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September 11, 2003

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

RE: IB Docket No. 02-364 Ex Parte Notice

Dear Ms. Dortch:

On September 11, 2003, Tony Navarra, President of Globalstar, L.P., William F. Adler, Vice President-Legal and Regulatory Affairs of Globalstar, L.P., Paul Monte, Director of Systems and Regulatory Engineering of Globalstar, L.P., and the undersigned participated in a meeting regarding Globalstar, L.P.'s positions on issues in the above-referenced docket with the following Staff of the International Bureau: Tom Tycz, Richard Engelman, Breck Blalock, Paul Locke, William Bell, Alexandra Field, Howard Griboff, and Kimberly Cook. Also present were Bruce Franca and Bob Eckert of the Office of Engineering & Technology.

As summarized on the enclosed handout "Big LEO Band Plan," which was distributed at the meeting, the representatives of Globalstar, L.P. ("GLP"), explained why the record in this docket does not support any change to the Big LEO Mobile-Satellite Service ("MSS") band plan. GLP is fully using its assigned Big LEO spectrum for traditional and innovative MSS services. Iridium Satellite, the only other operational Big LEO licensee, has not demonstrated that its system is spectrum constrained, based on its comments filed in this docket and on Iridium traffic data obtained by GLP from other sources.

Pursuant to Section 1.1206(b)(2) of the Commission's Rules, this letter and the enclosure are being filed electronically over the Commission's Electronic Comment Filing System.

Respectfully submitted,

William D. Wallace

Enclosure

BIG LEO BAND PLAN

IB DOCKET NO. 02-364

September 11 - 12, 2003

Globalstar

Summary

- The record in this Docket does not support <u>any</u> changes to the Big LEO band plan
  - All the available Big LEO spectrum is needed for Big LEO systems
  - The lower CDMA portion of the L-band remains encumbered
  - Iridium has not demonstrated that redivision of the L-band is in the public interest
- Globalstar is fully using its assigned spectrum for both traditional and innovative MSS services
- Iridium has not demonstrated that its system is <u>spectrum</u> constrained
  - Iridium's own analysis does not support its assertions
  - Data on Iridium's traffic from other sources rebuts Iridium's assertions

Globalstar

The Big LEO Band Plan in Review

- The FCC pushed the MSS industry to design a band plan to accommodate multiple entry and multiple technologies
- Four NGSO applicants selected CDMA sharing technology
  - Motorola insisted on a non-sharing technology and access to exclusive spectrum for Iridium
- After a lengthy Negotiated Rulemaking process, four NGSO applicants agreed to share L-band for forward links and S-band for return links, consistent with WARC-92 allocation
  - Motorola insisted on bidirectional links in the L-band alone for Iridium even though 16.5 MHz of S-band was available

Globalstar

The Big LEO Band Plan in Review

- To accommodate Iridium's non-sharing bidirectional system design, the FCC assigned Iridium exclusive access to 5.15 MHz at the upper part of L-band for return and forward links
- The four CDMA licensees were licensed to share 11.35 MHz at L-band, 16.5 MHz at S-band
- The FCC reserved the right to review the allocation of 3.1 MHz and to divide the L-band in half "in the event only one CDMA licensee goes forward" and if certain other circumstances developed

Globalstar

The Big LEO Band Plan in Review - The Consequences

- Globalstar adapted its system design to the FCC's Big LEO Band Plan and technical rules
- Globalstar designed its system to share spectrum and to operate with asymmetric band assignments
- Globalstar spent $4 billion to build its system
- Even in bankruptcy, Globalstar has
  - Continued to develop new equipment and services in reliance on the Big LEO Band Plan
  - Competed vigorously in the marketplace with Iridium in the face of Iridium's $3 million/month subsidy from DoD

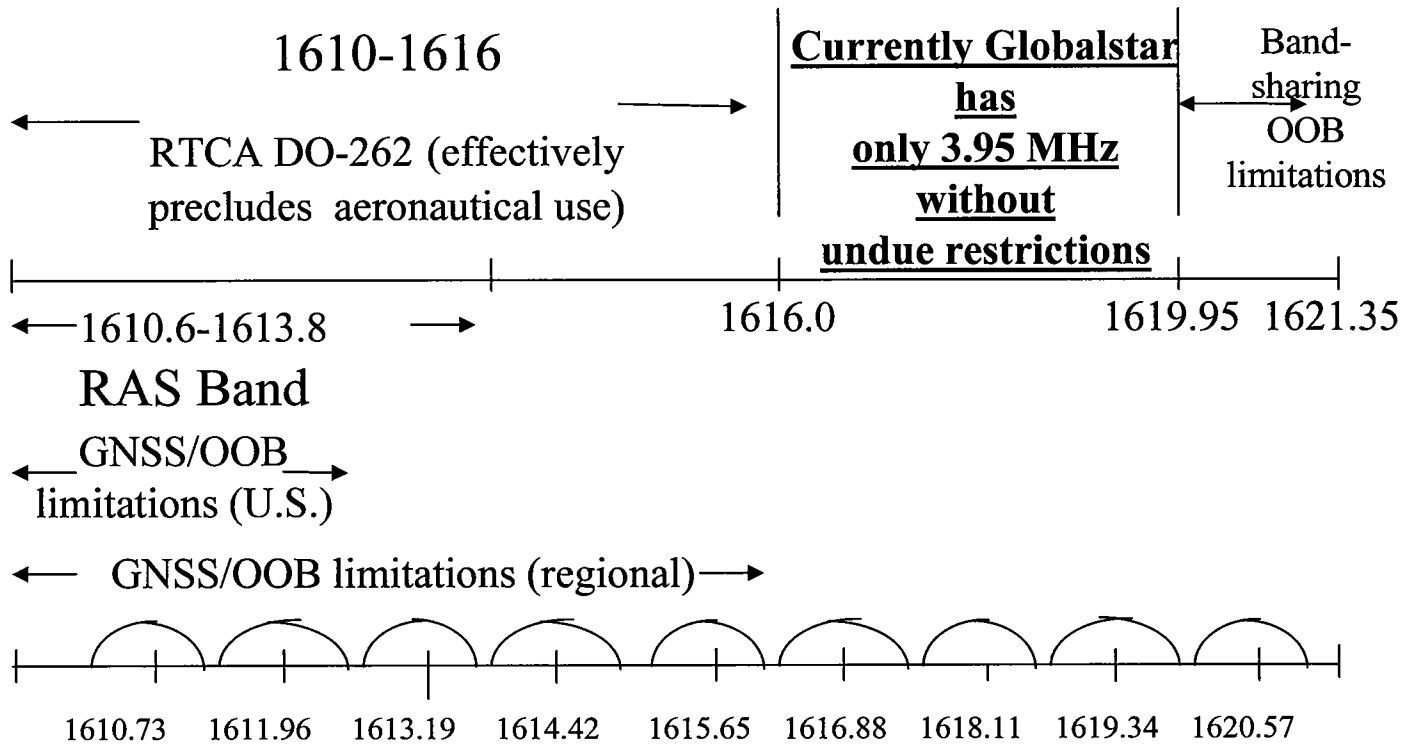
Globalstar

The Big LEO Band Plan in Review - The Consequences

- Based on the Band Plan, Globalstar has developed services for maritime, aviation, and simplex telemetry to address demand in various niche markets
- Globalstar has framed a system design for ATC in the Big LEO band and tested ATC phones
- Globalstar has endured adverse economic circumstances and adverse regulatory decisions to build its business
- Globalstar has competed with Iridium and regional GSO systems by marketing its higher quality of service and better value

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible



Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- Interservice protection requirements impose restrictions on usability of 1610-1621.35 MHz
- Iridium is significantly less affected by these restrictions
- Radioastronomy Service holds primary allocation at 1610.6-1613.8 MHz
  - Globalstar must protect RAS sites during observations through exclusion zones
  - Requires shifting calls to upper L-band channels
  - In certain places, above 1616 MHz

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- Global Navigation Satellite System (GPS and GLONASS) operates from 1574-1610 MHz
  - Out-of-band emissions limits applicable to Big LEO systems become more difficult to meet closer to 1610 MHz
  - Designing handsets to meet OOB limits results in restrictions on capacity in L-band channels near 1610 MHz
- ISM Allocation in Big LEO S-band
  - Microwave ovens, other unlicensed devices
  - May cause interference to forward links depending on location, proximity, proliferation, shielding, outside use, etc.

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- Voice and data services
  - In U.S., at least four or five (1.23 MHz) channels at L-band and eight or nine channels at S-band required for standard voice and data services
- Aviation
  - Designed to operate above 1616 MHz in L-band to meet FAA/RTCA standards for protection of GNSS
  - Speed of airplanes and movement through gateway service areas require assignment of two separate channels each for forward and return links

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- Simplex telemetry service
  - Requires assignment of two channels (2.5 MHz channelization) for commercially-acceptable quality of service
- Ancillary Terrestrial Component
  - If implemented, would be used in urban areas
  - Requires at least one forward link and one return link channel in certain geographic areas

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- CDMA Big LEO systems must operate with asymmetric frequency assignments
  - 11.35 MHz at L-band (user-to-satellite)
  - 16.5 MHz at S-band (satellite-to-user)
- Globalstar was designed to take advantage of and account for this asymmetry
  - PFD at S-band limits capacity
  - Ratio of users per L-band to S-band channel is about 1.4 to 1 to achieve equivalent capacity

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- Forward and Return Links on Globalstar are completely independent
  - Separate transponders on satellite (L-to-C for return link, C-to-S for forward link)
  - Separate modulation schemes, optimized for differing system characteristics
- Forward link: Constrained by PFD limits at S band
  - Translated into satellite power limits and antenna roll-off characteristics carefully designed to meet PFD limits
- Return link: Constrained by self and external interference, and out-of-band emission restrictions; typically up to 68 users per channel possible

Globalstar

Globalstar Is Using The CDMA Spectrum As Efficiently As Possible

- PFD limits the EIRP per channel to ~48 users on the forward link
- Return interference limited to ~68
- 68/48=1.4 ratio

Satellite to user	S-band down			
Average user data rate,kbps	2.40			
Carrier freq. GHz	2.50			
EIRP per channel, dBW	24.53			
Range, km	2797.00	1414 km LEO, 20 deg elev		
Path loss, dB	169.33			
Boltzmann's constant, dBW/K-Hz	-228.60			
Receive antenna gain (incl. line loss), dB	-1.00			
Receive Noise Temperature, deg-K	400.00			
Receive power, dBW	-145.81			
Interfering beam power density,dBW/Hz	-208.58			
Noise power density, dBW/Hz	-202.58			
Io+No, dBW/Hz	-201.61			
Achievable Eb/(No+Io), dB	22.00			
Required per-user Eb/(No+Io), dB	5.20			
users (and pilot) per channel	47.82			
Flux density, dBW/m2/1.23 MHz	-115.40			
Allowed flux density per 1.23 MHz	-115.40	-116.3 dBW/m2/MHz at 20 deg.		

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- Iridium has far more spectrum than it needs in the U.S.
  - Iridium should be able to serve a half million subscribers in CONUS with its current spectrum assignment
- Iridium's own data show no increase in calls per satellite after CDMA Channels 8 and 9 were made available for Iridium's use
- Iridium cannot provide ATC in the Big LEO L-band alone even with more spectrum (see Appendix)
- Iridium's experience in the Middle East during and after the Iraq War, even if accurately represented, has no bearing on the Big LEO Band Plan in the U.S.

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- Iridium's claimed service to customers in Africa, the Middle East, rural North America does not demonstrate a spectrum constraint either there or in the U.S.
- Iridium's claim of capacity constraints (according to its own definition) for short periods of time on a few days a year does not demonstrate a spectrum constraint

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- Iridium placed no actual number of subscribers, or any other meaningful data, into the record
  - If the data were favorable, Iridium would have provided it
  - Iridium has never provided evidence that its service to DOD in the Middle East was or is degraded or that a shortage of spectrum caused the degradation
  - Iridium claimed that its call drop rate in the Middle East improved with additional capacity but did not provide evidence to back up its claim

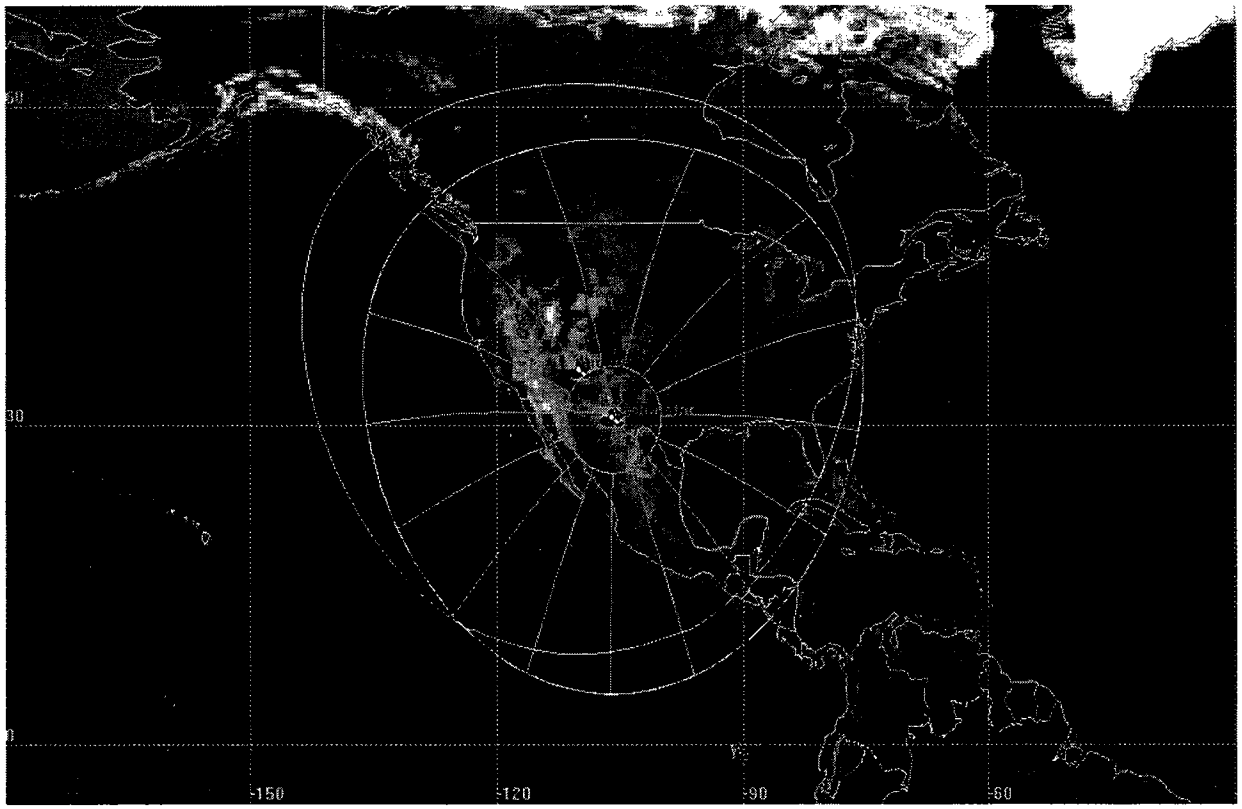
Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Observations at Clifton

- Data from Clifton gateway observations confirm limited use of L-band spectrum by Iridium system
  - Gateway input signals monitored at 2 GHz IF
  - Spectrum analyzer with resolution BW of 30 kHz, peak hold mode
  - Observations made over 3 days (10 am local to 5 pm local, week of 25Aug)
  - Peak sample had 34 Iridium carriers in eight of Globalstar's beams
  - Average over all samples is 4.67 Iridium carriers in eight of Globalstar's beams

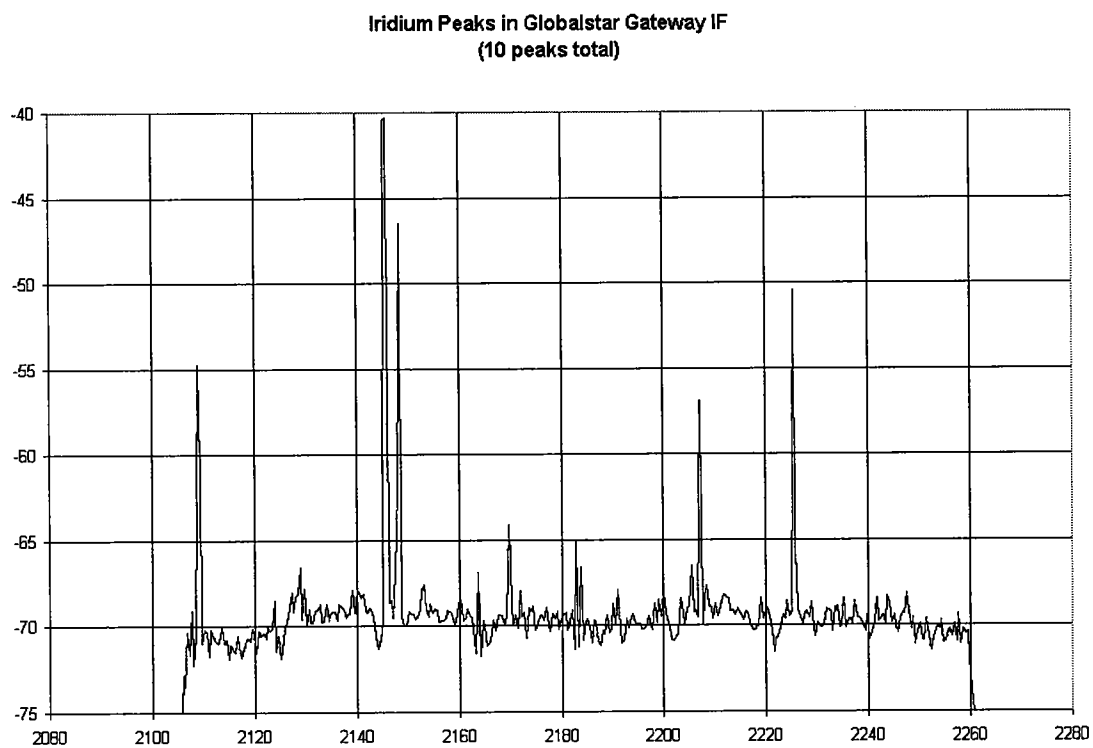
Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Coverage of Globalstar & Iridium Satellites Approximately 3 Iridium Beams in 1 Globalstar Beam



Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium System has few carriers in CONUS



Even with a generous interpretation of peaks, only 10 peaks seen in feederlink bandwidth of 8 Globalstar beams

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Expect 460 Iridium carriers in 8 Beams (not 10 carriers)

- If Iridium is fully utilizing the bandwidth, 460 carriers would be present in eight of Globalstar's beams based on parameters in Iridium's Aug. 1992 FCC amendment
  - 960 carriers per satellite (Iridium's Aug. 1992 FCC amendment)
  - Should see approximately 1/2 in eight Globalstar beams
  - This is can be easily calculated
    - Iridium's Aug. 1992 FCC amendment stated a five beam frequency reuse pattern. Eight beam reuse pattern used in this calculation which is generous for Iridium
    - Spacing 41.67 kHz
    - Expect 48 beams*6400kHz/(8 beam reuse pattern*41.67kHz) = 921 carriers
    - Eight Globalstar beams "see" approximately 1/2 of the Iridium satellite footprint

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Expect 460 Iridium carriers in 8 Beams (not 10 carriers)

- 'Max hold' mode overestimates number of users since every TDMA burst shows up as an Iridium carrier
  - A single 8 ms TDMA slot (in a 90 ms frame) counts as the entire Iridium carrier frequency being used

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium is underutilizing spectrum in U.S.

- Iridium's average spectrum usage in the US is 1.0% of available spectrum

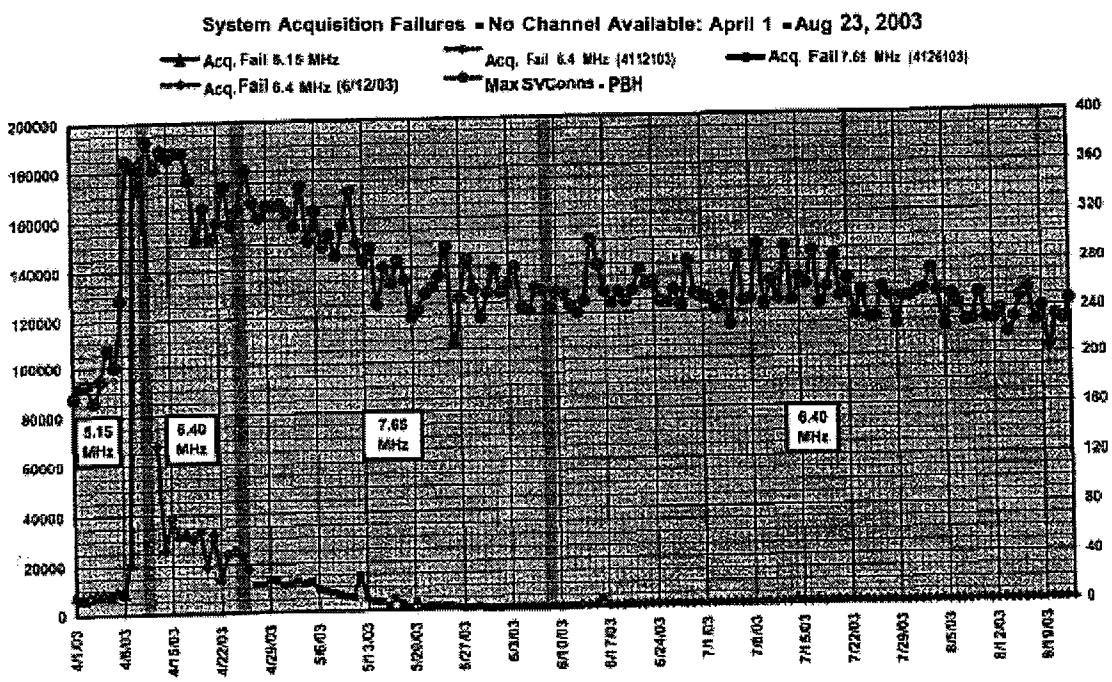
- Even if the observed peak number of 34 carriers is used, Iridium's spectrum usage in the US is 34/460 equals 7.4%
- Iridium's stated NRM capacity is 2556 full-duplex voice circuits in CONUS in 5.5 MHz (or 2393 in 5.15 MHz)
  - Actual usage is between 1.0% and 7.4% of this value, i.e., 5 to 136 full-duplex voice circuits in 5.15 MHz

- Globalstar's observations at Clifton show severe under-utilization of allocated spectrum

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium's own graph does not support Iridium's claims

- From Iridium's September 4 letter (also in May 8 letter)



- More spectrum did not increase capacity!
- How did "no channel available" decrease dramatically if no more capacity?
- As of mid-August, usage is back to "normal," i.e., Iridium no longer needs channel 9

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium Rebuttal: Part 1- Aug.7 DISA letter

Date	BW (MHz)	Relative spectrum	MOU/day	Relative MOU	CSR	Acquisition failures per day
Mar	5.15	1.00	41500	1.00	98%	
early April	5.15	1.00	108000	2.60	80%	150000
Apr 12+few day	6.4	1.24	115000	2.77	92%	20000
May	7.65	1.49			96%	5000
Jun-Aug	6.4	1.24	140000	3.37	96%	1000

- Minutes of Use (MOUs) per day do not make sense with decrease in acquisition failures
  - Iridium's graph shows peak satellite usage ~15Apr, yet the DISA letter states peak MOUs in June-August
  - April 12 to Aug, supposedly more than 20% increase in MOU with same spectrum, yet acquisition failures drop from 20,000 to 1,000
  - From early April to April 12 spectrum increased 24% and there was only a 6% increase in MOU, but a dramatic drop in acquisition failures
- Acquisition failure decrease likely attributable to users learning to use the system properly and/or Iridium fixed some other capacity limiter
  - Globalstar had the same experience

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium Rebuttal: Part 2 - Traffic Engineering

Globalstar traffic in Iraq (April 03)				
Peak fraction of UTs calling simultaneous	0.13			
Average call length, mins	3.9	mins		
Iridium back-calculation				
Peak circuits used	350			
Average traffic load, Erlangs	335	with 2% blocking		
Peak fraction of UTs calling simultaneous	0.13	assuming same as Globalstar		
Average call length, mins	3.9	assuming same as Globalstar		
Number of subscribers	**39169**			
Published # of Iridium DoD phones	15000	Mar. 2003 Govt Computer News		
Max. number of Iridium DoD phones	20000	DCA 100-01-C-4007		

Iridium's stated MOU cannot be reconciled with the number of phones deployed

Iridium said that 95% of Iridium usage in Iraq is DoD

Where did the other 19,000 phones come from?

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum - Iridium Rebuttal: Part 3 - MOU claims

- Iridium Reply Comments (p. 21) claims 28 million Minutes of Use (MOU) per quarter In Middle East
  - i.e., 311,000 MOU per day in average of 6.87 MHz
- Iridium May 8 letter: average 68,382 MOU per day in 2.5 MHz between April 26 and May 3
  - i.e., 187,913 MOU per day in 6.87 MHz
- Iridium graph (and Globalstar traffic) shows peak usage in April, so Iridium's claim in its Reply Comments cannot be correct
  - How can average usage be 311,000 MOU per day for a quarter when peak usage was 188,000?
- Probably Iridium picked the peak hour of the quarter and multiplied it by 90*24 to get 28 million MOU
  - 187,000 * 90 days * 1.89 (Iridium's stated peak to average ratio) = 31.8 million MOU per qtr.

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- In summary, Iridium's claim of insufficient capacity cannot be attributed to spectrum shortage
  - Possible system design shortcomings, which decrease the system's spectrum efficiency
  - Decreasing frequency reuse
  - Devoting spectrum resources to system overhead, beam-to-beam frequency restrictions and reserved capacity
  - Increasing spacing between carriers
  - Feeder link or cross-link constraints
  - Terrestrial network capacity constraints
- No FCC licensee should be rescued from the consequences of its own business and technical decisions at the expense of other licensees and the public

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- The radioastronomy community is very concerned about harmful interference from Iridium
- Iridium has not demonstrated that it can protect RAS sites in the U.S. or anywhere if it operates below 1621.35 MHz
  - Iridium's inability to assign frequencies regionally limits its ability to protect RAS sites
  - Iridium concedes that non-RAS-impinging beams can only be used outside an RAS site "field of view"
  - An RAS site is always in view of an Iridium satellite, and the system cannot control the frequencies in use on that satellite

Globalstar

Iridium Fails to Demonstrate a Need for Additional Spectrum

- Assigning additional L-band spectrum to Iridium would violate FCC policy and procedure as well as international law and comity
- Because the Iridium system cannot assign frequencies geographically, Iridium could not implement a new U.S. assignment in the U.S. alone
  - The FCC has found that its rules do not have extraterritorial effect and that the Communications Act does not give FCC authority to dictate the terms and conditions of operations on foreign territories
  - Iridium cannot be authorized to operate below 1621.35 MHz unless it demonstrates that it can adhere to national and regional band plans

Globalstar

Conclusions

- Iridium has not met the burden of proof demanded of it by the NPRM
- No other party has provided a factual basis to reallocate any Big LEO spectrum to terrestrial wireless use
- The record in this proceeding will not sustain a change in the Big LEO Band assignments
- There are voluntary, cooperative methods of addressing temporary, geographically isolated capacity shortages

Globalstar

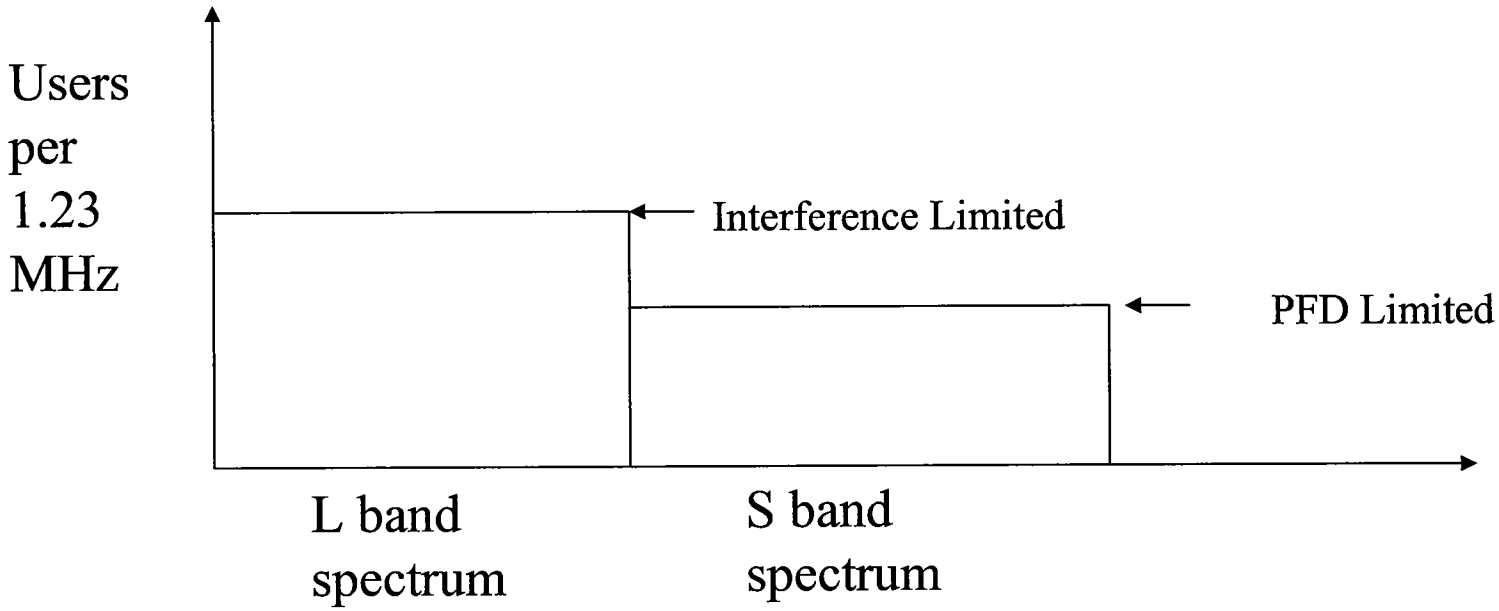
Appendix

Iridium Cannot Provide ATC in the L-Band

- Even with the entire 16.5 MHz band allocated to Iridium, its ATC handsets would need to operate with Tx and Rx frequencies only a few MHz apart
- High attenuation needed for transmit signal in receive band
  - else receiver front-end will be overloaded by transmitter signal
  - 157 dB based on GSM use and I/No of -10 dB
  - 145 dB based on CDMA use and I/No of -6 dB
- Current technology does not permit such filters to be cost-effectively implemented in handsets
  - 4 th order Chebyshev or 3rd order Butterworth has 16 dB attenuation at stop-band
  - filter size becomes impractically large as order increases

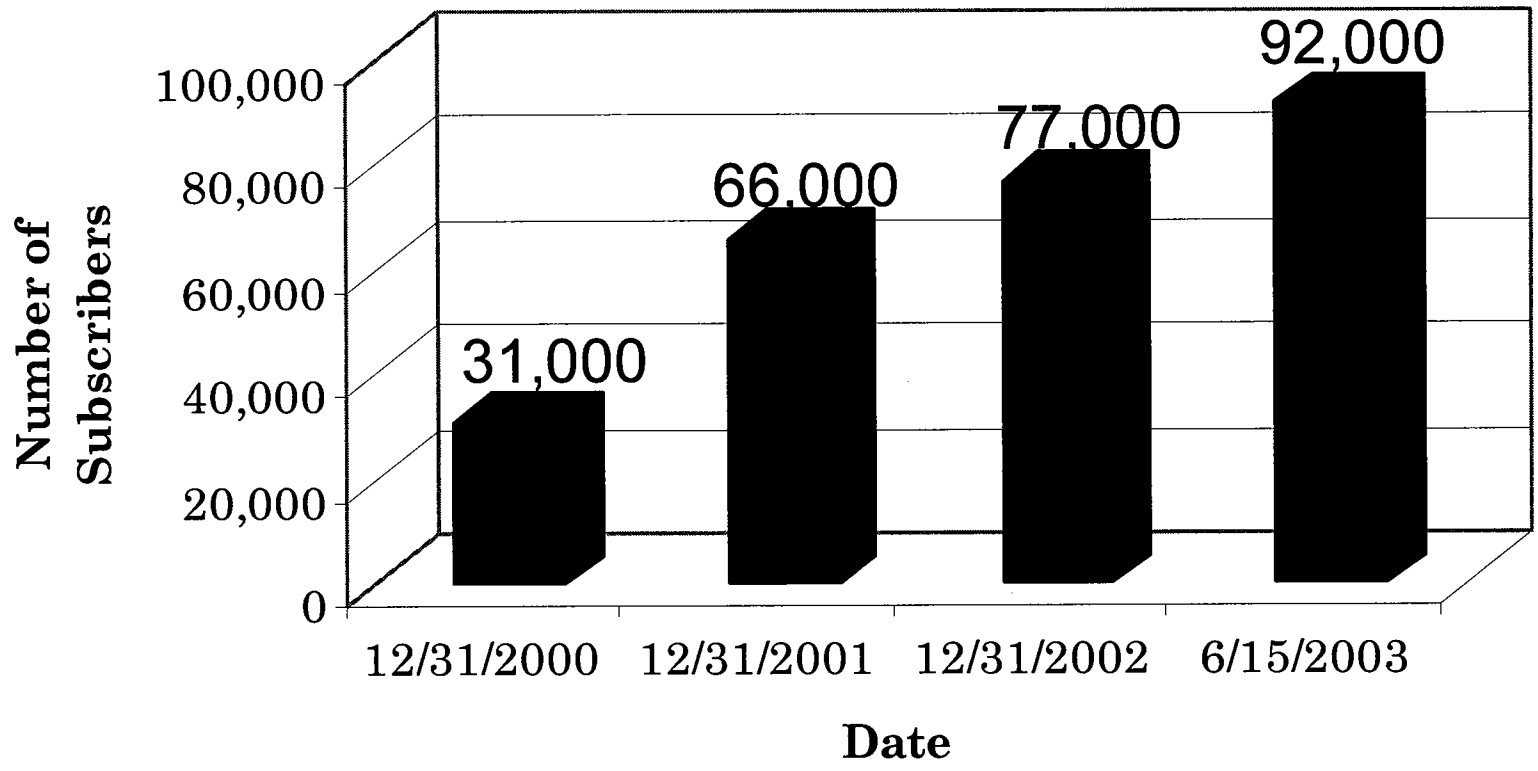
Globalstar

Globalstar L and S band spectrum requirements

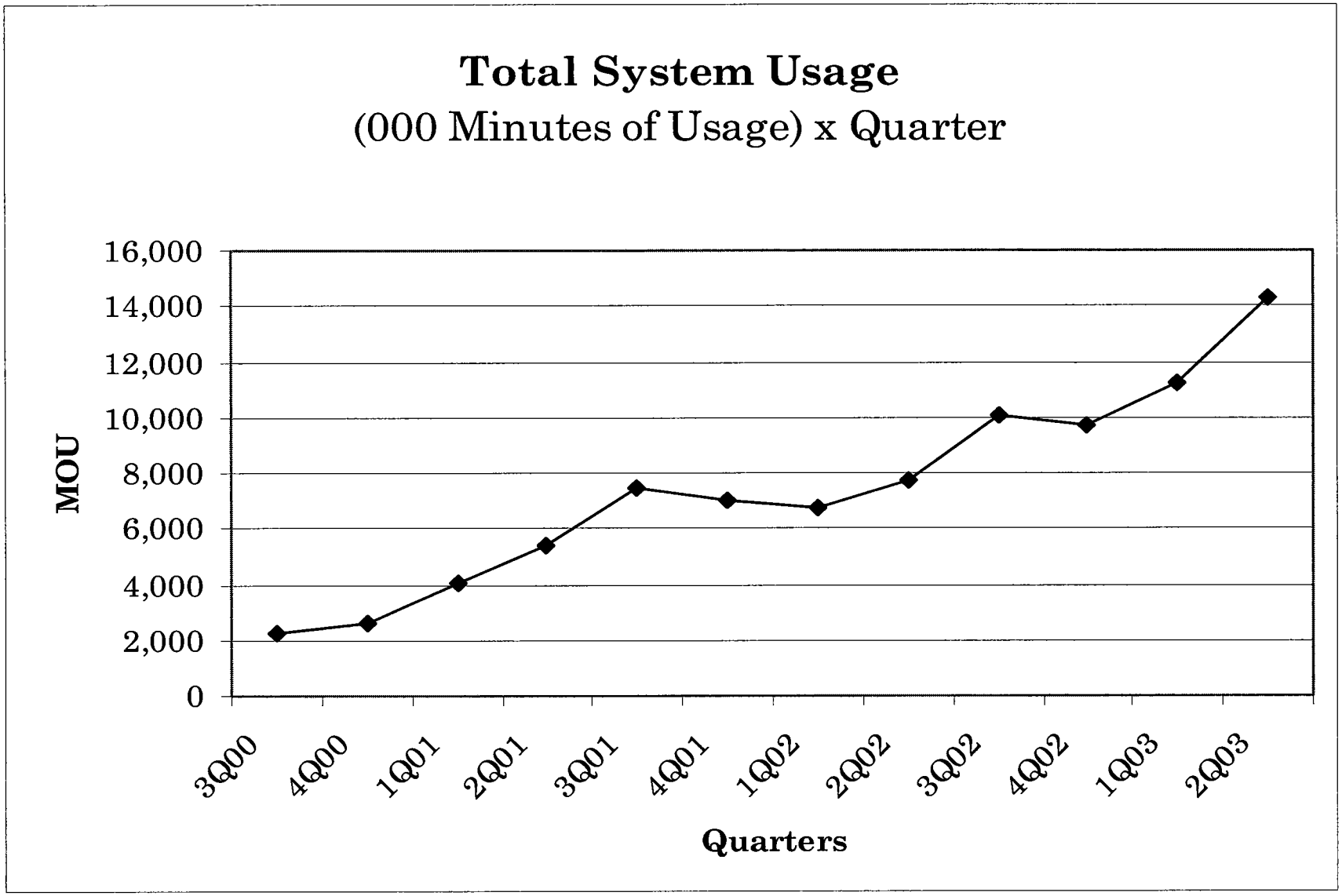


Globalstar

Total Commercial Subscribers

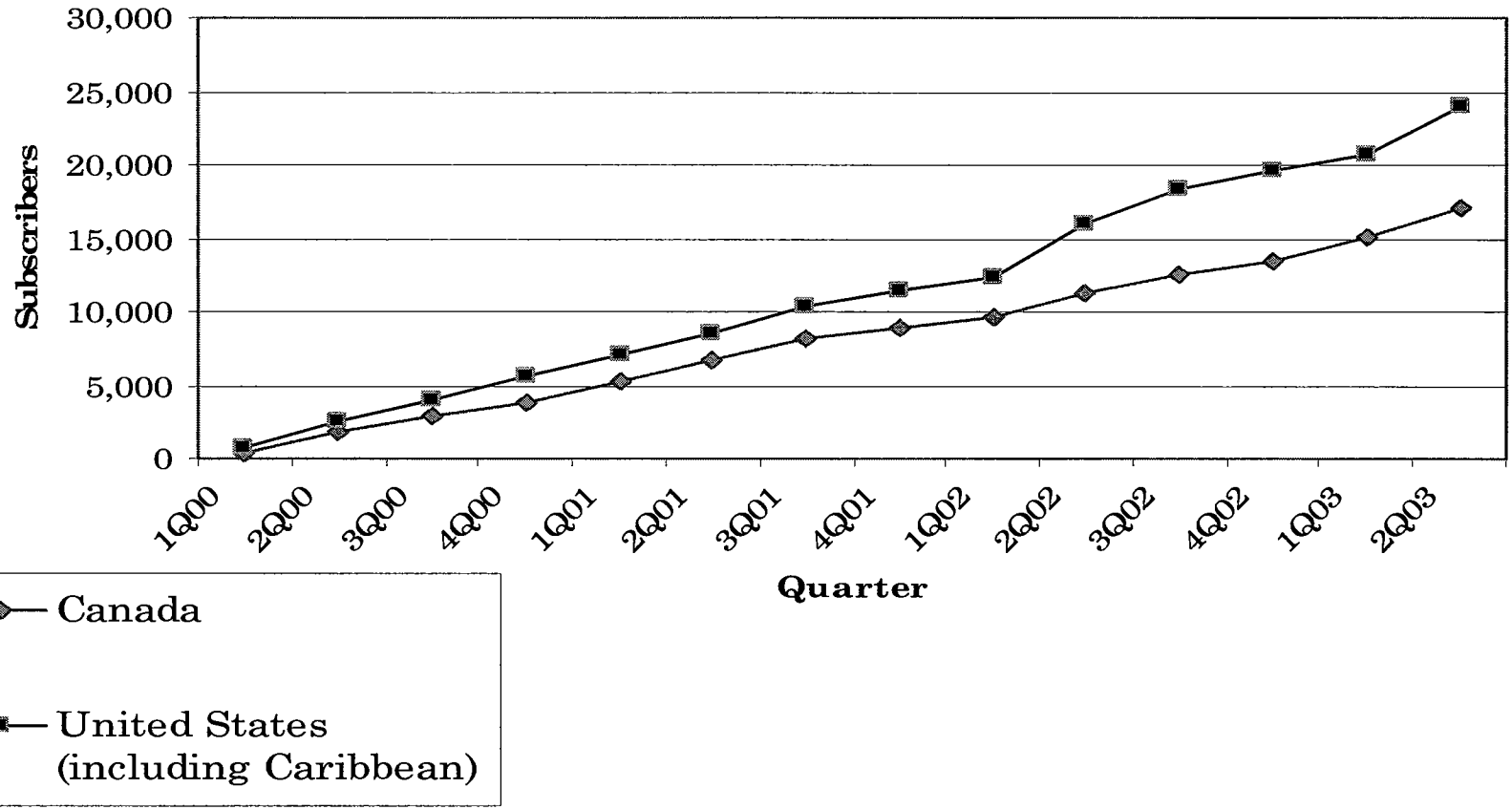


Globalstar


Total System Usage
(000 Minutes of Usage) x Quarter
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
0
MOU
3Q00
4Q00
1Q01
2Q01
3Q01
4Q01
1Q02
2Q02
3Q02
4Q02
1Q03
2Q03
Quarters

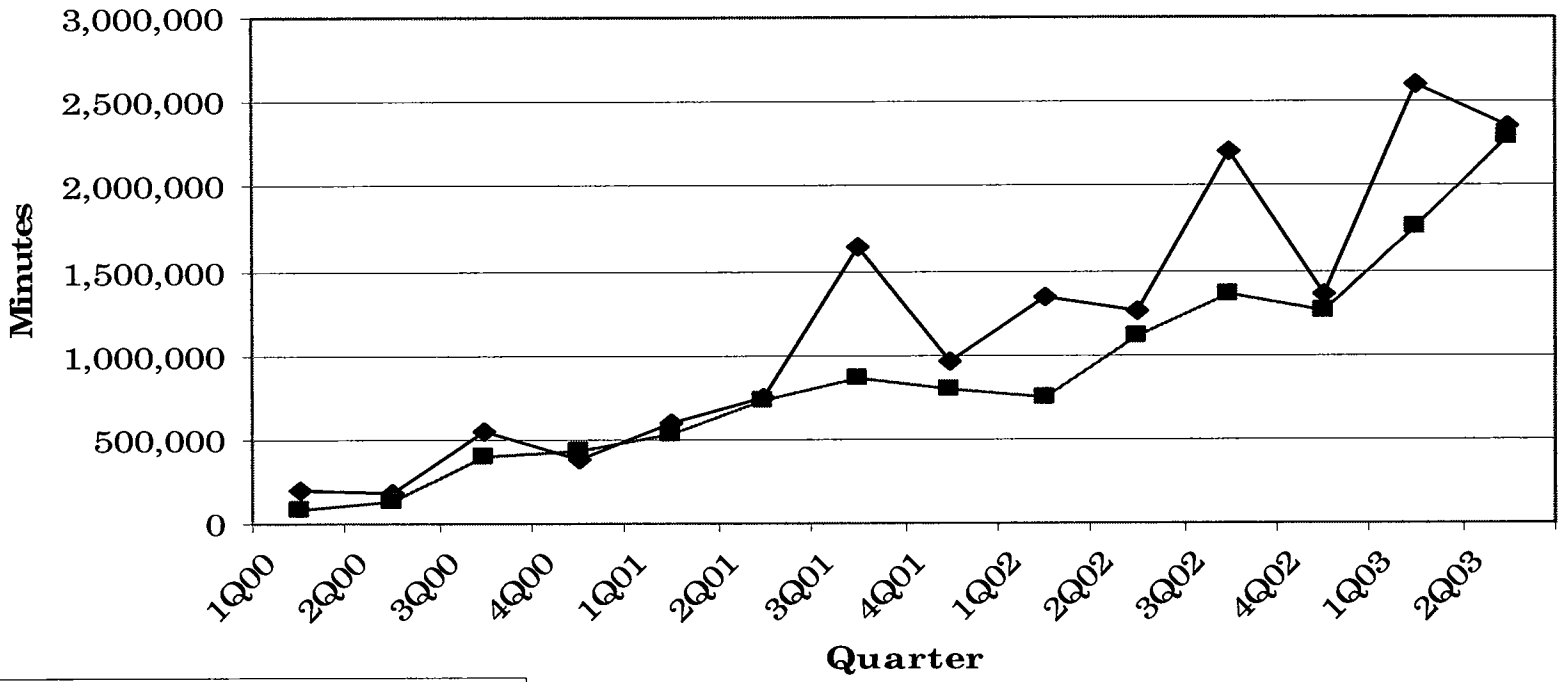
Globalstar

North American Subscribers
(by Quarter)



Globalstar

North American System Usage
(000 Minutes of Usage X Quarter)



Canada

United States (including Caribbean)

Globalstar