned separate band segments."[64]

Response: Neither Globalstar's March 22 Supplemental Comments nor its June 27 Technical Statement contains facts supporting the proposition that a MSS licensee operating an ATC network can do something that would "not be feasible" for a separate operator. Telcordia demonstrated how separate MSS and ATC operators could implement dynamic frequency assignment,[65] and Globalstar's June 27 filing does not even acknowledge this Telcordia discussion, much less challenge the points Telcordia makes.

Globalstar Unsupported Assertion No. 4:

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[62] In contrast, terrestrial carriers could build an ATC network at minimal cost, because they could take advantage of their existing terrestrial expertise and infrastructure (*e.g.,* towers, switches, facilities).

[63] GLP June 27 Letter at 7.

[64] GLP June 27 Letter at 3.

[65] *See* Telcordia Analysis at 77-79.

> "Dynamic frequency assignment allows the [MSS] operator to maximize the regions served by the entire MSS band, improving efficiency and capacity."[66]

Response: Cingular and Sprint have never questioned the proposition that the dynamic frequency assignment method of MSS sharing would be more spectrally efficient compared to the cochannel sharing approach. In fact, the Telcordia Analysis documented why this would be the case.[67] What the Telcordia Analysis further demonstrated is that band segmentation would be far more spectrally efficient than either co-channel or dynamic frequency assignment.[68] Globalstar has not even attempted to challenge this Telcordia conclusion.

Globalstar Unsupported Assertion No. 5:

> "Frequency re-use [in terrestrial networks] is utilized so that at one specific location, only a small portion of the licensed spectrum is deployed."[69]

Response: Globalstar provides no support for this statement, although it is accurate for certain air interfaces, including AMPS and TDMA. But as Globalstar should realize (since it operates a CDMA satellite system and proposes a CDMA terrestrial network), this statement is not accurate for the CDMA air interface. With CDMA, adjoining cell sites use the same frequencies (in part to facilitate "soft handoffs").

Globalstar Unsupported Assertion No. 6:

> "Obviously, tracking the beam patterns and assigning channels to ATC versus MSS to achieve these efficiencies becomes extremely complex. The MSS operator is the only entity with the requisite system software and the expertise and incentive to manage the channel assignment process."[70]

Response: Globalstar does not support these sweeping assertions with any facts. For example, although it asserts that the calculations needed to implement dynamic frequency assignment (whether by an integrated operator or separate operators) would be "extremely complex,"

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[66] GLP June 27 Letter at 3.

[67] *See* Telcordia Analysis at 70.

[68] *See id.* at 73-76.

[69] GLP June 27 Letter at 3.

[70] *Id.* at 4.

Globalstar does not quantify that complexity in any way (*e.g.*, required floating point operations per second).

Globalstar Unsupported Assertions No. 7:

> "Severing MSS and ATC operations would eliminate the capability to make use of this dynamic interference allocation to improve spectrum efficiency."[71]
>
> "Segmenting the [MSS] band would also make virtually impossible the type of coordination necessary to maximize the use of the spectrum. . . . [Band segmentation] is contrary to the goal of this proceeding and the public interest in maximizing spectrum efficiency and capacity."[72]

Response: These statements are grossly misleading. Band segmentation is an alternative to dynamic frequency assignment . There is no reason to use dynamic frequency assignment if band segmentation is used. The question for the Commission is which approach – dynamic frequency assignment or band segmentation – is more spectrally efficient. The record evidence is undisputed on this point. The Telcordia Analysis documents that band segmentation is far more spectrally efficient than dynamic frequency assignment,[73] and Globalstar makes no attempt to challenge this demonstration.

Globalstar Unsupported Assertion No. 8:

> "Segmenting the band would take some number of channels away from MSS operators *everywhere*, and would *potentially* cripple MSS service in those areas where it is not economically feasible to build the terrestrial infrastructure."[74]

Response: Globalstar does not present a single fact to support the claim that band segmentation would "*potentially* cripple MSS service" in areas where terrestrial networks do not exist. It has not, for example, identified the number of people located in remote areas not served by terrestrial networks, nor has it provided any calculations to quantify the MSS capacity required to serve people in these areas.

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[71] *Id.*

[72] GLP June 27 Letter at 4.

[73] *See* Telcordia Analysis at 73-76.

[74] GLP June 27 Letter at 4 (first emphasis in original; second emphasis added).

Globalstar concedes that after several years of operation, its "assets are underutilized" and that during 2001, its MSS system averaged only 65,400 minutes of use a day.[75] The Globalstar Creditors Committee has similarly conceded that Globalstar's spectrum is "drastically underutilized."[76] A simple calculation verifies this claim. According to Globalstar's June 27 Technical Statement, "The capacity of each Globalstar MSS return link satellite beam is approximately 60 MSS callers per 1.23 MHz channel."[77] At full utilization, therefore, each 1.23-MHz channel in each beam could support 60 handsets × 24 hours/day × 60 minutes/hour = 86,400 minutes/day per 1.23 MHz channel per beam. The Globalstar design constellation consists of 48 satellites with 16 beams per satellite. With 16.5 MHz in each direction, 13 channels could be accommodated, giving a total capacity of 86,400 × 48 × 16 × 13 = 862 million minutes/day, *which exceeds the 2001 average by a factor of more than 13,000.* Even allowing for the fact that some areas are covered by multiple beams, and that at any given time, some of the capacity will always be unused due to low population density, it is clear that it is not an exaggeration to say that GLP's capacity is "drastically underutilized."

Globalstar Unsupported Assertion No. 9:

> "The spectrum resource allocation demanded by an integrated MSS-ATC system is similar to, although more complex than, a terrestrial carrier's use of the separate channels for analog and digital service in the same geographic location."[78]

Response: There is no similarity at all between dual-mode cellular systems and integrated MSS-ATC systems. Analog service is provided in cellular systems to support legacy analog handsets, and in cell sites which have not been completely upgraded to digital service. In some cases, analog and digital service are provided on the same cell site but in different bands (*i.e.,* band segmentation). The analog and digital air interfaces are providing the same basic service over the same geographic area, but using technologies of different generations and using segmented frequency bands. Conversely, an integrated ATC-MSS system would provide different services over dramatically different coverage areas, using shared spectrum.

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[75] Globalstar Ex Parte at 4 and 7 (April 26, 2002).

[76] Globalstar Creditors Committee Ex Parte at 5 (May 13, 2002).

[77] GLP June 27 Technical Statement at 10.

[78] GLP June 27 Letter at 4-5.

Globalstar Unsupported Assertion No. 10:

> "The Terrestrial Carriers incorrectly claim that there is no technical obstacle to cooperation between unaffiliated MSS providers and ATC providers to offer subscribers an integrated satellite/terrestrial service."[79]

Response: Globalstar does not provide a single fact in support of this assertion. Although it asserts that the Telcordia discussion of this subject is "incorrect," Globalstar does not explain how it is incorrect.

Globalstar states that it is "absurd to suggest that a service provider whose interests are diametrically opposed to those of the MSS provider would somehow 'coordinate' to use some or none of its spectrum for terrestrial service."[80] However, Globalstar never explains why the interests of separate ATC and MSS operators necessarily would be "diametrically opposed." The two parties might decide to form a joint venture or provide a joint service.

More fundamentally, there is no basis to assume that separate ATC and MSS operators that provide completely independent services cannot comply with whatever rules that the FCC may adopt. The terrestrial CMRS market is fiercely competitive, yet this intense competition does not prevent CMRS licensees from complying with the FCC's adjacent and boundary interference rules.

Globalstar Unsupported Assertion No. 11:

> "In fact, if, as Cingular/Sprint's technical analysis claims, the use of an increasing number of terrestrial terminals increases the degradation to MSS service no matter what frequencies are set aside for ATC, then the MSS licensee would be at the mercy of the terrestrial licensee not to extend its service to a point of degrading the satellite component."[81]

Response: This statement appears to confuse two issues. If frequencies are set aside for ATC (band segmentation), then, assuming proper guardbands, increasing ATC terminal density

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[79] *Id.* at 7.

[80] *Id.* at 8.

[81] GLP June 27 Letter at 8.

would not affect MSS capacity. This is the reason why, as shown in the Telcordia analysis,[82] band segmentation is more spectrum-efficient than band sharing.

The first assertion – an increased number of ATC handsets increases degradation of MSS service – applies only to sharing between ATC and MSS in non-segmented spectrum. The remedy is a limit on the ATC handset deployment, which is a proposition with which Globalstar agrees. As Globalstar recognizes in its June 27 Letter:

> [A]t any given time, there will be a maximum allowable number of ATC users because of the potential for interference into MSS. The maximum number would have to be enforced *regardless of which entity was operating the terrestrial service.*[83]

The italicized language also responds to Globalstar's second unsupported assertion – the MSS licensee would be "at the mercy" of the ATC operator – because, as Globalstar itself recognizes, the FCC would be required to establish total emissions levels on ATC networks "regardless of which entity was operating the terrestrial service." The result, however, would be a severe limit on ATC handset density, resulting in low spectrum efficiency compared to band segmentation.

Globalstar Unsupported Assertion No. 12:

> "From the independent operator's perspective, such a separate ATC service with an MSS component would be unmarketable. The independent ATC operator would have no incentive to characterize the service as the terrestrial component of a satellite phone service but rather would have an irresistible incentive to market ATC as a standard cellular or PCS offering."[84]

Response: Globalstar does not recite a single fact for its assertion that ATC services provided by an independent operator would be "unmarketable."

Globalstar Unsupported Assertion No. 13:

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[82] Telcordia Analysis at 73-76.

[83] GLP June 27 Letter at 7 (emphasis added).

[84] GLP June 27 Letter at 8.

> "The economics of an independent ATC service suggest that, if licensed for ATC, the Terrestrial Carriers would not closely coordinate with an MSS carrier.[85]

Response: Coordination would be unnecessary with band segmentation. The Telcordia Analysis further demonstrates that coordination between separate ATC and MSS operators is possible even if dynamic frequency assignment is used instead.

IV. GLOBALSTAR'S NEW TECHNICAL INFEASIBILITY ARGUMENT AGAINST SEPARATE ATC AND MSS OPERATORS IS UNSUPPORTED AND LACKS MERIT

The Telcordia Analysis demonstrated that having separate ATC and MSS operators is "quite feasible, even with dynamic frequency coordination."[86] Globalstar does not challenge or question this Telcordia demonstration in any way, either in its June 27 Letter or in its accompanying Technical Statement. Globalstar nevertheless continues to assert in its June 27 Letter that separate operators would "not be feasible," citing "the attached Technical Statement" for support.[87] However, the accompanying Technical Statement does not say that separate operators would be technically infeasible; it states only that, in the opinion of the author, a Globalstar employee, separate systems would "not [be] practical."[88]

The Technical Statement recites only one reason for the proposition that separate operators would "not be practical." Globalstar states that an "integrated ATC/MSS system could use live noise floor measurements from the satellites themselves via the existing Gateway tracking antennas":

> Based on these measurements and knowledge of MSS traffic bandwidth requirements, a feedback loop to the ATC component could dynamically set frequency channels and traffic volumes, maximizing the number of ATC circuits while protecting the MSS circuits.[89]

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[85] GLP June 27 Letter at 8.

[86] Telcordia Analysis at 2. *See also id.* at 12 and 77-79.

[87] GLP June 27 Letter at 3.

[88] GLP June 27 Technical Statement at 14. The Globalstar employee asserts that this conclusion is self evident from "the most rudimentary analysis." *Id.* However, nowhere in the record of this proceeding has Globalstar or other MSS proponents proffered even a "rudimentary analysis" demonstrating that separate ATC and MSS operators would be impractical.

[89] *Id.*

Globalstar then asserts: "This [sharing of live noise floor measurements] cannot be accomplished by two different operators cooperating to the utmost."[90] Globalstar, however, never explains this conclusion in any way.

The arrangement proposed by Globalstar appears to require that only the MSS uplink receiver contain the capability to make "live noise floor measurements," and then report those measurements through the terrestrial gateway to the ATC network. The ability to make the noise floor measurements themselves depends only on the MSS uplink receiver, and is independent of whether MSS and ATC operations are separate or integrated. The sharing of the measurements between the terrestrial MSS gateway and the ATC network requires only a low-bandwidth dedicated landline signaling path, which also can be implemented with either separate or integrated operations. The legal ownership of the equipment controlling the ATC and MSS networks has no bearing on the technical feasibility of sharing straightforward network data between two pieces of equipment.

In summary, the one technical reason that Globalstar has proffered for the proposition that separate ATC and MSS operators are not "practical" lacks merit.

V. GLOBALSTAR'S CRITIQUE CONFIRMS RATHER THAN UNDERMINES THE TELCORDIA ANALYSIS

Globalstar asserts in its June 27 Letter that the "comments and technical statements of AT&T and Cingular/Sprint (collectively 'the Terrestrial Carriers') are riddled with factual and legal errors and distortions regarding integrated MSS-ATC systems."[91] However, the supporting Technical Statement takes issue with only two points in the Telcordia Analysis, neither of which is even mentioned in the Letter to which the Technical Statement is attached. Moreover, new information provided by Globalstar in its Technical Statement serves to support the Telcordia Analysis rather than to undermine the Analysis. Finally, the scope of the Telcordia Analysis was limited to technical issues; legal issues were not addressed at all.

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[90] *Id.*

[91] GLP June 27 Letter at 1.

A. Two Issues Raised About the Telcordia Analysis Actually Confirm the Validity of the Analysis

The theory of dynamic frequency assignment is to reduce ATC-MSS interference by avoiding cochannel, in-beam operation of ATC and MSS terminals. This is accomplished by assigning to ATC handsets frequency channels not utilized by the satellite beam. The Telcordia Analysis demonstrated that that while dynamic frequency assignment would reduce ATC-MSS interference compared to co-channel, in-beam sharing, dynamic frequency assignment would not eliminate ATC-MSS interference for two reasons:

1. The beam antenna patterns do not have sharp boundaries. The spacecraft uplink antenna would still capture power that is "outside" the nominal beam footprint, although the received power would be reduced according to the rolloff of the beam antenna pattern, and ATC handsets farther away from the nominal beam coverage edge would contribute less interference than those nearby. Nevertheless, adjacent-beam cochannel ATC handsets would still cause interference to the MSS uplink; and
2. Although ATC handsets operating within the nominal beam footprint would no longer be cochannel, they may still cause adjacent-channel interference to the MSS uplink, the degree of which will depend on the isolation between adjacent frequency channels. Telcordia predicted that adjacent-channel interference would likely be less significant than adjacent-beam interference.[92]

In response, Globalstar's Technical Statement recognizes the accuracy of the general point Telcordia made – namely, that Globalstar satellites have a pattern roll off into the adjacent beams.[93] Globalstar then asserts: "Telcordia's conclusions regarding the impact on ATC capacity are not correct."[94] Globalstar does not, however, identify what it thinks is "not correct" in the Telcordia Analysis. In fact, the two points Globalstar discusses (where it introduces new facts) helps to validate the Telcordia Analysis.

Globalstar first states that the "power of the immediately adjacent beams is approximately –6 dB with respect to a beam of interest,"[95] a fact Globalstar had not previously shared.

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[92] *See* Telcordia Analysis at 10.

[93] *See* GLP June 27 Technical Analysis at 12 ("Telcordia points out that the L-band beams on the Globalstar satellite are not ideal 'boxes', but have a pattern roll off into the adjacent beams. . . . [T]his is true.").

[94] *Id.*

[95] GLP June 27 Technical Statement at 12.

At this level, for a given MSS uplink capacity reduction, roughly four times the number of ATC terminals could be accommodated in the footprint of an adjacent beam as in the beam of interest. Therefore, eliminating in-beam cochannel ATC terminals *via* dynamic frequency assignment would increase the allowable ATC terminal density by a factor of four. The Telcordia Analysis estimated that, based on the results discussed in Globalstar's March 22 Technical Response *and without the benefit of the new information (-6 dB pattern roll off)*, dynamic frequency assignment would allow the ATC terminal density to be increased by roughly a factor of four compared to the cochannel sharing case.[96]

Globalstar's second point – "current CDMA implementation yields adjacent channel 'leakage' at approximately 1.5%"[97]– also verifies the supposition in the Telcordia Analysis that adjacent-channel interference is less significant than adjacent beam interference. It is not clear whether this figure accounts for only out-of-channel emissions of the transmitted signal, or also the imperfect adjacent-channel attenuation of the channel filter as well. Assuming that leakage accounts for both factors, the effective adjacent-channel isolation is about 18.2 dB.

In summary, Globalstar has not identified the areas in which it believes the Telcordia Analysis is "not correct" pertaining to the effect of adjacent-beam antenna pattern rolloff. If anything, Globalstar's discussion confirms the validity of the Telcordia Analysis.

B. The Significance of Globalstar's June 27 Response Is What It Does Not Do: Challenge the Major Points of the Telcordia Analysis

Telcordia made three main points in its Analysis with regard to uplink interference from ATC to MSS: (1) separate ATC and MSS operators would be technically feasible; (2) with spectrum sharing between ATC and MSS, there is a limit on the total capacity of an ATC network (whether operated independently or not) because of the interference ATC handsets would cause to satellites; and (3) band segmentation would be far more spectrally efficient than dynamic frequency assignment. Globalstar's June 27 Response either agrees with or does not challenge these three points.

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[96] *See* Telcordia Analysis at 71.

[97] GLP June 27 Technical Statement at 13.

1. Separate ATC and MSS Operators Are Technically Feasible. As discussed above, neither in its Letter nor in its Technical Statement does Globalstar respond to this Telcordia demonstration. Globalstar does make a new argument in its response (involving noise floor measurements), but the discussion above demonstrates that this argument lacks merit.

2. The Size of Any ATC Network Using MSS Spectrum Sharing Would Be Limited Because of ATC Handset Interference to MSS. Globalstar readily concedes that the size of any ATC network, including one using dynamic frequency assignment, would be limited:

> As the Telcordia Analysis points out, at any given time, there will be a maximum allowable number of ATC users because of the potential for interference into MSS. The maximum number would have to be enforced *regardless* of which entity was operating the terrestrial service.[98]

The Technical Statement confirms this point when it recites several examples where Globalstar might "trade off" MSS capacity to support additional ATC customers.[99] In fact, the Technical Statement quantifies this MSS/ATC tradeoff with a simple formula: "To summarize, an integrated MSS/ATC operator can share a channel in a beam between simultaneous MSS calls (M) and ATC calls (A) with no loss of MSS capability in any other beam or channel as long as M + A/490 is equal to or less than 60."[100] (The validity of Globalstar's entirely new ATC capacity analysis is addressed in Part I above.)

3. Band Segmentation Would Be Far More Spectrally Efficient Than Dynamic Frequency Assignment. Telcordia documented that "spectrum sharing between MSS and ATC systems is not spectrum-efficient, compared to segmentation":

> The fundamental reason is that with sharing, the allowable MSS and ATC terminal densities are both controlled by the very large area of the MSS beam footprint, whereas with segmentation, only the MSS terminal density depends on the beam footprint.[101]

It is significant that Globalstar does not challenge this demonstration in any way, whether in its June 27 Letter or in its Technical Statement. Although Globalstar continues to state the

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[98] GLP June 27 Letter at 7 (emphasis added).

[99] *See* GLP June 27 Technical Statement at 10, 12 and 13.

[100] GLP June 27 Technical Statement at 14.

[101] Telcordia Analysis at 76.

obvious – dynamic frequency assignment is more efficient than cochannel, in-beam sharing (a point Telcordia never challenged and, in fact, helped confirm) – Globalstar has not questioned the fact that band segmentation is far more spectrally efficient than dynamic frequency assignment.

From an engineering viewpoint, it would be much simpler as well as more spectrally efficient to segment the spectrum. With segmentation, there is no tradeoff between MSS and ATC usage, as ATC usage would no longer be limited by the need to control uplink interference to the spacecraft. This is the basis of the discussion in the Telcordia Analysis on spectrum efficiency, which shows that segmentation of the ATC and MSS spectrum is far more spectrum-efficient than a shared operations, even if the shared operations use some sort of dynamic coordination.[102]

[102] Telcordia Analysis at 73-76.