

MSS traffic levels build up over time with market take-up.^{48/} The CPM Report concludes as follows:

Based on the studies undertaken in the 2483.5-2500 MHz and 2160-2200 MHz bands, sharing between non-GSO/MSS (space-to-earth) systems and the FS should be feasible. However, in the long term sharing difficulties could arise between non-GSO/MSS systems and the FS. Accordingly, consideration should be given to a possible gradual transition approach in order to enable the FS to migrate to other frequency bands with no overlap with the MSS allocations between 1-3 GHz ...^{49/}

The Industry Advisory Committee Report reached similar conclusions, finding that non-GSO MSS/FS sharing was unlikely and GSO MSS/FS sharing unworkable.^{50/}

The interference model that Comsat used to simulate interference between an intermediate circular orbit ("ICO") spacecraft operating in the MSS and terrestrial stations in the FS is difficult to authenticate due to lack of a detailed description of the model. As a result, Motorola was unable to assess the validity of the Comsat sharing analysis.^{51/} Nevertheless, there are a number of inconsistencies and possible shortcomings of the model which should be mentioned at this time. First, the model uses a simulated FS system, based on average system parameters, rather than a more realistic system based on the published reference system.^{52/} Second, the

^{48/} See CPM Report, Chapter 2, Section 1, pt. A.2, para. 1.4.6.4 (a)

^{49/} CPM Report, para. 1.4.6.4.(c). (emphasis added).

^{50/} Industry Advisory Committee Report, para. 3.3.2.3. (a) & (b).

^{51/} The Comsat model raises more questions than it answers. In order to provide comments on the appropriateness of the model, Comsat would need to make available far more information. For example, Comsat would need to provide details as to its Simulation Methodology, Input information, Output information and Victim System Information before its result could be replicated. Absent this information, the Comsat study would be of little value to the Commission in evaluating this issue.

^{52/} The assumptions used for "typical" FS links are based on hop lengths of 24.2 km +/- 3 km that yield a C/N of 76.3 dB. One of the major advantages to the use of 2 GHz is that the individual hops can traverse long distances and thus a typical length of 15

(continued ...)

locations of the FS system were determined from the FCC database by letting the computer randomly select the FS site locations and directions. Random selection will most likely not show the mainbeam-to-mainbeam interference case -- the maximum interference case. Comsat's use of randomly-selected FS networks, based upon average parameters rather than real networks, would seem to minimize the interference impact on the FS networks. The use of an average link is a poor approach to determine whether systems can share as it does not take into account the longer links used at 2 GHz. This results in a high Carrier-to-Noise (C/N) ratio that makes the results of the Comsat analysis appear overly optimistic. Third, the model fails to address the impact of interference on the loss of fade margin and the reduction of availability. Availability is the basis for network quality and determines the required C/N ratio within the network. Fade margin requirements are a function of geographic location, climatic zone, terrain, and link length. Use of "averaged" link lengths in these types of analyses is particularly misleading since required fade margins (for a given availability) are a function of the cube of the link length. Finally, the simulation is based upon an ICO MSS system at 10,355 km and is not applicable to a LEO system at a much lower altitude with different communication parameters.

The analysis provided by Comsat, without more, fails to make a showing that a fully-loaded MSS system could share these downlink bands. The Commission must carefully consider the long-term consequences of not requiring the phased relocation of FS users before MSS systems become operational.

^{52/} (... continued)

miles seems inappropriate. This is especially true when the CCIR hypothetical FS link is indicated to be in the range of 40-50 km. "Transmitter Power & Repeater Distance of Radio Relay Systems Operating in the 1 to About 10 GHz Band", 1990 Report of the CCIR, Report 1188.

C. The Cost of Moving Incumbent Users Should be Apportioned in a Manner that Does not Handicap the Development of MSS on a Global Scale

The Commission received a wide array of opinions as to how it should implement the relocation of BAS/FS incumbent licensees in the MSS uplink and downlink bands. However, there is broad consensus that the Commission should adopt some version of its emerging technologies rules to ensure that incumbents are fairly compensated for relocation to other bands.^{53/} At the same time, Motorola and other potential MSS providers urge the Commission to devise a plan that does not cripple the embryonic MSS service with excessive costs. This plan must equitably divide these relocation costs among MSS and other new service licensees -- both foreign and domestic -- who will benefit from the relocation of the BAS/FS licensees.

As a precursor to any future relocation plan the Commission may adopt, Motorola strongly urges consideration of a transition plan that includes a filing deadline on granting primary status for any new BAS/FS applications at 1990-2025 MHz and 2165-2200 MHz if and when it adopts a final decision allocating this spectrum to MSS.^{54/}

^{53/} In the Matter of Redevelopment of Spectrum to Encourage Innovation in the Use of New Telecommunications Technologies, ("Emerging Technologies Proceeding"), First Report and Order and Third Notice of Proposed Rule Making, 7 FCC Rcd 6886 (1992); Second Report and Order, 8 FCC Rcd 6495 (1993); Third Report and Order and Memorandum Opinion and Order, 8 FCC Rcd 6589 (1993); Memorandum Opinion and Order, 9 FCC Rcd 1943 (1994); Second Memorandum Opinion and Order, 9 FCC Rcd 7797 (1994). Supporters of some version of the emerging technologies policies include American Petroleum Institute, Association of American Railroads, Association for Maximum Service Television; Bell South; CELSAT; Creative Broadcast Techniques and the New Vision Group; Iridium; Loral; Motorola; Society of Broadcast Engineers; TRW; and UTC.

^{54/} For example, in order to accommodate PCS at 1850-1990 MHz, new private operational fixed microwave applications filed after January 16, 1992 are licensed only on a secondary basis. 47 C.F.R. §94.61(b), note 35. Motorola supports in principle the creation of a "transition plan" similar to that proposed by Loral at pages 9-11 of its Comments. The adoption of a plan with milestones for limiting primary status for new applications, ending primary use by BAS/FS, restricting BAS/FS renewals and requiring

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1. The Global Nature of MSS Systems Should Cause the Commission to Adjust its Relocation Rules

The Commission must recognize that its existing emerging technologies relocation rules may not be adequate for an MSS service that is inherently global in nature. First, MSS providers will be faced with significant band-clearing expenses not only in the U.S., but in country-after-country as operating authority is received worldwide. If other nations follow the example of the U.S. emerging technologies rules, the MSS industry could face astronomical costs for compensating incumbents, and may be forced to clear bands that have limited use in other countries.^{55/}

Moreover, the current rules do not contain a mechanism requiring foreign-based MSS providers to share the costs of clearing the U.S. domestic 2 GHz bands in which they will provide service. If foreign MSS providers that serve the U.S. market avoid paying the relocation costs of using the MSS spectrum, U.S. providers serving the same U.S. customers will be at a severe competitive disadvantage.^{56/} Loral notes the difficulty the Commission will have in gaining jurisdiction over these foreign MSS providers and suggests the need for a mechanism to require such payments at the time a foreign MSS provider seeks an operating license.^{57/}

2. The Emerging Technologies Rules for Relocating Incumbents Do Not Reflect the Shared Nature of MSS Spectrum by Placing all Obligations on the New Technology "Licensee"

The Commission's emerging technologies rules do not reflect the nature and scope of the MSS service, and in particular, do not provide a mechanism for

^{54/} (... continued)

a migration plan with renewals is a prudent method of capping the substantial costs -- estimated at over \$3 billion by several commenters -- that the MSS industry may face to relocate the existing base of incumbent licensees.

^{55/} See Comments of PCSAT at 10.

^{56/} See Comments of TRW at 15-16.

^{57/} See Comments of Loral 18-19.

compensating MSS licensees who take the initiative in clearing 2 GHz spectrum that benefits other users. The current rules place the burden of negotiating relocation agreements on the emerging technology licensee.^{58/} However, the relocation of any one BAS channel or fixed microwave pair may benefit more than one MSS licensee. The benefit of this cleared spectrum could also enure to future MSS providers who would have otherwise been required to negotiate -- and pay for -- the relocation of the incumbent BAS/FS licensees.

Motorola agrees with Loral that the current relocation rules work best where the emerging technology licensee receives a discrete band of spectrum in a specific geographic area, allowing for ready apportionment of relocation costs to the "displacing" licensee. This cost causation model breaks down with MSS, where new licensees will share spectrum on a global basis.^{59/}

Motorola urges the Commission to develop an MSS relocation procedure that encourages each MSS licensee to take the initiative in clearing the 2 GHz spectrum and fairly allocates the costs of relocation among all of the licensees who will benefit from the cleared spectrum. The Commission might wish to consider creating an enforceable right allowing the MSS licensee paying for FS/BAS relocation to be compensated by other MSS licensees (or licensees in other services) who eventually use the cleared BAS/FS spectrum.^{60/}

^{58/} See, e.g., 47 C.F.R. §94.59(a) (proposed to be renumbered as 101.69(a))

^{59/} See Comments of Loral at 17-20. Loral asks many of the important questions that the Commission should consider as it fashions MSS relocation rules: Who is the "displacing" MSS provider when two or more MSS assignments overlap with the spectrum of BAS/FS licensees?; Which MSS licensees should pay and in what proportion?; How will foreign MSS licensees contribute?; When would relocation occur and will the incumbent be permitted to reclaim its spectrum after the launch of an MSS system?

^{60/} For example, Pacific Bell Mobile Services recently submitted a Petition for Rule Making that proposes the creation of an "Interference Right" that the compensating licensee acquires upon relocating a microwave incumbent. This "Interference Right"

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V. BOTH STATUTORY AND POLICY CONSIDERATIONS MILITATE AGAINST THE USE OF AUCTIONS TO LICENSE MSS SPECTRUM AT 2 GHZ

A. The Commission Has a Statutory Obligation to Consider Other Options Before Using Auctions to Assign MSS Spectrum

The commenters, without exception, note emphatically the Commission's continuing statutory obligation to consider other licensing methods before resorting to auctions.^{61/} While Title VI of the 1993 Omnibus Budget Reconciliation Act^{62/} permits the Commission to use competitive bidding to license spectrum, it does so only when mutually exclusive applications are accepted for filing for any initial licenses or construction permits. Furthermore, the statute obligates the Commission to use competitive bidding only as a last resort after considering "engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity in application and licensing proceedings. . . ."^{63/} Thus, Congress has not authorized the Commission to use auctions as a substitute for its traditional public interest criteria. Rather, it has recognized that auctions may be one method of serving the public interest in the limited circumstances where mutually exclusive applications exist -- circumstances which the Commission must seek to avoid. Moreover, as Congress itself has noted, the need to avoid mutually exclusive

^{60/} (... continued)

provides the compensating licensee with an enforceable right to receive compensation, minus depreciation, from current and future licensees who would otherwise have caused interference with the microwave incumbent. Petition for Rulemaking of Pacific Bell Mobile Services Regarding a Plan for Sharing the Costs of Microwave Relocation, RM-8643, placed on Public Notice May 16, 1995.

^{61/} See Comments of Celsat at 18; Comments of Comsat at 24-27; Comments of Constellation at 4; Comments of GE at 4-12; Comments of Hughes at 5; Comments of Newcomb at 9; Comments of Motorola at 26-27; Comments of PCSAT at 11-12; Comments of Teledesic at 10-12; Comments of TRW at 18-20.

^{62/} 47 U.S.C. § 309(j)(1) (Supp. V 1993).

^{63/} 47 U.S.C. § 309(j)(6)(E). See also H.R. Rep. 111, 103rd Cong., 1st Sess. 258-59 (1993), reprinted in U.S.C.C.A.N. 378, 585-86; Letter from John D. Dingell, Chairman, House Committee on Energy and Commerce, to James H. Quello (Nov. 15, 1993).

applications is particularly strong were global satellite systems such as Big LEOs are concerned.^{64/}

The FCC itself has recognized both the need for and the viability of avoiding mutual exclusivity in its Big LEO proceedings. In those proceedings, the Commission successfully adopted engineering solutions, negotiation, threshold qualifications, service regulations, and other means in order to avoid mutual exclusivity.^{65/} The Commission reserved auctions as a possibility in the unlikely event that mutual exclusivity could not be avoided.^{66/} This outcome is consistent with the FCC's earlier statement that eliminating mutual exclusivity advances its own goals of licensing multiple systems and enhancing competition.^{67/} In short, it is far too early in the licensing process for the Commission to determine that auctions are an appropriate method for licensing MSS spectrum at 2 GHz. Rather, as with the Big LEO proceedings, the Commission should consider a variety of other solutions first before promoting competitive bidding for this band.

B. Auctions Are Inappropriate for Licensing MSS Spectrum at 2 GHz

An FCC decision to use auctions to license MSS spectrum is also inappropriate in another respect: unless and until the Commission clearly defines the property rights that will correspond to the licensed spectrum, it will be virtually impossible for potential bidders to place a value on that spectrum. Defining such

^{64/} Id.; Comments of TRW at 20; Comments of Teledesic at 11.

^{65/} See Comments of Motorola at 27; Comments of Teledesic at 12 (citing Big LEO MSS Allocation Order, 9 FCC Rcd. 536 (1994) and Big LEO MSS Licensing Order, 9 FCC Rcd 5936 (1994); Comments of GE at 10-12.

^{66/} See Big LEO MSS Licensing Order at 5965-5970; Comments of Teledesic at 12.

^{67/} See Radio Determination Satellite Service, 104 FCC 2d 650, 653 (1988); Comments of Teledesic at 12.

property rights will involve both establishing clear licensing and operating parameters and coordinating MSS systems with other countries.

Additionally, auctioning such spectrum is likely to lead other countries to take a similar approach, which in turn would add considerably to valuation uncertainties and prohibitively raise costs in the MSS industry. At best, these costs will be passed on to the U.S. consumer. At worst, these costs will affect the competitiveness of the U.S. MSS industry. Either result, however, is clearly contrary to the U.S. public interest, an interest which is best served by a healthy, competitive MSS industry that can offer high-quality services at reasonable prices.

1. The Commission Must First Identify the Parameters of the MSS License Before It Considers Competitive Bidding

The Commission's consideration of competitive bidding of MSS spectrum at 2 GHz is premature because a lack of clearly defined property rights makes it extraordinarily difficult for potential bidders to value the spectrum offered. There are two dimensions to this problem. First, the Commission has not clearly defined the licensing parameters -- particularly those involving system (GSO/LEO) construction requirements and coverage areas that will inevitably affect the nature and value of the spectrum offered to potential bidders.^{68/} Second, unlike terrestrial Personal Communications Service ("PCS") systems, global systems like Big LEOs will need licenses from most foreign countries. In the words of Hughes:

It is unclear how much spectrum that is nominally licensed to an MSS system actually can be used until the coordination is completed with competing or neighboring MSS systems. These uncertainties prevent parties from accurately "valuing" spectrum for auction purposes before the coordination process is complete. Simply stated, the absence of adequate information precludes entities from determining what they are paying for in advance. This type of valuation problem simply was not present when the

^{68/} See Comments of Loral at 26; Comments of TRW at 20; Comments of GE at 16-18.

Commission considered auctioning other spectrum licenses, such as PCS.^{69/}

This valuation process is further complicated by the fact that the international bilateral coordination process is accomplished on a government-to-government basis. Until such agreements are reached, it will be impossible for potential bidders accurately to value the spectrum they will be bidding on within the United States, or, for that matter, accurately to assess what their costs will be world-wide.^{70/}

2. A Domestic Competitive Bidding Process Will Subject U.S. MSS Licensees to Multiple Auctions and Encourage Foreign Governments to Extract Exorbitant Fees as a Condition of Reaching Operating Agreements

Competitive bidding also carries with it other adverse international implications. As Commissioner Quello (and many of the comments submitted in this proceeding) has pointed out, the United States' use of auctions to license MSS spectrum may lead other countries either to do so themselves or to exact exorbitant fees for such spectrum.^{71/} Multiple auctions not only compound the valuation uncertainties discussed above, but could also result in the discriminatory treatment of U.S. satellite systems, who will be competing against systems licensed by other countries, including systems offered by foreign governments themselves.^{72/} Indeed, the prospect of such multiple auctions is more than an abstract concern: the Mexican government recently adopted a new law that would allow for the auctioning of all

^{69/} Comments of Hughes at 3.

^{70/} See Comments of PCSAT at 13; Comments of Motorola at 25.

^{71/} See Letter from Chairman James H. Quello (June 23, 1993); Comments of Motorola at 25; Comments of Hughes at 3; Comments of PCSAT at 14; Comments of Teledesic at 12; Comments of TRW at 23; Comments of Comsat at 27-29.

^{72/} Comments of Motorola at 25-26.

spectrum, including MSS spectrum.^{73/} Moreover, discrimination against U.S. MSS providers may be compounded if the Commission allows foreign MSS systems to provide service in the U.S. market while not having to pay for spectrum.^{74/}

The necessity of bidding on spectrum around the globe will raise costs prohibitively for the MSS industry. Such costs include not only the costs of the auctions themselves, but also the costs associated with lost investor confidence. As Hughes noted:

The international MSS satellite systems that are being proposed require substantial investor commitment around the world. Open-ended capital requirements and uncertainty associated with auctions will affect the ability of these satellite ventures to line-up investors. As a result, technologies in which capital requirements are certain will be favored as investors divert resources from satellite-based technologies in favor of those technologies with known costs.^{75/}

At best, these huge costs will be passed on to consumers in the form of higher prices for MSS services. At worst, as TRW stated in its comments:

The cost to MSS operators of entering auction after auction is order to gain access to each foreign nation would be so high as to make global MSS economically impractical, thereby denying to the peoples of the world the many and diverse benefits of MSS technology.^{76/}

Such exorbitant costs could not only harm consumers, but they could also seriously cripple the U.S. MSS industry, an outcome that is even more likely when coupled with the possibility that U.S. firms may be discriminated against in foreign markets. This outcome could undermine the technological leadership of the United States in

^{73/} Federal Law on Telecommunications of Mexico, Article 16, unofficial translation of the International Institute of Wireless Communications.

^{74/} See Comments of Motorola at 26.

^{75/} Comments of Hughes at 4. See also Comments of Teledesic at 12.

^{76/} Comments of TRW at 23-24. See also Comments of Comsat at 27-29; Comments of GE at 20.

important satellite and mobile communications.⁷⁷ It could also undermine the Administration's efforts to establish a global information infrastructure ("GII"), the success of which will depend in part on reduced barriers to competition and increased regulatory transparency -- two criteria which competitive bidding clearly does not promote.⁷⁸

VI. CONCLUSION

The commenters are nearly unanimous in their support of the Commission's proposal to allocate an additional 70 MHz of global MSS spectrum in the United States and its commitment to seek a similar allocation at WRC-95. The record in this proceeding, as well as the evidence compiled in preparation for WRC-95, demonstrates that demand for global MSS spectrum will continue to increase and soon exceed available spectrum. The 2 GHz band provides an opportunity to provide the MSS industry with such spectrum. The Commission should allocate this additional spectrum with a minimum of technical restrictions. The record indicates that the incumbent users can be relocated to higher bands in accordance with the Commission's emerging technologies rules; however, the Commission must recognize the distinction between MSS global licenses and domestic assignments as it fashions relocation policies that are fair and equitable to both new MSS licensees and the incumbents. Finally, the Commission must carefully consider the ramifications of its

⁷⁷ Comments of Motorola at 26.

⁷⁸ Comments of Comsat at 30-31.

preliminary view of using competitive bidding for MSS, a radio service that will share spectrum with other systems and cross national boundaries.

Respectfully submitted,

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Dated: June 21, 1995

CARL T. JONES
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**FURTHER INFORMATION REGARDING
REPORT OF FINDINGS
UNDERTAKEN TO DETERMINE
DISPLACEMENT IMPACT
UPON 2 GHZ TERRESTRIAL STATIONS**

Carl T. Jones Corporation's ("CTJC") background and qualifications are a matter of record with the Federal Communications Commission. CTJC has been authorized by Motorola Satellite Communications, Inc. ("Motorola") to undertake studies related to certain aspects of the proposed spectrum allotment changes set forth in E.T. Docket No. 95-18, *Amendment of Section 2.105 of the Commission's Rules to Allocate Spectrum at 2 GHz for Use by the Mobile-Satellite Service*. The results of these studies ("CTJC Report of Findings") were included with the Comments submitted by Motorola in the instant proceeding.

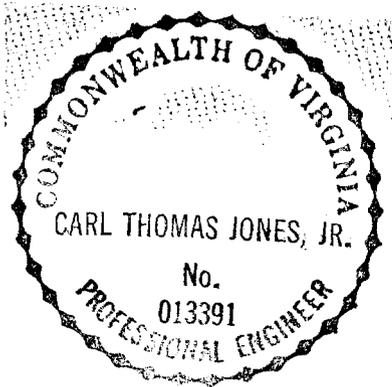
The purpose of this material is to provide further information regarding the assumptions and specific hardware cost estimates used in projecting the total costs presented in the CTJC Report of Findings. The supplemental material is submitted on the attached Exhibits 1, 2 and 3. A detailed representation of all the assumed hardware costs is contained in Appendix A and Appendix B of the CTJC Report of Findings.

This material has been prepared by me or under my direct supervision and is believed to be true and correct.

DATE: June 20, 1995



Carl T. Jones, Jr., P.E.
President, Carl T. Jones Corporation



Receiver Cost

In representing the estimated cost of relocating a given fixed or mobile microwave service station from the existing 1990-2110 MHz frequency band to an alternate frequency band, the cost of the receiver and associated hardware was considered in the analysis as follows:

FOR FIXED BAS STATIONS AND REPEATERS:

Operating Frequency	Estimated Cost			
	Receiver	Receive Antenna	Transmission Line	Connectors
2110-2145 MHz	\$8,135	\$1,940	N/A *	N/A *
6.875-7.125 GHz	\$8,495	\$2,220	\$6,364	\$580
12.7-13.25 GHz	\$8,130	\$2,180	\$5,116	\$580

FOR MOBILE BAS STATIONS:

Operating Frequency	Estimated Cost			
	Receiver	Receive Antenna	Transmission Line	Connectors
2110-2145 MHz	\$11,500	\$7,000	N/A *	N/A *
6.875-7.125 GHz	\$11,500	\$3,400	\$6,364	\$580
12.7-13.25 GHz	\$11,500	\$3,400	\$5,116	\$580

* A given facility's existing transmission line and associated hardware were determined to be usable in the 2110-2145 MHz band. Therefore, no migration costs are attributed to these items.

Steerable Receivers and Repeaters

The CTJC Report of Findings considered steerable receivers and repeater systems in the cost estimates for an assumed population of BAS users. The assumptions are as follows:

FOR FIXED BAS STATIONS:

- 25 % of the fixed BAS stations which migrate to 12.7-13.25 GHz frequency band would require a new repeater system (i.e. a second hop) to maintain the current quality of service over a given path because of increased propagation losses in the higher frequency band.
- The cost of a new repeater system is detailed above.

FOR MOBILE BAS STATIONS:

- 20% of the mobile BAS stations which migrate to the 6.875-7.125 GHz frequency band would require a steerable receive antenna to maintain the current quality of service over a given path because of increased propagation losses in the higher frequency band.
- 50% of the mobile BAS stations which migrate to the 12.7-13.25 GHz frequency band would require a steerable receive antenna to maintain the current quality of service over a given path because of increased propagation losses in the higher frequency band.
- The cost of a steerable receive antenna was estimated to be \$50,000.

**Assumed Number of Fixed Transmitters & Receivers,
Portable Transmitters and Portable Receivers
per Mobile BAS Station**

The CTJC Report of Findings used the following ratios derived from an NAB Report dated January, 1992. The actual survey, referenced in the 1992 NAB Report was conducted in June, 1991. An updated survey, submitted in the "Joint Comments of the Association for Maximum Service Television, Inc., and Other Major Television Broadcasting Entities" in the instant proceeding, was conducted by NAB in April, 1995. For comparative purposes, both sets of data are presented below.

Number of Units Per Mobile BAS Station:

<u>CTJC Report</u>		<u>1995 Survey</u>
1.70	ENG TRANSMITTERS	2.00
2.00	ENG RECEIVERS	1.40
1.48	PORTABLE TRANSMITTERS	1.50
0.80	PORTABLE RECEIVERS	0.80

As the data in the Table illustrates, the recent survey indicates a 15% increase in the number of ENG transmitters in the last four years. Although the cost estimates in the CTJC Report of Findings considered a lesser number of ENG transmitters, the CTJC Report considered 42% more ENG receivers than the 1995 NAB Survey found in operation. The new ratios presented in the 1995 NAB Survey do not materially affect the final cost estimates in the CTJC Report of Findings.

SERVICE LIST

I, Brent H. Weingardt, hereby certify that the foregoing was served by first-class mail, postage prepaid, this 21st day of June, 1995, on the following persons:

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