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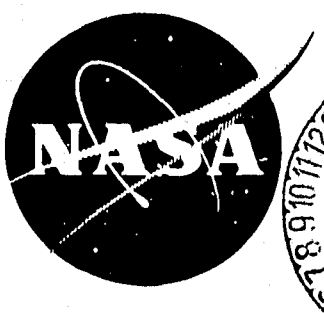
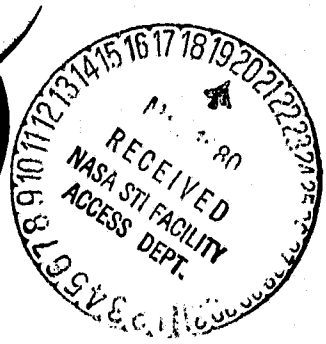
18/30 GHz FIXED COMMUNICATIONS SYSTEM SERVICE DEMAND ASSESSMENT

prepared for

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
NASA LEWIS RESEARCH CENTER
NAS-3 21359





VOLUME III — APPENDIX

of them, however, are used for communications. CWP's will not get sufficient air play until the installed base has reached a "critical mass".

Wohl, A.D. "Communicating Word Processors," Datamation, Mar. 1978: 102-110.

A search for explanations of the slow start of electronic mail systems based on word processing hardware. Incompatibility of communications protocols between communicating word processors, the considerable cost of word processing units, and the want for additional stations to reach a "critical mass" of users are the principal forces at work. The article maintains that a "critical mass" will eventually be reached, the sooner if common carriers implement value-added conversion services and the costs of word processing units with communications options drop substantially in the near future.

ELECTRONIC MAIL - FACSIMILE

Anderson, H. "Facsimile Data Compression . . . How It Can Help the Bottom Line," Communications News, Sept. 1978: 66-67.

The article spells out the principal features of three methods of data compression - run-length coding, two-direction simultaneous scanning, and early character recognition - entertained by facsimile terminal manufacturers. The article also considers Compression Lab's Fax-Comp, facsimile augmentation equipment that reduces transmission time from 6 minutes to 24 seconds at 2400bps (6 seconds at 9600bps) of facsimile terminals in the field.

Detailed Description of the Analog Facsimile Exchange Service, in-house document, Oct. 15, 1976.

Documentation supporting implementation by Western Union of the Analog Facsimile Exchange Service. Estimates of total facsimile installations are drawn from an internally prepared source, MP & NSD's Facsimile Services Market and Technology Assessment: 1975-1983. Included in the Strategic Planning report are usage characteristics conditioned to the 1982 facsimile environment: average transmission time per page, average number of pages per facsimile message connection, average daily total terminal connection time, average holding time per connection, and average number of connections per business day.

Electronic and Electro-Optical Publishing Equipment Market, New York: Frost & Sullivan, Sept. 1977.

A discussion of competing media that may effect the growth of the publishing and printing industry. Television, facsimile, and, ultimately, the combination of the two will pose a real threat to the conventionally printed word. Satellite printing, mainly of news magazines and large newspapers, is identified as a major new facsimile submarket which will grow at 7.2% annually.

ELECTRONIC MAIL - FACSIMILE

"Experimental fax net handles NASA teleconferencing," Data Communications, Sept. 1977.

Cost data associated with NASA's 55-terminal experimental facsimile network which, in conjunction with audio interconnection, has served as a teleconferencing medium for the past three years. Using sub-minute facsimile terminals, often in an unattended, broadcast mode, NASA has been able to reduce its annual travel expenses significantly.

Facsimile & Electronic Mail, New Canaan, CN: International Resource Development, Inc., Nov. 1976.

A monographic analysis of the facsimile market providing, in part, assessments of satellite and optical fiber wideband facsimile transmission, local/remote copiers, and growth of low-cost, and high-speed facsimile units. Also provided are forecasts of market demand through 1986, survey results by industry of facsimile user characteristics and applications, and a discussion of probable instances of cross elasticity.

Facsimile Equipment & Systems in the U.S.A., New York: Frost & Sullivan, May 1977.

A study based, in part, on the results of a survey of major facsimile users. Included are discussions of special-application facsimile networks, facsimile common carriers, facsimile equipment and manufacturers, and market growth characteristics through 1981. Of note is the supposition that 30 to 35% of the traffic carried by the SBS system will be facsimile and that 80% of this facsimile traffic will be carried at night.

The Facsimile Industry, San Jose: Creative Strategies International, Mar. 1978.

An examination by business application and by equipment segment of growth trends in the facsimile market through 1982. Growth will be measurably influenced, the article contends, by general economic conditions,

the cost of communications, and new product innovations and competitors. It is expected that digital, fast analog, and slow inexpensive analog business facsimile units will be the fast movers, all at the expense of the current installed base of slow expensive analog business facsimile units.

"The Facsimile Market Verges on a New Era," EMMS, Aug. 15, 1978.

An evolutionary look at the market for facsimile devices. The article identifies four "eras" of development, the fourth and emerging era being the genesis of facsimile networking and fax unit store-and-forward capability.

"Facsimile: 1978 Overview," Communications News, Dec. 1977: 67-84.

A series of articles covering all the facsimile bases - facsimile market growth, common carrier facsimile networks, special-purpose facsimile applications, and a buyer's guide to facsimile equipment. The lead article is accompanied by tables culled from facsimile studies by Frost & Sullivan, International Resource Development, and the Yankee Group.

Facsimile Services Market and Technology Assessment, in-house document, Nov. 25, 1975.

An internally prepared market research document exploring the facsimile equipment and services markets. Considered in the document are the impact of facsimile on Western Union's existing services, an evaluation of electronic postal services, and the revenue and usage potential of a proposed Western Union Remote Copying Service. Various consultant estimations of the total market are critiqued and an 8-year market forecast is assembled therefrom.

"Fax pace quickens in both speed, new vendor entries," Data Communications, Mar. 1978.

A summary article describing the increased activity in transceiver production, which

will speed the pace toward electronic mail. One industry observer who projects substantial growth in demand for sub-minute, digital facsimile transceivers finds that such growth will not necessarily be at the expense of the slower, analog devices.

Hughes, J.W. "Facsimile Equipment Update," Telecommunications, Feb. 1977: 22-28.

Brief descriptions of facsimile terminals currently marketed by 14 manufacturers.

Markets for Facsimile Equipment and Services, New Canaan, CN: International Resource Development, Inc., July 1974.

A comprehensive examination of the facsimile market addressing, in part, technological, sociological, and business trends, all of which point to the sustained growth of the facsimile market. The current market is defined by market type - mailroom, dial-up, convenience, and specialized facsimile - and projections for the years 1976, 1979, and 1984 are provided. It is noted that by 1984 most new equipment will incorporate substantial bandwidth compression circuitry.

"New Technology Spurring Greater Use of Facsimile," Communications News, Sept. 1978: 54-55.

The article highlights recent developments in the facsimile marketplace: new common carrier offerings, both domestic and international, which permit communication between unlike terminals; the emergence of a facsimile-oriented electronic mail service in Canada; and the entry of Panafax into the U.S. terminal market. Significant manufacturer market shares and three consultant forecasts of terminal growth through 1985 are also shown.

Report on Facsimile, Cambridge, MA: The Yankee Group, Nov. 1975, Feb. 1976, May 1976.

Three quarterly reports discussing day in, day out events occurring in the facsimile

market and providing estimates of current and prospective terminal demand, geographic distribution, time of transmission, and type of user. The Yankee Group reckons that half of the documents facsimiled could stand a delay of up to several hours.

"Resurgence of Facsimile," Telecommunications, May 1978: 85-88.

Summarizing the major findings of a recent study by Creative Strategies, the article indicates that the market for facsimile equipment will grow at a 20% annual rate by 1981 even though its real potential will not become evident until after 1982. Principal factors influencing market growth will be, when they occur, development of a fully automated under-two-minute unit priced below $100 per month or a fully automated under-one-minute priced below $150 per month, lower communications costs with packet switching and satellite systems, and some semblance of standardization. The article, in addition, includes a listing of facsimile devices currently on the market.

Schreiber, B.R. "Facsimile in the Future - Where Does It Fit?," Telecommunications, May 1978: 77-82.

The article postulates that the dramatic growth of the installed base of facsimile equipment envisioned by many did not materialize because factors other than time and the U.S. Mail, specifically, the rapid advance of communications technology, were not entered into the forecasting equation. The market for stand-alone facsimile equipment, which will become highly segmented, will continue to grow through 199[illegible] because human nature has an unalterable attachment for paper or hard copy.

Southern Pacific Communications Co., Facsimile Service Forecasts, (working papers in filing), Jan. 4, 1978.

Three-year forecasts of facsimile traffic carried by SPC over its Speedfax network.

ELECTRONIC MAIL - FACSIMILE

Traffic is segregated by speed of transmission and facsimile terminals by service point.

"Special Report: Facsimile's Finest Hour," Communications News, Dec. 1976: 29-43.

An analysis of the facsimile market, including anticipated growth statistics, costs, examples of installation, and a buyers guide to terminal devices currently marketed by 15 manufacturers.

Stamps, G. Business Plan for a Facsimile-Related Electronic Message Service, GMS Consultants, July 1976.

A report prepared for Western Union evaluating the introduction by Western Union of electronic facsimile-based letter message services. Estimations of total market revenue and of cost per delivered page are provided.

Wells, L. "Facsimile Growth," Telecommunications, Feb. 1977.

Provides market forecasts through 1980 for both convenience and operational facsimile devices. By 1980 the ratio of the one to the other is expected to be 60:40.

ELECTRONIC MAIL - GENERAL

Automating Business Communications Conference, American Institute of Industrial Engineers, Jan. 1978: 137&142, 155-160, 199-203, 375-377, 460-477, 500-504, 603-617.

A compilation of papers whose theme is the integration of text processing, electronic mail, intelligent telephone systems, and teleconferencing into the automated office.

Caswell, S.A. "Electronic Mail Delivers," Computer Decisions, Apr. 1977: 32-39.

The article includes projections of cost per record message sent via various means of electronic mail through 1985 and shows, in pie-chart fashion, the 1977 hard-copy and visual message market.

_____, Satellites and the Automated Office, Boston: Boston University and the Institute for Advanced Professional Studies, Nov. 1977.

A description of the electronic mail market. Although the current round of electronic mail systems cannot compete with the U.S. Postal Service in terms of cost per message and only exists because the benefits far outweigh the extra expenses, the next round, which may include extensive satellite-channel terminal interconnection, will compete favorably with the USPS on a cost basis.

Duscha, J. "For Computers, a Marryin Sam," The New York Times, Dec. 25, 1977.

The article gives the particulars of TDX Systems' Datapost, a Mailgram-type service that uses facsimile machines, telecopiers, and TDX computers in combination with the USPS's Express Mail Service.

"An Electronic Mail & Message Systems Primer," EMMS, vol. 2, no. 7, Apr. 3, 1977: 1-9.

An elaboration of currently operational electronic mail and message systems (EMMS) and a projection of communications revenues and equipment shipment values for each type

of system for 1978. Discussed are the effects of cross-elasticity impacts on revenue generation by type of EMMS service.

"Electronic mail net blueprint is unveiled by USPS," Data Communications, Dec. 1977: 15-16.

The article summarizes the U.S. Postal Service's intentions to introduce an electronic message service system, commercially available on a limited scale in 1981 and on a full scale in the mid 1980's. Post offices comprising the nodes of the packet switched system will be linked by terrestrial and/or satellite channels. The design goal of nodal processing equipment is 10 pages per second.

Evans, J.J. "New Survey: Bank Postal Expenses Keep Rising. How to Control Them," Banking, May 1978.

The article sets forth the vital statistics of the banking industry's outgoing postal traffic. Community banks (deposits of less than $100 million) mailed an average of 147,000 pieces in 1976, 98% of which were first class. Large banks (those remaining) mailed an average of 5 million pieces in 1976, 97% of which were first class. The average cost per piece mailed in both cases was 20 cents.

Eward, R.S. "Policy Issues in Electronic Mail," Horizon House, Oct. 1977: 943-949.

A discussion of technology developments and their implications, future trends, and regulatory history contributory to an understanding of electronic mail policy issues.

_____, Policy Issues in Electronic Mail, Indialantic, FL: Martech Strategies, Inc., Nov. 1977.

A discussion of the major factors affecting the growth of electronic mail, of the policy issues that must be addressed, and of the impact of electronic mail on the U.S. Postal Service.

ELECTRONIC MAIL - GENERAL

Miller, F.W. "Electronic Mail Comes of Age," Infosystems, Nov. 1977.

A description of electronic-mail type services provided by Western Union, Graphic Scanning (Graphnet), TDX Telecommunications (Datapost), and Scientific Time Sharing Corp. ("Mailbox") to the business community. The article also describes the in-house electronic mail system maintained by the Wharton School of Business.

The Report on Electronic Mail, Cambridge, MA: The Yankee Group, Aug. 1977.

A freehand analysis of the elements of facsimile, electronic mail, and word processing systems and services. Specific evaluations of sub-minute facsimile devices, Quip Systems, computer-based message systems, Wiltek, TDX, and competing facsimile message services.

The Report on Electronic Mail, Cambridge, MA: The Yankee Group, Dec. 1977.

The Yankee Group's basic report on electronic mail. Among the items considered are the digital broadcasting service proposed by TDX, the public facsimile services offered by SPC and ITT, the Viewdata concept, and the current status of the facsimile equipment industry.

Stamps, G.M. "Electronic mail: technology ready for packaging," Data Communications, Jan. 1977: 53-60.

The article suggests that a hybrid electronic mail terminal, able to operate simultaneously in both word processing and facsimile modes, will become commercially available within one or two years. Bits-per-page statistics are provided for keystroke, facsimile, and hybrid alternatives.

U.S. Postal Services Support Panel - Telecommunications, Electronic Message Systems for the U.S. Postal Service, Washington: National Research Council, June 1977.

A study funded by the U.S. Postal Service to evaluate various means of electronic

mail distribution and to recommend a delivery system for the nation's mail service. A major conclusion reached by the panel was that the U.S.P.S. would not necessarily benefit from owning its own delivery system.

Western Union Electronic Mail Business Plan, in-house document, 1977.

A complete business plan which includes identification of competition in and the potential size of the record message market, estimation of the price elasticity of electronic message traffic, and a forecast of WUEMI revenue and traffic.

FIBER OPTICS

Barbetta, F. "Digital Com Demands Spur Fiber Optics," Electronic News, Dec. 12, 1977.

The article suggests that both the perceivable increase in use of digital switching and transmission systems by voice and data common carriers and the development of optical fiber waveguides that reduce power loss and make possible longer repeater spans will stimulate interest in fiber optics. The article sets forth the testing and marketing activities of the principal fiber optics manufacturers.

"The beam that lights the future," Telephony, Aug. 9, 1976.

The article underlines the phenomenal growth potential of fiber optics, especially for telecommunication and cable television applications. The advantages and disadvantages of fiber optic systems are cataloged, the latter, it is presumed, disappearing as the major telephone laboratories and several other organizations turn their attention to the practical development of such systems.

Communications Markets and Strategies, vol. II, New York: Quantum Science Corp., 1977: 127-140.

A comprehensive treatment of fiber optic communications. Covered are the benefits of fiber-optic-based systems, the part played by fiber optic cable in "the office of the future", significant advances in fiber optic technology since 1972, principal fiber optic cable suppliers, full-scale Bell System tests in Atlanta and Chicago, and near-term service applications.

Dickinson, R.V. Data Communications on Coaxial and CATV Networks, E-COM Corp., Nov. 1977.

A description of the means by which coaxial cable and cable TV networks can be used for data transmission and of the high-quality performance characteristics such means will provide.

FIBER OPTICS

Edwards, M. "Fiber Optic Links Forge Paths for the Expected Information Explosion," Communications News, Feb. 1978: 30-33.

The article touches all of the optical fiber bases: principal advantages of optical links; recent advances in optical fiber technology; trade-offs between LED's and lasers (light sources) and between PIN silicon and silicon avalanche photodiodes (light detectors); experimental installations for central office-to-central office telephone traffic in Atlanta, Chicago, Los Angeles, and Brussels and for CATV traffic in New York City and Higashi Ikoma; and principal component manufacturers.

"Fiber optics: light at last," Data Communications, Aug. 1977: 18-25.

The prospective sharp reduction in optical fiber costs, to pennies a meter, and success in the laboratory in extending the useful life of solid-state lasers are perhaps all that is needed, the article maintains, to get fiber optic communications onto a fast track Several examples of operational systems, most of which serving either the government or military sector, are provided.

The Impact of Wideband Communications, New Canaan, CN: International Resource Development, Inc., Aug. 1977.

A researched report on the prospects of wideband communications. The report finds that the supply of bandwidth, until recently insufficient, has burgeoned with the advent of satellites, videotape recorders, microwaves, digital signaling, and optical fiber cable. It is expected that wideband will fundamentally change office practices, the mails, publishing, education, and television.

Kahn, I. "Fiber Optics and Lasers Will Meed Demand for More Broadband Links," Communications News, Dec. 1977: 22-23.

The article underscores the significance of two emerging technologies - optical fibers and gallium arsenide lasers. Once emerged these two technologies will shape the way communications is conducted.

FIBER OPTICS

Leigh, P. Lightwave Communications, New York: The First Boston Corp., Aug. 19, 1976.

A primer on fiber optic communications. Included are estimates of the value of fiber optic shipments in 1981 by market segment.

_____, A Technology Whose Time Has Come, New York: The First Boston Corp., Feb. 24, 1977.

The article, the transcript of a speech given before the Department of Commerce, describes the three-step process of fiber optic communications, points out the theoretical and presently attainable advantages of the technology, measures the commitment of manufacturers to full-scale production, discusses present obstacles to success, and identifies gainful vendor strategies. Of the strategies, winning early supply contracts in order to establish one's product specifications as the industry standard is considered the most beneficial.

_____, "Advantages of Optical Transmission Offer Far-Reaching Implications," Communications News, May 1977: 119.

The article identifies four basic advantages of fiber optics - electrical isolation, large bandwidth, potential low cost, indifference to moisture and temperature. The telephone industry, the article goes on, represents the largest potential market for fiber optic cable, over half the total demand.

_____, A Current Survey of Lightwave Electronics, New York: The First Boston Corp., Oct. 18, 1977.

The article maintains that optical transmission will eventually become the principal means of signal transmission. As the industry develops, certain technologies will be favored to others: single fiber channels will be preferred to fiber bundles, graded index fibers will be preferred to

step-index fibers, and semiconductor lasers will be preferred to LED's. The article also considers the principal vendors of fiber optic systems, noting where they may find new opportunities.

Meier, A.R. "Centel plunges into optical communication," Telephony, Dec. 12, 1977: 26-29.

The article sets forth Central Telephone's first steps to implement an optical communications system that will accommodate ordinary commercial telephone traffic. The article considers, in particular, the techniques of splicing utilized by Centel installation crews.

Optical Communications Systems, Frost & Sullivan, Sept. 1977.

A general discussion of the atmospheric and waveguide means of optical communications. The first type will be limited to short-range and special applications; the second, and by far the more serviceable, will be appropriate for telecommunications and computer uses. The study, although noting the real promise of optical communicators, did not find an apparent need within the commercial satellite community to use them in space.

Optical Fiber Cable Systems, Nippon Electric Co. Ltd.: Sections 17 and 21.

A flip-chart presentation of the basic optical fiber cable configuration, the advantages of optical fiber cable, and the uses, both short and long-distance, of same.

"Taking a shot at fiber optics," Telephony, Dec. 5, 1977: 63-70.

The particulars of a 6.5 mile experimental optical fiber communications system that has been installed in Belgium by GTE and the Belgian telecommunications agency.

"FM MAIL"

Barna, B. "The hottest new idea in electronic mail," Computer Decisions, Feb. 1978.

The article describes TDX's proposed nationwide electronic mail system which will operate over subsidiary communications channels of commercially licensed FM radio stations. The principal obstacles to early system implementation, the article indicates, are regulatory.

"Digital Broadcasting Blossoms Overnight," EMMS, vol. 2, no. 10, May 15, 1978: 6-8.

The article paints a bright future for Digital Broadcasting Corp., which intends to lease the FM subcarriers which are a part of an FM radio station's allocated channel space in order to broadcast digital information to local subscribers connected into nationwide networks. It is expected that newsletter and stock quotation services will be principal users of the Digital Broadcasting system. At date of publication, the company had received letters of intent for 26,000 terminals.

"Faxnet -- 'A Radio Newspaper,'" EMMS, vol. 2, no. 12, June 15, 1978: 7-9.

Particulars on Fax Net Inc., which presently provides FM mail service to grocers and travel agents in Chicago and Minneapolis. The article maintains that FM mail, although serving no more than a niche market, will experience rapid growth.

"Now FM broadcasters carry the mail," Business Week, Nov. 28, 1977: 46B-46D.

Particulars on the two front-line FM mail carriers, Digital Broadcasting Corp. and Fax Net Inc. It is expected that specialized news bulletins will be the principal constituent of FM mail. It is not clear, the article notes, whether the FCC will choose to regulate FM mail.

"FM MAIL"

"Will Digicast Replace Today's Modern Newspaper?," EMMS, vol. 2, no. 19, Oct. 2, 1978: 5-7.

Noting that there is often considerable distance between what is technologically implementable and what is realistically marketable, the article maintains that a plan to use a subchannel carrier of the FM band to distribute an electronic newspaper, a plan that is technologically implementable, is likely to fail. Only with a newspaper's large-size pages is it possible for the eye to scan a day's worth of news in a few minutes, what it cannot do if it must await the playback of an entire electronic newspaper. The article does foresee, however, a bright future for broadcasting via FM subcarriers - specialized publications.

IBM/SBS

Data Communications Equipment Market in the U.S.A., New York: Frost & Sullivan, Feb. 1975.

A discussion of the introduction of SDLC by IBM in 1974 and of the effect of SDLC and the concept of Advanced Function for Communications on users and on independent terminal and mainframe vendors. The new concept is considered an imposing challange to IBM's competitors.

Myers, D. "Business Communications - in orbit by '80, in service, '81," Telephony, Feb. 27, 1978.

A press-release type description of the SBS system and of trial service provided to Montgomery Ward during Project Prelude. It is noted that economic evaluation of the SBS system cannot proceed without consideration of several imperfectly quantifiable elements, e.g., in the case of teleconferencing, reduced travel time.

Prelude: Communications of the Future - Evaluation Report on Project Prelude, Experiment No. 26 in the CTS Program, McLean, VA: Satellite Business Systems, May 30, 1978.

Evaluation report of trial 12/14GHz transmission links established by SBS between specific, volunteer customer locations over CTS. Trial users evaluated three communications applications: video conferencing, data processing, and high-speed facsimile. Prospective cost to the user, by the project's ground rules, was not determinative.

"Prelude Program Previews Satellite Business Systems," Communications News, Mar. 1978.

A press-release type description of Project Prelude, a four-month demonstration of intra-company communications conducted by SBS via the 12/14GHz Communications Technology Satellite. Participants in the demonstration were Aetna, Montgomery Ward, Rockwell, and Texaco.

IBM/SBS

Printers & Papers in the Office of the Future, New Canaan, CN: International Resources Inc., Feb. 1977.

The study considers the impact of technology on the office of the future. Described in some detail is the makeup of SBS-type satellite networks, which will funnel variable-speed voice, data, and visual traffic through single message switching or data concentration stations. Also discussed are local and remote printing stations and communicating word processors. An indication of the impact of these technologies on paper flow is included.

SBS Special Report, Waltham, MA: International Data Corp., Jan. 1978.

A comprehensive description of the SBS system and the services, both conventional and new, it will avail. System saturation will be attained, it is projected, when 10 to 15 customers (in addition to IBM and Aetna), each with 20 to 25 earth stations and 20Mbps worth of capacity, are on-line. Of interest is the claim that voice traffic will be carried at 32Kbps.

Sherwood, H.F., "IBM's Strategy in Terminals and Distributed Processing," Datamation, Mar. 1978: 92-98.

The article identifies two conceivable strategies that explain recent actions of IBM: (i) consideration of distributed networks as bridges from centralized computing to multiple installations of smaller mainframes, which might, in turn, grow into larger installations; and (ii) provision of cheap transmission services (SBS) so that users will continue to transfer data base elements to single large centralized installations rather than store them at distributed sites.

MEMORY DEVICES

Berman, M., and N. Snyderman, "Surge in Bubbles Boon to GGG," Electronic News, Mar. 20, 1978: 87-88.

Early jockeying for position in the bubble memory component and supplier markets. Referring to a recent Creative Strategies study, the article notes that although charge coupled devices are five or six times faster than bubbles, the latter are competitive; bubble memories are, notably, non-volatile and, at some point, will be less expensive.

"Bubbling Up Some Memory Devices," Data Management, Aug. 1977: 12-15.

Brief descriptions of today's principal memory technologies - magnetic tapes, ferrite cores, integrated circuits, charge coupled devices, and magnetic bubbles. The article notes that, given a specific per-unit cost, there is generally a trade-off between storage capacity and speed of data retrieval.

Gilder, J.H. "Wonnerful, wonnerful - turn on the bubble machine," Computer Decisions, Nov. 1976: 20.

An overview of two emerging, competing semiconductor technologies - bubble memories and charge-coupled devices. Increased chip memory densities are expected for both technologies in the near future.

Hanson, D. "65K CCDs Split Into 3 Camps; National to Second Source Intel," Electronic News, Dec. 5, 1977: 37.

The article points to the nonuniformity of opinion of industry observers over the market potential for charge coupled devices. The article concludes that the demand for CCDs is a function of the price differential between CCDs and dynamic memory devices.

MEMORY DEVICES

"The Outlook for Bubble Memory Devices," Mini-Micro Systems, Feb. 1978.

A report noting the results of a study conducted by Venture Development Corp. into the market potential for bubble memory devices. The market is expected to grow rapidly provided bubble system prices are competitive with moving head disks. Bubble memory shipments are estimated to exceed one billion dollars by 1985.

Shaffer, R.A. "Bubble Memories Aren't Developing Rapidly as Expected," The Wall Street Journal, Aug. 4, 1978.

The article suggests that the bubble memory market is not developing as rapidly as enthusiasts once expected. Texas Instruments, the market's principal supplier, has not yet reached several significant productions milestones, leading industry observers to conjecture that bubble memories will not fulfill their original promise until at least 1980.

MISCELLANEOUS

An Analysis of Domestic and Foreign PABX Markets, Washington: U.S. Department of Commerce, Office of Telecommunications (in conjunction with Dittberner Associates), Apr. 1976.

The study considers the past and present market for PABX equipments in the United States, analyzing, in part, equipments supplied to this marketplace by the major U.S. and foreign manufacturers. The study also provides a broad look at U.S. export activities in the PABX market area. The time frame of interest is 1972-1975. Likely trends in the PABX market area are forecasted through 1985.

An Analysis of Domestic and Foreign Small Earth Station Markets, Washington: U.S. Department of Commerce, Office of Telecommunications (in conjunction with Arthur D. Little, Inc.), May 1976.

The report considers the domestic and foreign markets for small earth stations (earth stations with antennas measuring 10 meters or less in diameter). It is projected that domestic small earth station shipments will grow from $7.7 million in 1975 to $62.9-89.5 million in 1985. Foreign small earth station shipments are expected to show similar growth, from $16 million in 1975 to $142-224 million in 1985.

Barbetta, F. "Local Digital Switching Systems, PBX's to Dominate Telecom Field," Electronic News, Jan. 2, 1978: 17.

Industry observers indicate that the independent telephone companies will have a significant impact on this market, either through implementation of digital equipment for new or replacement of existing local central office equipment. Within the PBX area, digital techniques are encroaching upon the long existent analog systems. Key systems and Automatic Call Distribution systems, each with more sophistication through digital technology, are becoming competitive with small PBX systems.

MISCELLANEOUS

"Booming International Telecom Market," Microwave Journal, Nov. 1977: 34.

Arthur D. Little relates the growth of domestic and international satellite communications systems through 1985 promulgated by the advancements in technology of switching, transmission, local distribution and terminal equipments. The growing importance of digital techniques will replace the traditional use of analog services over the next ten years. Most prominent among the newly developed technologies are the higher frequency satellite systems operating at up to 30GHz.

Committee on Interstate and Foreign Commerce, Options Papers, Washington: U.S. Government Printing Office, 1977.

A series of papers presenting various options open to the Subcommittee on Communications which has revisited the Communications Act of 1934 with the intention of general revision: Considered are policy options for the spectrum resource; commercial and public broadcasting; safety, special, and mobile radio communications; domestic communications common carriers; international communications; cable television; the right to privacy; and regulatory structure and procedure.

Data Base and Industry Sector Forecast, Vol. III, MAPTEK Strategy Report, New York: Quantum Science Corp., 1976.

An industry-by-industry summary of projected communications expenditures - broken down into equipment, leased facility, and labor subcategories - through the year 1980. Descriptions of specific company installations and communications networks are provided. In the article it is predicted that the demand for facsimile and TDM equipment and for satellite earth stations will grow dramatically.

MISCELLANEOUS

Information Resources Policy - Arenas, Players, and Stakes, Vol. I, Cambridge, MA: Harvard University, 1977.

A chart and text presentation of the arenas, players, and stakes involved in the development of information resources policy. Of especial interest is a diagram showing the functional relationship between investment cost per mile of transmission system and number of circuits.

"Interconnect - Ten Years Later," Communications News, Mar. 1978.

Interconnect penetration over the past ten years in the consumer marketplace and business applications area has been developing at a fast pace. Some industry estimates of this penetration state that it has reached a 5 to 10% level, whereas Independent Telecommunications Analysts in a recent study showed that in the Denver market a 28% penetration has been accomplished. ITA considers that Denver is typical of the national trend and therefore, the national level should be 20 to 28%. The most important effect that interconnect has done for the industry has been to accelerate new technology that has provided the user with service enhancements and new capabilities that would still be nonexistent or possibly just surfacing. Unit growth over the next ten years has been forecasted as (1) station equipment, from 2.2M to 10.4M units, 21%, (2) PBX's from 5.8K to 24K units, 24% and (3) key systems, from 7.8K to 37K units, 21%.

Langley, G.A. "Beginnings: The global transition to digital switching is underway," Telephony, July 10, 1978: 104-131.

Digital switching offers advantages that financially aware telecommunications administrations no longer can ignore. The author predicts that many countries will find themselves turning to digital before the year 2000. Within his text he describes current systems, step by step, common control, stored program control and then digital with his reasoning for conversion to digital.

MISCELLANEOUS

Management Action Report, Vol. I, MAPTEK Action Report, New York: Quantum Science Corp., 1976.

> A report marking the trend toward integrated systems accommodating previously separate elements of business information, that is, voice, data, image, and text. AT&T and IBM/SBS are the only vendors, the report observes, that are in a position to support fully integrated systems. Four key products which will serve as the nucleus of fully integrated systems are noted.

Sefton, N.H. "Duke University Tel-Com: Large Interconnect or Small Telco?," Business Communications Review, Nov./Dec. 1977: 3-11.

> The article describes Duke University's privately owned telecommunications system which serves the university, its medical center, and student population. The system is organized and operated "very much like a small telephone company", with its own central office; inside and outside plant; business office; and traffic, commercial, and data processing departments.

Telecommunications & Society, 1976-1991: Report to Office of Telecommunications Policy Executive Office of the President, Cambridge, MA: Arthur D. Little, Inc., June 22, 1976.

> The report provides a set of five scenarios that illustrate some of the impacts, conflicts, issues, and changes that might arise during the next 15 years from the interaction between technological innovation in telecommunications and the social context in which it occurs. This context includes our national economy, political framework, industrial structure, international relations, and personal life styles.

White, C.E. "International Carriers Looking Up and Forward," Telecommunications, Aug. 1976.

> The article provides an estimate of U.S. - World telex traffic through 1980. Factors encouraging the growth of international data communications over the time period in question are identified:

lowering of costs, introduction of new services, reduction of regulatory controls, and introduction of compatible standards.

MOBILE RADIO

Land Mobile Communications and Public Policy, Vol. II - Urban Forecasts of Conventional LMR Demand and Elaboration on the Demand-Related Aspects of the Study, Beverly Hills: Systems Applications, Inc. (for the Office of Telecommunications Policy), Aug. 31, 1972.

The second volume of a three-volume study providing OTP a quantitative basis for its formulation and implementation of public policies that affect the evolution of the domestic land mobile radio (LMR) industry. Included in the present volume are a discussion of the scope and particular objectives of the demand aspects of the study, a critique of previous LMR forecasting studies, and brief descriptions of the conventional LMR services for which forecasts were produced. The appendices contain demand forecasts for various urban areas under different sets of assumed conditions.

MOBILE RADIO

"And then there were 21,860," Broadcasting, Feb. 6, 1978: 32-33.

The article sets forth a new narrowband technology that will increase the number of land mobile channels seven to tenfold within the assigned spectrum. As with the cellular concept, most radio common carriers consider implementation of the new technology beyond their financial resources.

Evaluation of the Market for Mobile Communications Equipment, Chicago: INTEC, Inc. May 18, 1972.

The study quantifies potential demand for several types of mobile communications equipment and identifies demographic differences between positive and negative respondees. It is concluded that the demand for paging systems is more price elastic than the demand for mobile telephone systems and that vendors would not be misled to venture into the tone only and tone plus voice pager residential markets.

"Fewer busy signals for mobile phones," Business Week, Aug. 7, 1978: 60B-60C.

The article highlights "nontechnical roadblocks" which may hold up the general introduction of the Bell System's Advanced Mobile Phone Service: the absence of FCC-imposed standards and the delay tactics of radio common carriers, many of whom cannot afford the huge investment required to build cellular systems. In this winner-take-all market, Bell has forecasted 10 million subscribers by 1990; others, principally radio phone suppliers, anticipate slower, but still significant, growth.

Fredrickson, D. "Airborne Service Gets Off Ground," Communications News, Nov. 1978: 78-79.

A status report on the evolvement of the air-ground telephone system, which presently serves 4000 subscribers from 52 ground stations. Ground station usage has been growing at a 25% annual rate.

MOBILE RADIO

Jamieson, W.M., C.S. Peet, and R.J. Bengston, Potential Markets for a Satellite-Based Mobile Communications System, Columbus, OH: Battelle Columbus Laboratories, Apr. 16, 1976.

The study, initiated under NASA contract, addresses the nature and character of land mobile communications uses and users. The study also seeks to measure user demand for a satellite-based mobile communications system, concluding that the local nature of most land mobile communications, the emergence of land-based means of improving spectrum utilization, and the expense of satellite services will hold up its early development.

Kraus, R. A Complete Mobile Radio Market Study on the 900 MHz High Capacity System, Dedham, MA: Horizon House International, 1976.

The study gives evidence of a linear relationship between price and demand for mobile radios, evaluates several mobile radio market projections found in the literature, derives its own market forecast, and proposes several marketable non-vehicular uses for mobile radios.

Land Mobile Communications and Public Policy, Principal Study Findings and their Policy Implications, Beverly Hills: Systems Applications Inc., Aug. 31, 1972.

The study identifies significant trends in the evolution of the mobile radio market (in 1972) and projects subscriber counts through the year 2000. The study also considers alternative public policy objectives; in conclusion it proposes that government introduce mobile radio services that would not be conceived in a timely fashion if left to private industry and that, otherwise, the mobile radio market be as competitive as possible.

O'Brien, J.A. "Final tests begin for mobile telephone system," Bell Laboratories Record, July/Aug. 1978: 171-174.

Description of two ongoing tests, one in Chicago and one in Newark, whose results are intended to measure the market potential for the Bell System's Advanced Mobile Telephone Service, a cellular mobile telephone service

that affords considerable radio spectrum saving. A second goal of the two tests is to show that call setup and handoff can be handled reliably, even in small cells, where there will be the greatest amount of interference.

"Squabbling over mobile phones," Business Week, June 6, 1977: 36J.

The article takes note of the contention between the Bell System, which has advanced a cellular solution to radio telephone service expansion, and many radio common carriers, which have pushed the single, powerful transmitter concept to the same end, the other requiring investment beyond their means. It appears that the FCC will favor the cellular concept.

"Testing the new radiophones," Business Week, Mar. 28, 1977: 341.

A prospect of the next generation of radiophone services, which will operate in reallocated spectrum and make use of a new arrangement of ground stations called a "cellular system". Tests of the cellular concept are being conducted by the Bell System, in Chicago and Newark, and by American Radio Telephone Service Inc., in the Baltimore-Washington area.

The U.S. Mobile Radio Equipment Market, New York: Frost & Sullivan Inc., May 1978.

The study provides both historical and prospective glances at the mobile radio equipment market which includes land mobile radios and antennas; pagers, private paging systems, and paging transmitters; marine radios; scramblers; CB radios and antennas; and radio scanners. Through 1980 the aggregate base of mobile radio equipments is expected to grow at a nominal rate; beyond 1980 growth will be rapid.

MOBILE RADIO

Watanabee, S. "Pagers Ride Crest of Mobile Society Wave," Communications News, Nov. 1978: 89.

An encouraged look at developments in the pocket pager market. The article points to an experimental satellite paging service interconnecting Chicago, Los Angeles, and New York; reduction in the size of pocket pagers; and multi-readout and multi-address R & D as indicators of the market's good health.

White, C.E. "Mobile Radio's Cautious Growth," Telecommunications, Aug. 1977: 10.

The article points to the impending battle between those that espouse cellular land mobile systems and those that espouse centralized, high-powered land mobile systems. The Bell System, a major proponent of the cellular concept, has obtained 350 land mobile plant construction permits during the last year, increasing its market share and its ability to affect market decisions.

PRICE ELASTICITIES

Davidson, P. "various in-house price elasticity studies," in-house documents, May 1974, June 1976, and Nov. 1976.

Various price elasticity studies conducted by or in concert with Paul Davidson, a frequent consultant to Western Union in econometric/price elasticity matters. Included are derivations of price elasticities for public message and money order services, voice-originated Mailgrams, and TWX.

Interconnection - an economic impact analysis, Washington: Office of Telecommunications Policy, 1973: 93-110, 326-341.

An analysis of cross elasticity between a variety of products or service concepts among which, in combination, paging and mobile radio, facsimile and videophone, and business protective alarms and CATV or videophone. In addition, price-demand elasticity analyses of, for example, facsimile devices, mobile telephones, and tone/voice one-way pagers are included. It is noted that any analysis of demand is incomplete without recognition that demand is often created by imaginative and aggressive marketing.

Johnson, H.R., and J.R. Wilkinson, Advanced WESTAR and TDRSS Market Study, in-house document, July 16, 1975.

An internally conducted study assessing the demand for satellite channels through the year 1990 and estimating the price elasticity of demand for such services. The study provides a logical jumping-off point for further evaluation of price elasticity and traffic statistics.

Lage, G.M., and J.D. Rea, A Time Series Analysis of the Demand for Telecommunications Services from the United States to the United Kingdom, Washington: Office of Telecommunications Policy, Aug. 1975.

The study identifies and quantitatively measures the determinants of demand for telecommunications services. Involved are the development of a theoretical model of the behavior of the users of telephone, telegraph,

and telex services and the econometric specification and estimation of equations measuring observed, past behavior. It is concluded, at least in the present instance, communications between the U.S. and the U.K., that telephone and telegraph services are price inelastic and that telex service is price elastic.

SATELLITE DEMAND

Golomb, S.W. "Some Scenarios on Communications by the Year 2000," Astronautics & Aeronautics, Jan. 1976: 66-69.

Three scenarios of communications in the year 2000. In one instance advanced communications will be used to monitor the daily activities of the citizenry, in another to make universally available those services of the new technology that are communicable, and in a third to maintain a given standard of living in the face of decreased availability of natural resources.

Marsten, R.B. "Service Needs and Systems Architecture in Satellite Communications," IEEE Communications Society Magazine, May 1977: 14-23.

Projected demand for fixed and broadcast satellite capacity provided by North American domestic satellite systems through 1989. Beyond 1989, the article finds, 18/30GHz satellite systems will have to be implemented if all reasonable demands are to be met. The article also suggests that a need for 60GHz and 90GHz satellite systems will materialize before 2000.

Pritchard, W.R. "Is Satellite Communications a Viable Market?," Telecommunications, Mar. 1978.

Forecasts of the number and value of new satellite and earth station purchases worldwide through 1988. Not included are the costs of launch vehicles and of research and development. The article concludes with the supposition that fiber optics will not be economical for most of the applications for which satellite systems are now being contemplated.

Stamminger, R. A 25-Year Traffic Forecast for Domestic and Regional Satellite Communications, Dedham, MA: Horizon House International, Oct. 1977.

A model-derived forecast of domestic communications satellite traffic requirements for the year 2002. The total global traffic requirements correspond to 1800 present-day C-band transponders

and 140 direct broadcast channels (50 operating spacecraft). The article concludes with a discussion of the satellite systems that may be operating by the year 2002.

A 25-Year Forecast for Commercial Communications Satellites and the Congestion of the Geostationary Arc, Gaithersburg, MD: Future Systems Inc., Nov. 1977.

A conceivable arrangement of geostationary satellites in the year 2002. The study maintains that 18/30GHz satellites will carry video conference and high-density telephone traffic in 2002. Only AT&T, Telesat, and a video conferencing entity are expected to position 18/30GHz satellites in the orbital arc practicable for U.S. communications.

World Environment and Satellite Communications 1978-2003, A Review of Opportunities, Gaithersburg, MD: Future Systems Inc., May 1978.

The report anticipates how the changing world environment, which will see significant and disproportionate population growth and soaring energy costs, will affect demand for satellite communications. It is expected that future satellite systems will provide video conferencing, electronic mail, facsimile, electronic news, database, financial transaction, order entry, inventory control, and other information services in addition to the conventional telephony services. Projected transponder demand through the year 2003 is provided for some of these services.

SATELLITE/EARTH STATION TECHNOLOGY

Baer, W.S. "Telecommunication Technology in the 1980s," in Communications for Tomorrow, Policy Perspectives for the 1980s, New York: Praeger, 1978: 61-123.

Descriptions of some of the advances in telecommunications technology that can be expected during the 1980s. Of all technological changes, the article finds, covergence of communications and computing technologies will have the most profound effects on telecommunications in the 1980s. The article notes, however, that the introduction and commercial growth of any technological improvement will be determined by requirements for compatibility with the existing network, by availability of capital, by depreciation policies, and by regulatory constraints than by their technical "ripeness".

"Bell Labs Conducts High-Frequency Satellite Studies with New Antenna," Communications News, Sept. 1977.

The article lays out the reasons for which Bell Labs has constructed an ultra-sensitive radio antenna: to determine if 18/30 GHz satellite systems will operate reliably, to evaluate discrimination at a single receive point of signals of the same frequency arriving from different satellites, and to study radio signals emanating from beyond the solar system.

Brandinger, P.E. "20-30 GHz Communication Satellite Systems Design," ICC 78 Conference Record, vol. 1, June 1978.

A discussion of the various means by which 18/30 GHz satellite systems can be designed to minimize the effect of rain attenuation. Availability can be increased by site diversity, store-and-forward transmission, angle diversity (multiple satellites), inter-satellite crosslinks (especially in global systems), up and downlink optimization on board multi-band satellites, and steep elevation angles (satellite positioning over land masses).

SATELLITE/EARTH STATION TECHNOLOGY

Cooper, R. Future Communications Satellite Systems, NASA/ Goddard Space Flight Center, Nov. 1977.

A discussion of technological problems facing future satellite communications applications. Identified in the article are the problems of orbital spacing, propagation, and higher prime power for spacecraft. The article also discusses space shuttle launch costs and public service space platforms.

Covault, C. "Platform Design for Numerous Uses," Aviation Week and Space Technology, June 19, 1978.

A description of a geosynchronous space platform that could carry the U.S. satellite communications capability. The space platform would house multiband capacity equivalent to several current single-purpose communications satellites. K-band, the article suggests, could support electronic mail and data transfer. The article notes that the communications capability would become more vulnerable to attack under such an arrangement.

DiFonzo, D.F. Introduction to Commercial Communications Satellite Systems, Boston University and the Institute for Advanced Professional Studies, Nov. 1977.

A brief description of the AT&T, RCA, SBS, and WU satellite systems. In addition, the article discusses the relationship between orbital and launch vehicle parameters on the one hand and future satellite design on the other.

Edelson, B.I. "Global Satellite Communications," Scientific American, Feb. 1977: 58-73.

A primer on basic satellite communications. Using the Intelsat system to illustrate specific points, the article goes into spacecraft and earth station design, means of transmission, and operations and economics. International traffic, the article holds, will grow at a 15% annual rate.

SATELLITE/EARTH STATION TECHNOLOGY

Fordyce, S.W., and L. Jaffe, "Future Communications Concepts: The Switchboard-in-the-Sky," Part I, Satellite Communications, Feb. 1976.

Depicting the orbital crowding of C-Band spacecraft in Region II, the article speculates that a like situation will occur when Ku- and K-band generation spacecraft are launched. The article predicts that multiple, non-overlapping spot beams and orbital platforms will be implemented in anticipation of these recurring instances of overcrowding.

A Forecast of Space Technology, 1980-2000, NASA SP-387, Jan. 1976.

A detailed forecast of the future of space technology in the United States during the last quarter of the 20th century. Although the report does not focus on communications satellite technology, it does provide projections of synchronous orbit satellite data transfer rates and transmission costs through the year 2000.

Gustin, H.J. Small Aperture Earth Stations for Domestic Thin Route Applications, Bell Manufacturing Co., Nov. 1977.

An examination of low cost earth stations whose characteristics are appropriate for thin route satellite communications. Cost is identified as an overriding concern.

Hilsen, N.B., L.D. Holland, R.E. Thomas, R.W. Wallace, and J.G. Gallagher, "Millimeter Wave Satellite Concepts," NASA/ Lewis Research Center, Sept. 1977.

The paper identifies the techniques on which development and commercial implementation of a millimeter wave communications satellite depend. For each technology an assessment of risk is made.

SATELLITE/EARTH STATION TECHNOLOGY

Hyde, Communication Satellite Antenna Technology, Boston University and the Institute for Advanced Professional Studies, Nov. 1977.

A discussion of the relationship between rain depolarization, rain attenuation, and frequency re-use on the one hand, and earth station antenna characteristics on the other.

Kelly, R.L. Low Cost Ku-Band Earth Terminals for Voice/Data/Facsimile, Fairchild Space and Electronics Co., Nov. 1977.

Text providing cost and application data for Ku-Band earth terminals.

Kiesling, J.D., B.R. Elbert, W.B. Garner, and W.L. Morgan, "A technique for modeling communications satellites," Comsat Technical Review, vol. 2, no. 1, Spring 1972: 73-98.

The paper presents a model of the space segment of a representative communications satellite system. With the model it is possible to formulate parametric relationships among satellite power, mass, and cost.

Lombardo, P. Recent Developments in C and Ku Band Station Receivers, LNR Communications, Inc., Nov. 1977.

A technical review of the amplifiers and receivers operating in the C and Ku downlink bands.

Morgan, W.L. "Communications Satellites - 1973 to 1983," ICC 78 Conference Record, vol. I, June 1978.

The paper reviews the current status of fixed, maritime mobile, and broadcasting satellites. Orbital conjestion, the obvious consequence of the accelerated launch of the single-purpose satellites, will be obviated, the article suggests, by the development of orbiting antenna farms.

SATELLITE/EARTH STATION TECHNOLOGY

Mundie, L.G., and N.E. Feldman, The Feasibility of Employing Frequencies between 20 and 300 GHz for Earth-Satellite Communication Links, Santa Monica, CA: Rand Corporation, May 1978.

A report prepared for the Defense Communications Agency inquiring into the feasibility of using frequencies above 8GHz for military satellite communications. Much of the report is devoted to the development of a model for estimating the statistical distribution of weather-induced outages as a function of data rate and downlink frequency. The model points to rapid performance degradation as the elevation angle of the user terminal falls below 30° (in the given configuration) and the downlink frequency increases. The article concludes, however, that annual throughput will increase materially if the high-frequency outages can be tolerated. The model was developed for Washington, D.C., a region with relatively high rainfall, but could be extended to any location where weather data are available.

Myers, D. "Satellite communications - a down-to-earth glimpse of the 1980s and beyond," Telephony, May 22, 1978: 27-31.

Recording the transactions of the 7th American Institute of Aeronautics and Astronautics Satellite Communications Systems Conference, the article points to several issues of growing concern to observers of the communications satellite manufacturing industry - too many suppliers (too few buyers), heavy pressure from optical fiber technology, precedence of political considerations over technological ones. Becoming more cheerful, the article identifies three prospective technological events that will promote satellite communications in the 1980s - the use of satellites for video broadcasting and conferencing; the use of K-band frequencies and, in conjunction, small, low-cost earth stations; the use of the space shuttle as a launch vehicle, freeing manufacturers of some spacecraft design constraints.

SATELLITE/EARTH STATION TECHNOLOGY

_____, "Technology of the '80s," Telephony, June 12, 1978: 28-33.

Transcript of an interview with W.O. Baker, president of Bell Telephone Laboratories. Dr. Baker considers the turns technological research, especially that dealing with satellites and memory devices, may take in the 1980s.

Rogers, T.F. NASA's Future Role in Space Telecommunications, Washington: National Research Council, Nov. 1977.

An identification of telecommunications research programs which could be suitably undertaken by NASA.

Scott, W.G. Communication Satellite Multibeam Antennas, Boston University and the Institute for Advanced Professional Studies, Nov. 1977.

A discussion of frequency band re-use accomplished by means of multiple beam spacecraft antennas. There may either be several, differently pointed, broad-shaped area coverage beams or many narrow pencil beams, each pointed in a different desired direction.

Technology Priorities for Future Satellite Communications, NASA/Goddard Space Flight Center, July 1978.

A compilation of satellite communications R & D projects more suitably undertaken by NASA, which is able to enter upon high-technology, high-risk activities, than by private industry. Subjects of a comprehensive NASA investigation would include system analysis and synthesis, multibeam antennas, low-cost user terminals, intersatellite links, and propagation. The report maintains that saturation of the 4/6 GHz band will occur in 1984, of the combined 4/6 and 11/14 GHz bands in 1990, and of the combined 4/6, 11/14, and 18/30 GHz bands shortly after the year 2000. Means of retarding saturation are suggested.

SATELLITE/EARTH STATION TECHNOLOGY

"Telecommunications - Orbiting a New Market," Electronic News, May 30, 1977.

The article considers the market for small earth stations, a market whose value, one source has projected, will increase five-fold between 1977 and 1985. By the following year, 1986, there will be approximately 7500 rooftop earth stations in place, 375 of which pointed to the SBS satellite system.

Tillotson, L.C. "A Model of a Domestic Satellite Communication System," Bell System Technical Journal, Dec. 1970 (manuscript submitted July 12, 1968): 2111-2136.

A study conducted by Bell Labs to evaluate the potential of a 50-satellite communications system operating on a multibeam basis in the 15 to 40 GHz range. Of interest is the reported finding that 10- to 20-mile earth station diversity is a sufficient safeguard against down time due to rain attenuation.

The University of Dayton Research Institute, Space Broadcast Communications Technology Value Assessment Methodology Study, NASA Contract NAS3-20365, 1978.

The study was undertaken to develop a methodology that could be utilized by NASA to facilitate selection of the most appropriate space communications technologies for R & D support. Forecasts of the growth of all significant elements in the U.S. telecommunications system were prepared, interactions among these elements were identified, and both were incorporated into a cross impact model. From a large number of runs, statistical pictures of the future were developed.

Van Trees, H.L., E.V. Hoversten, and T.P. McGarty, "Communications satellites: looking to the 1980s," Spectrum, Dec. 1977: 43-51.

The article, whose technical complexity makes it somewhat inaccessible, considers the areas of technology that are likely

to have a significant impact on satellite communications applications and services in the 1980s. Areas covered are launch vehicles and satellite "busses"; antennas; on-board processing; intersatellite links; multiple access; error control; terminals, sources of coding, and multichannel processing; and terrestrial interface and interconnection.

White, W., and M. Holmes, "The Future of Commercial Satellite Communications," Quest (the quarterly journal of TRW Defense and Space Systems Group), Spring 1978: 46-67.

A thoughtful account of the current disposition of satellite communications. Discussed are the specific orbital spacing characteristics of communications satellites, notably those operating at 18/30 GHz, and the susceptibility of high-frequency satellites to signal loss during thundershowers. At 18/30 GHz, the article finds, a rain margin of at least 25dB may be required along the eastern seaboard, where a large fraction of total traffic is located. Various means of circumventing signal loss are discussed. The article concludes that the future will bring "higher frequencies, bigger satellites, and digital communications".

Wright, D.L., and J.D. Kiesling, "Communications Satellite Services for Special Purpose Users," in Telecommunications & Economic Development, Exposition Proceedings, vol. I, of the first International Telecommunications Exposition, Atlanta, Oct. 9-15, 1977, (Dedham, MA: Horizon House Int.): 200-208.

The paper identifies potential satellite services, specifically TV and radio distribution, video teleconferencing, audio/facsimile teleconferencing, multiplexed data/voice, land mobile, and TV and radio broadcasting; examines the technology necessary for their efficient implementation; and determines minimum service cost versus user network size. Included is a schedule of prospective launch vehicle costs expressed in 1976 dollars.

SATELLITE/EARTH STATION TECHNOLOGY

ADDENDUM

Crombie, D.D. "Direct Satellite Communications," Lowering Barriers To Telecommunications Growth, Washington: U.S. Department of Commerce, Office of Telecommunications, Nov. 1976.

A discussion of spectrum and orbit resource limitations and the effects they may have on the public service sector's ability to obtain telecommunications services sufficient to meet its needs. Economic and technical conditions generally favorable to the public service sector are specified.

"Japan extends Technology Program," Aviation Week & Space Technology, Oct. 17, 1978: 104-108.

A sketch of the probable course Japanese communications entities will follow in implementing a domestic communications satellite system. Although it is clear that they intend to establish a multiple-satellite broadcast/communications capability in the 1980's, it appears that they will defer a decision on spacecraft characteristics and operating frequencies until data collected from the first two satellites, which will operate at 20/30GHz and 30/35GHz, respectively, have been evaluated.

Posner, E.C. Information and Communication in the Third Millennium, Pasadena, CA: Jet Propulsion Laboratory, July 24, 1978.

Amplification of a talk given at the Communications Society Communication Theory Workshop held in April 1978. It is predicted that point-to-point satellite trunking will become outmoded, guided waves, especially optic fibers, taking over heavy traffic routes. The same optic fiber networks are expected to impact commercial broadcasting, first class postal delivery, and newspaper publishing. Finally, it is proposed that satellites will not become passé; they will serve as the primary instrument of a burgeoning mobile communications market.

SATELLITE/EARTH STATION TECHNOLOGY

ADDENDUM

"Satellite Communications Advancing Without Federal Development Funds, But National Lead Will Not Be Sustained Long, Survey Respondents Say," Telecommunications Reports, vol. 44, no. 30, July 31, 1978: 43-45.

The results of an Office of Science & Technology Policy survey on the federal role in satellite communication research and development. Fearing that private R&D will not sustain U.S. technological leadership, especially in the area of satellite ground terminals, beyond the next few years, respondents maintained that government should undertake to develop advanced technology that is too risky for private industry. Needed variously, they said, were new infrastructure, greater channel capacity, lower circuit cost, and in some cases, operations at 20/30GHz, multiple spot beams, multiple accessing, and satellite-to-satellite relay by laser link.

STATISTICS

American Hospital Association Guide to Health Care Field, Chicago: American Hospital Association, 1978.

An alphabetical listing by state and city of approximately 7000 hospitals in the United States. Shown for each entry are number of beds, number of admissions, number of employees, percent occupancy, and payroll expenses.

Area Economic Projections 1990, Washington: U.S. Department of Commerce - Social and Economics Statistics Administration, Bureau of Economic Analysis, 1975.

The document provides projections of personal income, employment, and population in 1980 and 1990 for 426 geographic areas which cover the nation and for another 226 areas which represent different groupings of the 426. Historical data for selected years back to 1950 are also included.

The Budget of the United States Government - Fiscal Year 1979, Appendix, Washington: Executive Office of the President, Office of Management and Budget, Jan. 1978.

The document contains detailed information on the various appropriations and funds that comprise the budget. Included for each agency are the proposed text of appropriation language, budget schedules for each account, explanations of the work to be performed and the funds needed, proposed general provisions applicable to the appropriations of entire agencies or groups of agencies, and schedules of permanent positions.

City Employment in 1976, Washington: U.S. Department of Commerce - Bureau of the Census, July 1977.

The pamphlet provides municipal employment and payroll data by function, population size-group, and city of 50,000 population or more.

STATISTICS

City Government Finances in 1975-76, Washington: U.S. Department of Commerce - Bureau of the Census, Sept. 1977.

The pamphlet provides municipal revenue and expenditure data by population size-group and city of 50,000 population or more. Additional financial data is shown for the largest 48 cities.

Consumer Expenditure Patterns, vol. I: Food, Household Supplies, Personal and Health Care Products, New York: The Conference Board, 1978.

The first of two volumes showing how the American family spends its money. Covered in the present document are volume expenditures for food and related items, as well as housekeeping supplies, and personal and medical products. The findings were based on a survey conducted by the Bureau of Labor Statistics over a two-year period ending in mid-1974, updated in part by the authors to reflect the demographic characteristics that prevailed in 1977.

Governmental Finances in 1975-76, Washington: U.S. Department of Commerce - Bureau of the Census, Sept. 1977.

The pamphlet provides the gross balance sheet data of federal, state, and local government. Revenue data are further shown by state and source and expenditure data by state and function.

A Guide to Consumer Markets, 1977/1978, New York: The Conference Board, 1978.

A standard source of statistical information concerning the consumer - his demographic and social profile and his economic behavior. Areas covered include population, labor, and employment trends and characteristics; consumer income and expenditure patterns; and the production, distribution, prices, and price indexes of consumer goods and services. In several cases historical and projectional data are provided.

STATISTICS

The 1977 Dow Jones-Irwin Business Almanac, Homewood, IL: Dow Jones-Irwin, Jan. 1977.

The document is comprised of a series of articles and tables concerning regulatory and legal affairs, regional and population trends, and economic/business statistics.

The 1978 Fortune Double 500 Directory, Chicago: Time, Inc., 1978.

The document ranks by sales the 1000 largest industrial corporations and 50 largest retailing companies; by assets the 50 largest commercial banking, life insurance, and diversified financial companies, and utilities; and by operating revenues the 50 largest transportation companies.

Podolsky, A., and C.R. Smith, Education Directory, Colleges & Universities: 1977-78, Washington: National Center for Education Statistics, 1978.

The document provides a variety of statistical information on institutions of higher learning. Compiled is the number of such publicly and privately controlled institutions by state, sex of student body, calendar system, and accreditation. Also compiled is an alphebetical listing of same by state.

Statistical Abstract of the United States, Washington: U.S. Department of Commerce - Bureau of the Census, 1976, 1977.

The standard summary of statistics on the social, political, and economic organization of the United States. The data are compiled from many statistical publications, both public and private.

Statistical Reference Book, Data Entry/Data Communications Equipment, Waltham, MA: International Data Corp., July 1976.

A reference book providing growth statistics for data entry/data communications devices. The installed base for such devices is expected to grow at 20-25% annually through 1980.

STATISTICS

Statistics of Communications Common Carriers, Washington: Federal Communications Commission, 1975.

The document provides a variety of statistical information concerning telephones in place, telephone distribution, inside and outside plant, telephone calls and record messages, and common carrier revenues and expenditures. In most cases historical data are provided.

Statistics for States and Metropolitan Areas, Washington: U.S. Department of Commerce - Bureau of the Census, 1977.

The document provides a variety of statistical information for states, divisions, regions, and standard metropolitan statistical areas (SMSA). For each state, 195 statistical items are provided; comparable totals are shown for Census divisions and regions and the United States. For each SMSA, a corresponding selection of statistical items is shown.

The United States Budget In Brief - Fiscal Year 1979, Washington: Executive Office of the President, Office of Management and Budget, Jan. 1978.

The document provides a nontechnical overview of the 1979 U.S. Budget. Included are summary and historical tables on the federal budget and debt, together with graphic displays.

VALUE ADDED SERVICES

"AT&T is preparing national data net with easy access," Data Communications, Sept. 1977: 15-16.

The article describes the general architecture of AT&T's Advanced Communications System, noting that the system's basic components - No. 4 ESS switches, digital intercity transmission facilities - are currently available but in some other employ.

"AT&T Makes First Move in Advanced Communications Service Drama," EMMS, Aug. 1, 1978: 1-4.

A newsletter analysis of AT&T's Advanced Communications Service, whose first nodes may become operational as early as 1980. The service will handle code conversion, data editing and formatting, message switching, and incompatible terminal interfacing. By 1983, AT&T's request for rule-making states, ACS will generate revenues of $500 million annually. Noted in the analysis is the thorny issue of regulating hybrid services.

Communications Markets and Strategies, New York: Quantum Science Corp., 1977: Vol. II, 93-126.

The study outlines the services offered by five value added carriers - AT&T, Graphnet, ITT, Telenet, and Tymnet, It is proposed that packet switching, which is the principal means of data transfer of all five carriers, is the natural vehicle for electronic mail sources.

Criner, J.C. "VANS - Current Regulatory Issues," Telecommunications, July 1978.

The article, observing that the Communications Act of 1934 does not provide specific guidance for regulators of value added common carriers, recites the major instances of rule-making that have shaped the value added network environment. Principal issues have been resale/sharing, maximum separation of data processing functions from communications functions, and determination of a realistic boundary between monopoly and competition.

VALUE ADDED SERVICES

Gamble, R.B. "VAN Services in the U.S.," Telecommunications, July 1978: 49-54.

The article provides a roster of Value Added Networks which, as a whole, will reach billion dollar proportions during the 1980's. Descriptions of three types of VAN service are provided - terminal-to-computer, record message, and voice/data.

Hovey, R.B. "The user's role in connecting to a value added network," Data Communications, May/June 1974: 35-40.

A primer on packet-switching technology. Throughout, reference is made to the case of Telenet.

Johnson, T. "Projecting the future roles of packet-switching networks," Data Communications, July/Aug. 1976: 18-23.

The article sets forth a possible course of events for packet switching. Whereas to date only the boldest and most advanced users have transferred major applications to public packet-switching facilities, it is expected that within the next few years the population of terminals connected to packet-switching networks will include those installed in the home. The scenario, conceived in 1976, is not in accordance with observable fact as of this writing.

"A Look at Message/Packet Switching," Telecommunications, Jan. 1978: 44-52.

A synthesis of responses supplied by message-switching and packet-switching entities to questions regarding market strategy, technical innovation, market potential, etc.

Packet Data Communications, Gathersburg, MD: Future Systems Inc. (with Digital Communications Corp.), May 1977.

A two-volume report on packet data communications. The first volume covers packet-switching technology, the Telenet and ITT Com-Pak networks, access arrangements, interface options, pricing structures, and service applications. The second volume contains reprints of articles on the subject.

VALUE ADDED SERVICES

Packet Data Communications, Gathersburg, MD: Future Systems Inc. (with Digital Communications Corp.), June 1978.

An updated version of FSI's 1977 report on Packet Data Communications. Added to the earlier report are descriptions of several new packet-switching networks: Tymnet (United States), Datapac (Canada), and Transpac (France).

Roberts, L.G. "Development of Packet Switching Networks Worldwide, " Telecommunications, Oct. 1976.

The article, making the case for a public data communications network service, addresses the design of a public packet-switched network. The article concludes with examples of packet network services.

"Study Says Packet Switching Is Cheapest," Electronic News, Mar. 27, 1978: 27.

The article, setting forth the findings of a recent study of Department of Defense communications requirements, maintains that packet switching makes possible a less costly integration of voice and data operations than do either standard or hybrid circuit-switching arrangements. Determinative in selection were the observation of trends showing that the cost of computerized switching is decreasing faster than the cost of communications transmission, that digital transmission and multiplexing equipment are becoming less expensive than comparable analog gear, and that the practicable bit rate of voice digitization equipment is falling.

Value Added Network Services, Menlo Park, CA: INPUT, Dec. 1977.

The study, which forsees a $1 billion Value Added Network Service industry by 1982, identifies the services that may be provided on a VAN basis and the major potential providers of such services over the next five years. Although WU is currently the largest supplier of VAN services, it is expected that AT&T will become the dominant supplier when it introduces ACS. Although the availability

of SBS-type wideband facilities will substantially affect the growth of VAN services, it is expected that such availability will only benefit those users that are willing to put their communications networks through major changes.

White, C.E. "Packet Switching for Fast and Secure Data," Telecommunications, Jan. 1978: 33-38.

A catalog of current packet-switching applications and a review of recent technological developments, specifically dual service and packetized speech. The article concludes with a synopsis of future developments.

VIDEO

"Aetna tries using TV to cut travel costs," Business Week, Mar. 6, 1978: 34-36.

A news-release-type article describing Aetna Life and Casualty Co.'s role in Satellite Business System's Project Prelude. Ascertaining that its travel costs will increase 80 to 90% between 1975 and 1980, Aetna estimates that effective use of sophisticated communications, particularly video conferencing, could shave 10 to 25% of this total.

Baer, W.S. Cable Television in the United States--Revolution or Evolution?, Santa Monica, CA: The Rand Corporation, Feb. 1974.

A pre-satellite interpretation of events within the cable television industry. The paper identifies three principal advantages of cable over broadcast television: significantly more channels, restriction of a channel or a program to a specific audience, and two-way capability. The latter, the paper notes, may not generate much near-term interest, telephone lines, which can also provide a return path, being, obviously, in considerable supply.

Baran, P. Potential Market Demand for Two-Way Information Services to the Home: 1970-1990, Menlo Park, CA: The Institute for the Future, Dec. 1971.

A description of potential home information services which may be grouped into the following six major categories: education, business conducted from the home, general information access, shopping facilitation, entertainment, and person-to-person communications. Although the article does not give time and place, it can be presumed that direct-to-home satellite broadcasting in the U.S. will not progress beyond the embryonic stage before 1990, Japanese experiments to the contrary.

_____, "Broad-Band Interactive Communications Services to the Home: Part II - Impasse," IEEE Transactions on Communications, Jan. 1, 1975: 178-184.

An article exploring the impediments presently blocking the development of the potential

broad-band cable interactive services industry. Key parameters of an "ideal home terminal" are discussed. Circumvention of developmental roadblocks and design of an "ideal terminal" are seen most expeditiously accomplished through an industry-government "partnership" arrangement.

Bender, W.G., and P.D. Shapiro Outlook for the CATV Industry Through 1985, Cambridge, MA: Arthur D. Little Inc., Dec. 1976.

A primer on cable TV. Included are system and subscriber historical and prospective growth statistics; discussions of the future of pay cable, business, and interactive services; and descriptions of program supplies, major system operators, and cable TV events outside the United States. The authors predict that the basic cable subscriber population will grow by 1.0 to 1.4 million per year through 1985 and that pay cable will reach a penetration level of 35% by the same year.

Brown, D.M. "Video Conferencing - A Viable Alternative to Travel," Intelcom Conference Papers & Proceedings, Oct. 1977.

The paper discusses the evolution of video teleconferencing in Canada and points to probable near-term developments. Users of the first system (1972) found voice switching unreliable and unnatural; the central studio location inconvenient and, as some felt, less secure than home offices; the four-city network geographically inadequate; and projected costs prohibitively high. Bell Canada has since found other means of camera switching than voice activation; developed a transportable studio intended for customer premises origination/reception; connected Western Canada to the network by satellite; and engaged in research of video bandwidth compression utilizing digital processing techniques. To date the service has only been offered on a non-commercial basis.

Cable Television, Federal Communications Commission News Bulletin, May 1970.

A summary of rules and regulations governing cable television. Signal carriage, access

cablecasting, and copywrite payments are primary considerations. The bulletin, in conclusion, underlines the need for citizen participation in the regulatory process.

Chapanis, A. "Interactive Human Communication," Scientific American, Mar. 1975.

Experimental confirmation that problem-solving is almost as quickly accomplished with audio teleconferencing as it is with video + audio teleconferencing. This article has been further reviewed and supported in the SRI study, Teleconferencing Systems: A State-of-the-Art Survey and Preliminary Analysis.

Donnelly, W.J. The Emerging Video Environment, New York: Young & Rubicam, 1978.

A pamphlet forecasting the nature of the video environment of the early 1980's. It is projected that 30% of the homes using TV will be hooked up to cable by the end of 1981. 30% penetration, the prospectus goes on, is the critical mass required before an electronic communications medium can become a broad-based advertising medium. Once cable TV begins to attract advertising dollars, commercial broadcasters, of course, will become particularly anxious. The prospectus maintains, however, that advertising support will not fall off for broadcast television, which is designed to reach large market segments and significant customer blocks.

Erikson, A. "Digital TV: when, not if," Electronics, June 23, 1977: 94-95.

A status report on the digital television equipment manufacturing arena. By the mid-1980s, the report maintains, digital video processing will have become generally accepted. By that time, too, receivers with digital frame stores may be on the market.

VIDEO

Feldman, N.E. Interconnecting Cable Television Systems by Satellite - An Introduction to the Issues, Santa Monica, CA: The Rand Corporation, June 1973.

An early paper to anticipate the use of satellite systems in the process of distributing programming to the cable television community. Establishing that both pay television and two-way or interactive television are material to cable's future growth, the paper maintains that only the first arrangement, pay television, will be suited to satellite distribution.

Hough, R.W. and R.R. Panko, Teleconferencing Systems: A State-of-the-Art Survey and Preliminary Analysis, Menlo Park, CA: Stanford Research Institute, April 1977.

A general survey of recent studies conducted to evaluate user attitudes toward video teleconferencing. The studies reviewed support the position that public teleconferencing systems do not capture the imagination of potential users. Private, in-house systems accommodating frequent, regularly scheduled meetings seem to engender the most enthusiasm.

Impact of Wideband Channels, New Canaan, CN: International Resources Development Inc., Aug. 1977: 67-84, 100-113, 200-203.

A discussion, in part, of the various methods by which an illusion of "presence" can be introduced into video teleconferencing, to date a generally disappointing means of communication. Mention is made of SBS entry into the video teleconferencing market. It is indicated that video teleconferencing will form a low proportion of the SBS network loading.

"Informercials, Qubits and Quaint Facts about Qube," EMMS, vol. 2, no. 15, Aug. 1, 1978: 10-11.

A status report on Warner Cable's Qube, a two-way cable system being test marketed in Columbus, Oh. Underscored is the capability of Qube to measure audience response to advertized products and to tabulate television-viewer statistics.

VIDEO

Kahn, A., and Herb Nunnally, Communications in Lieu of Transportation, Baltimore: Westinghouse Electric Company, Feb. 1977.

A two-phased investigation of user attitudes toward video teleconferencing. The critical test of the teleconferencing concept, it was found, is user acceptance of the teleconferencing room. Preliminary results using the 12/14 GHz Communications Technology Satellite have been generally promising. There have been some problems, however, with voice-switched cameras.

Martin, J. Future Developments in Telecommunications, Englewood Cliffs, NJ: Prentice-Hall, Inc., 1977: Ch. 8.

A description of AT&T's Picturephone and Picturephone Meeting Service. Neither service has been successful commercially and it is presumed that a thoughtful examination of the psychology of the communications process would explain why. Mention is made of various means by which the bandwidth needed to transmit video signals between central offices can be reduced.

McNair, M.P., and E.G. May, "The next revolution of the retailing wheel," Harvard Business Review, Sept./Oct. 1978: 81-91.

Noting that the world of routinely purchased, staple, everyday merchandise is splitting off from the world of more specialized goods and services which involve an element of ego-enhancement, the authors purpose that consumers will eventually prefer to purchase the first type of good electronically, using the time saved to pursue other activities, including the purchase of goods of the second type. They observe, however, that the road to full implementation is not smooth. A practicable delivery system must be developed; a sufficiently large volume of transactions at start-up must be assured, justifying the significant capital expenditure; and consumers must be convinced that the spector of government scrutiny is illusory.

VIDEO

Potter, J.G. Emerging Markets for Satellite Data Communications in the Public Service, San Diego, CA: Public Service Satellite Consortium, Jan. 1978.

> The paper estimates the volume of traffic that would be turned over to satellite in 1982 by six major sectors of the public service community. Video applications, mostly one-way, are likely to predominate.

Pye, R., and E. Williams, "Teleconferencing: is video valuable or audio adequate?," Telecommunications Policy, June 1977: 230-241.

> The article identifies four factors that are expected to influence the success of a teleconferencing system. Cost considerations, which are a primary factor, generally favor the implementation of an audio conferencing system in those cases where either an audio or video means of communication has been chosen to replace travel. The article concludes that audio is adequate and video is not valuable.

"Rethinking Teleconferencing: On Raising a Cripple From the Dead," EMMS, vol. 2, no. 14, July 17, 1978: 1-6.

> An assessment of findings made public by SBS following user appraisal of its video teleconferencing services during Project Prelude. The article holds that SBS's failure to evaluate the interchangeability of audio and video teleconferencing alternatives has caused it to prejudge the viability of business video.

"Satellites: tomorrow is here today," Broadcasting, March 27, 1978.

> A review of broadcasting entities that have entrusted their communications requirements to the satellite carriers. One industry observer finds that satellites "are the next logical step in communications" and that developments such as direct-to-home satellite service may be only "10 to 15 years down" the road.

Shales, T. "Television in the '80s," The Washington Post, June 18, 1978.

Speculations, some serious, some not, on what television will be like in the 1980s by ten sources standing at various points in the television industry spectrum. None of the ten entries is particularly informative. In beginning remarks, however, the survey's editor indicates that what really happens will depend on the health of the economy and the degree to which the broadcasting industry allows change to occur.

"Southern Satellite's Taylor: It's Rolling Like Gang Buster," The Media Report, July 31, 1978: 2.

Results of a survey conducted by Southern Satellite Systems to gauge the growth of satellite services delivered to the cable television community. It is expected that the number of satellite channels will increase threefold over the next four years, pay TV channels clearly the headliners over the next two.

Taylor, J.P., "'Two-way' pay-cable system automates many functions, including monitoring audience," Television/Radio Age, July 8, 1974.

An examination of Coaxial Communications Inc.'s simplified two-way pay-cable system in Columbus, Oh. The article proposes that two-way cable services will become available on a step-by-step basis, the first service, ostensibly two-way pay cable, providing a base for the next service, the two then providing a base for the next, and so on. It is expected that alarm and metering, shopping, and polling services will be early adjuncts to the two-way pay cable base.

_____, "Satellite distribution of TV programming explodes on many fronts," Television/Radio Age, Jan. 30, 1978.

The first in a series of five articles that look into the possibility of the satellite as a vehicle for video program distribution. The article catalogs the

programmers that currently avail themselves of satellite distribution, indicating that they, rather than the major commercial networks, were expected to take the back seat when it came to pioneering the use of satellites. The article, in conclusion, poses the question "How will past and prospective satellite developments affect the broadcast industry?" and suggests that a suitable answer may evolve out of the remaining four articles of the series.

_____, "New flexibility in programming envisioned resulting from upsurge in satellite distribution," Television/Radio Age, Feb. 27, 1978.

The second in a series of five articles that look into the possibility of the satellite as a vehicle for video program distribution. The article weighs the liklihood that the broadcasting industry will implement a satellite distribution capability. It is proposed that the affiliates rather than the networks will start the ball rolling, the former keen on the flexibility of multiple program pickup and the increased independence that come with owning an earth station. Without some affiliate commitment to satellite transmission, it is presumed that an audience level acceptable to national advertisers will not obtain. The future of satellite video distribution is therefore closely tied to what the affiliates do and they, in turn, by what the outriders of satellite video distribution, the PBS's and the CBN's and the SIN's, do.

_____, "'Space shortage', regulations, equipment choice among station concerns as satellite use grows," Television/Radio Age, May 8, 1978.

The third in a series of five articles that look into the possibility of the satellite as a vehicle for video program distribution. The article suggests that the number of C-band and, eventually, of K-band transponders that would be available to network broadcasters in first and second generation commercial satellites would fall short of the number required to accommodate the full complement of network

programming, barring video channel compression. Orbital crowding, the need for full backup on secondary satellites, the predictable failure of in-orbit transponders - all would frustrate any effort on the part of network broadcasters to "go satellite" in the near future.

_____, "Satellites of the '80s will have more channels, power, frequency - but no dramatic changes," Television/Radio Age, June 5, 1978.

The fourth in a series of five articles that look into the possibility of the satellite as a vehicle for video program distribution. The article examines second- and third-generation satellite systems, which will become operational in the 1980s, inquiring particularly into their usefulness as video carriers. With the launch of the second-generation satellites, the article maintains, there should be enough orbiting channels to meet all reasonable video requirements. The article does not see direct-to-the-home broadcasting, launch of satellites by the television networks, or utilization of the 18/30 GHz band for video distribution as probable events.

_____, "Satellite systems of the 1990's will operate from huge platforms orbiting in space," Television/Radio Age, July 3, 1978.

The fifth in a series of five articles that look into the possibility of the satellite as a vehicle for video program distribution. The article considers the basic characteristics of third- and fourth-generation domsats, which will be flying in the 1990's. It is anticipated that these satellites will be fitted for on-board processing, which is more appropriate to highly sophisticated switched communications networks than to broadcast and cable television operations. Television entities may, however, benefit from the headlong charge of technology; third- and fourth-generation satellites will be higher powered, offsetting some degradation from multiple-channel transmission and facilitating remote pickups.

VIDEO

Television Factbook: Services Volume, No. 47, Washington: Television Digest, Inc., 1978.

A compilation of radio, broadcast television, and cable television historical data. Included are station revenues and expenses, sets in use, stations and CATV systems in operation, and market ranking.

Ten-Year Video Business Plan: 1978-1987, in-house document, Dec. 1977.

A plan analyzing Western Union ten-year business opportunities in four broad video submarkets-network distribution, occasional use, CATV distribution, and business video. Included in the plan are an overview of the competitive environment, design of a ground-and-space video distribution network, an analysis of cost and investment elements, and an estimation of revenue potential through 1987.

"Three networks bide their time on satellites," Broadcasting, Mar. 27, 1978.

A sampling of major network attitudes toward satellite distribution of their day-to-day TV and radio programming. All three major networks are adopting a "wait and see" posture, wary, for one thing, of a curtailment by AT&T of some of its occasional services, leaving what could become a dangerous lack of backup, and, for another, of the effects of sunspots on transmission.

Veith, R. Talk-Back TV: Two-Way Cable Television, Tab Books, Oct. 1976.

A lengthy discussion of two-way cable services. The author predicts that pay TV will lead the way to a two-way communications environment. Alarm monitoring, limited channel polling, and at-home shopping are considered the most likely two-way services to take hold in the near future. There will be a rivalry, the discussion maintains, between cable TV companies and telephone companies for two-way service franchises.

VIDEO

Waters, H.F. "TV of Tomorrow," Newsweek, July 3, 1978: 62-74.

A popularized prospectus of second-generation television. The general movement toward "narrowcasting", possible responses of the network television/television set industry to cable TV inroads, the shape cable TV itself may take, and the uneasiness of some viewers to a new technology that may alter leisure habits and social arrangements are the article's principal considerations.

Williams, E., and S. Holloway, The Evaluation of Teleconferencing: Report of a Bell Canada Conference Television System, London: Communications Study Group, 1974.

The results of a survey of user attitudes toward the Bell Canada four-city teleconferencing system. Respondents indicated that teleconferencing emphasized the work-oriented aspects of meetings to the detriment of the more inter-personal, socially-oriented aspects. Those who showed a reluctance to traveling long distances felt that teleconferencing was suitable for a wider range of tasks than those who didn't. Contrary to the reported findings of D.M. Brown, the present authors found that attitudes were not effected by the proximity of the teleconferencing studio to respondent premises.

Wilmotte, R.M. Technological Boundaries of Television: Vol. I - Findings and Recommendations, Springfield, VA: National Technical Information Service, Dec. 1974.

A report, prepared for the FCC, seeking to determine what may reasonably be expected of television technology within the next decade. Noteworthy among the new developments are large, flat screens displaying high resolution pictures for home viewing; bandwidth compression; and sub-carrier transmission of still pictures. Addressing grade of transmission, the report found that for entertainment quality was paramount; for other purposes quality was of little value beyond the point of ease of identifying certain elements of the picture.

VIDEO

Zaputowycz, R.Z. SMPTE Study Group on Digital TV Meeting, in-house memorandum, Mar. 29, 1977.

A review of subjects discussed in meeting by the SMPTE Study Group on Digital TV. Top on the meeting agenda was consideration of various means of bandwidth compression. Those means intended for video teleconferencing, it is noted, presently suffer from motion breakup.

_____, Digital TV Bandwidth Compression Study, in-house document, May 11, 1977.

A consuming analysis of various analog and digital techniques by which satellite transponders can accommodate more than one TV program. General characteristics of the two techniques are cataloged. Although analog compression techniques are more easily and inexpensively implemented than digital compression techniques, they are, by comparison, relatively inefficient. The study concludes, with a projected schedule of digital TV developments as a function of time.

_____, The Ninth Meeting of the Digital TV Study Group, in-house memorandum, Feb. 26, 1978.

A review of subjects discussed in meeting by the SMPTE Study Group on Digital TV. The major networks, the review notes, will not make use of digital transmission services until network quality digital throughput standards have been tariffed and their analog studios have been outfitted digitally, the latter occurring only after their analog equipment has been fully depreciated. Another major user of satellite video services, the CATV industry, will also shy away from digital transmission, the funds needed to retrofit CATV headends to accommodate digital transmission being beyond the reach of most CATV operators.

VIDEO

Viewdata and Its Potential Impact in the USA, Interim Report - The UK Experience, New York: Link (in association with Butler Cox & Partners Limited, London), Aug. 1978.

The report describes early experiences in the United Kingdom with Viewdata, an interactive service whose physical components are television sets, the telephone system, and a network of computer bases. The report also considers the likely success of Viewdata in the marketplace, looking first at the domestic market in the UK; next at the business market; third at the pressures acting in and between the Post Office, television set manufacturers, and information providers; and finally at the international market.

VOICE - ANALOG

"FDC Analysis - Sensitivity Studies," WATS Response Filing, American Telephone & Telegraph Co., Apr. 29, 1977: vol. 50.

Five sets of sensitivity studies performed on WATS data compiled for the 12-month period ended September 30, 1976. Revenue, investment, market, traffic, and division-of-revenue data are provided in the document.

"GTE chariman predicts world's telephones to double in 10 years," Telephony, Oct. 31, 1977: 47.

Estimates of telephone populations in 1987. In the United States the number of telephones will grow at a 4.6% annual rate, increasing from 149 million to 234 million; in Canada at 7.2% annually from 13 million to 24 million; in Europe at 7.9% annually from 132 million to 282 million; and, overall, at 6.2% annually from 380 million to 736 million.

"Independent Telcos Point to Gains and Pitfalls," Communications News, Dec. 1977: 86-87.

The article provides telephone statistics - operating revenues, and numbers of telephones, operating companies, and operating company employees - for the years 1966 through 1976. Separate counts are shown for Bell and the Independents. Independent telephone placements and operating revenues have grown at a faster rate than have Bell's counterparts over the eleven year period.

"Market Analyses - Inward and Outward WATS," AT&T 1977 Annual FDC-7 Report, American Telephone & Telegraph Co., June 30, 1978: vol. 2.

The study discusses the sources and procedures used to develop historical (1977) and projectional (1978-1980) market data for Inward and Outward WATS. The study also considers the accuracy of earlier projections, comparing the 1976 view of 1977 and the actual demand experienced in 1977.

VOICE - ANALOG

"Market Analyses - Inward and Outward WATS," AT&T Docket No. 18128 Response, Central Submission, American Telephone & Telegraph Co., July 8 1977, vol. 7.

The study discusses the sources and procedures used to develop historical and projectional market data for Inward and Outward WATS. Under consideration are revenues; number of access lines, messages, and minutes; and weekday and weekend percentages. The volume of Outward WATS traffic is at least twice the volume of Inward WATS traffic.

"Market Analyses - MTS Domestic," AT&T 1977 Annual FDC-7 Report, American Telephone & Telegraph Co., June 30, 1978: vol. 10.

The study provides historical (1975-1977) and projectional (1978-1980) traffic and revenue data for Bell's domestic Message Telecommunications Service (MTS), detailing the method by which the projectional data are derived. The study also considers the accuracy of earlier projections, comparing the 1976 view of 1977 and the actual demand experienced in 1977.

"Market Analyses - MTS Domestic and MTS Overseas/International," AT&T Docket No. 18128 Response, Central Submission, American Telephone & Telegraph Co., July 8, 1977: vol. 16.

The study discusses the forecasting of domestic and non-domestic interstate MTS traffic and revenues. Under consideration are the forecasting methodology used, the development of the MTS message forecasts provided for Docket 18128, and the sources of data relevant to the forecasting process.

"Market Analyses - Private Line Telephone Channels and Telpak," AT&T 1977 Annual FDC-7 Report, American Telephone & Telegraph Co., June 30, 1978: vol. 4.

The study provides historical (1977) and projectional (1978-1980) traffic and revenue data for Bell's Series 2000/3000, 4000, 5100, 5200/5300, 5400, and 8000 (voice only) private line offerings. Traffic data are expressed as total channel sections and channel miles per air band.

VOICE - DIGITAL

McDonald, J.C. "Local Digital Switching - A Successful New Technology," Telecommunications, Jan. 1978: 69-72.

Digital networks are now being planned where voice is digitized at the subscriber drop and is transmitted in digital form to and through the serving central office. As required, the local central office will extend the digital signal over a digital toll trunk to the digital toll switch and on to the intertoll network. The use of digital networks will allow telcos to implement end-to-end digital transmission and switching to improve subscriber service at a lower first cost and lower recurring costs.

Occhiogrosso, B. "Digitized voice comes of age, part 1 - trade-offs," Data Communications, Mar. 1978: 45-51.

The article, underlining the inevitability of digital voice communications, outlines the principal advantages of such transmission - voice/data integration, less degradation, secure communications, reduced bandwidth, and compatibility with computers. Voice quality, voice digitization rates, and equipment costs - all trade-off factors when choosing between analog and digital voice communications - are also discussed.

Sergo, J.R. "An Independent carefully plans the switch to digital equipment," Telephony, Mar. 13, 1978: 26-28.

An independent telephone company examines the approach for introducing digital switching and transmission networks on a district by district basis. The plan is presented from the viewpoint of general application considerations and restrictions with the rationale that it may apply to both this individual company and other operating groups. Even though the plan outlines advantages and disadvantages, the author makes the point that digital switching is here to stay and the growth rate will rapidly establish the service concept nationally.

VOICE - DIGITAL

White, C.E. "Bits of Voice," Telecommunications, Apr. 1978: 46-48.

Although the article describes a new telecommunications voice multiplexer/concentrator for use with private line voice systems, the author delves into the controlling factors, trends, both present and future plus benefits of introducing digital transmission techniques. The economics of in-plant investment within the overall industry is described as the largest deterrent for replacing analog facilities with digital and therefore will inhibit the expansion of digital voice communication systems in the U.S. and Canada.

Yeh, L.P. "Digital Telecommunications Networks," Telecommunications, Aug. 1977: 21-25.

A review of the major advantages and disadvantages of digital techniques and of the causes of bit error rates. The basic configuration of a digital network is described. It is conjectured, however, the the implementation of such networks will be gradual; there is, understandably, an unwillingness to write off the plethora of existing analog networks.

APPENDIX B

MARKET DEMAND FORECASTS

The Appendix contains the detailed forecasts of telecommunications services traffic volumes for the period 1978-2000 for the voice and data service categories. The traffic volumes are displayed in the two units of measure, thousands of half voice circuits and terabits of data per year. In each computer run, six key time periods are presented - 1978, 1980, 1985, 1990, 1995 and 2000, in order to show the long term traffic trends.

For each services' traffic forecast a projection is shown for the:

- Baseline Forecast
- Impacted Baseline - Expected Case
- Intrastate Traffic
- Intra SMSA Traffic
- Inter SMSA Traffic less than 40 Miles
- Data Traffic Carried on Voice Facilities
- Net Long Haul Traffic - after removal of traffic to the hinterlands

The discussion of each of these intermediate forecasts and their purpose can be found in Task 2.A, Section 3, methodology, of Volume II.

SERVICE DEMAND ASSESSMENT

Baseline Forecast

Voice Category

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	777.0000	991.0000	1373.0000	2093.0000	3133.0000	4606.0000
WTS (PUBLIC)	511.0000	615.0000	958.0000	1453.0000	2164.0000	3120.0000
WTS (BUSINESS)	410.7000	502.0000	873.0000	1551.0000	2816.0000	5100.0000
RADIO PROGRAM TRANSMISSION		1.0000	6.0000	7.0000	7.0000	8.0000
MOBILE RADIO TELEPHONE	5.0000	7.0000	21.0000	37.0000	57.0000	90.0000
TOTAL ALL APPLICATIONS	1703.7000	2026.0000	3231.0000	5141.0000	8157.0000	12912.0000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate Traffic Only)

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	777.0000	903.7000	1408.1000	2191.8000	3305.4000	4857.4000
WTS (PUBLIC)	511.0000	615.0000	973.5000	1533.3000	2321.1000	3492.5000
WTS (BUSINESS)	410.7000	503.5000	896.1000	1625.2000	2959.6000	5360.1000
RADIO PROGRAM TRANSMISSION		1.0000	6.0000	7.0000	7.0000	8.0000
MOBILE RADIO TELEPHONE	5.0000	7.0000	23.2000	43.5000	67.0000	94.0000
TOTAL ALL APPLICATIONS	1703.7000	2030.2000	3306.9000	5400.7000	8660.1000	13812.0000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate Traffic Only)

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	777.0000	902.9000	1396.6000	2159.0000	3248.1000	4773.1000
WTS (PUBLIC)	511.0000	615.0000	965.7000	1503.2000	2262.5000	3371.5000
WTS (BUSINESS)	410.7000	503.0000	885.9000	1595.3000	2909.7000	5253.2000
RADIO PROGRAM TRANSMISSION		1.1000	6.6000	7.6000	7.6000	8.6000
MOBILE RADIO TELEPHONE	5.0000	7.0000	22.5000	41.2000	53.7000	89.2000
TOTAL ALL APPLICATIONS	1703.7000	2028.9000	3277.3000	5306.2000	8482.6000	13495.7000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate Traffic Only)

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	777.0000	905.5000	1428.5000	2247.8000	3398.4000	4993.9000
WTS (PUBLIC)	511.0000	615.0000	981.1000	1566.6000	2390.2000	3631.3000
WTS (BUSINESS)	410.7000	504.5000	907.4000	1671.6000	3048.7000	5521.2000
RADIO PROGRAM TRANSMISSION		1.0000	6.0000	7.0000	7.0000	8.0000
MOBILE RADIO TELEPHONE	5.0000	7.0000	24.1000	45.9000	70.9000	99.4000
TOTAL ALL APPLICATIONS	1703.7000	2033.1000	3347.0000	5538.9000	8915.2000	14253.8000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Intrastate Traffic Only)

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1979	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	297.7000	346.2000	539.5000	839.7000	1266.4000	1861.0000
WTS (PUBLIC)	347.8000	418.6000	662.6000	1043.7000	1579.9000	2337.2000
WTS (BUSINESS)	220.8000	273.8000	453.5000	765.1000	1337.4000	2321.0000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE						
TOTAL ALL APPLICATIONS	866.3000	1038.6000	1655.6000	2648.5000	4183.7000	6559.2000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Intrastate Traffic Only)

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	297.7000	345.9000	515.1000	827.2000	1244.4000	1826.7000
WTS (PUBLIC)	347.8000	419.6000	657.3000	1023.2000	1540.0000	2294.9300
WTS (BUSINESS)	220.8000	273.5000	449.4000	751.0000	1110.8300	2274.7000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE						
TOTAL ALL APPLICATIONS	866.3000	1038.0000	1641.8000	2601.4000	4095.2000	6398.3000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Intrastate Traffic Only)

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	297.7000	346.9000	547.3000	861.2000	1302.0000	1913.3000
WTS (PUBLIC)	347.8000	418.6000	567.8000	1066.3000	1626.9000	2471.7000
WTS (BUSINESS)	220.8000	274.3000	460.3000	786.9000	1377.7000	2330.9000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE						
TOTAL ALL APPLICATIONS	866.3000	1039.9000	1675.4000	2714.4000	4306.6000	6715.8000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate and Intrastate Traffic)

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1983	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1074.7000	1249.9000	1947.6000	3031.5000	4571.8000	6718.4000
WTS (PUBLIC)	858.8000	1033.6000	1636.1000	2577.0000	3901.9000	5869.7000
WTS (BUSINESS)	631.5000	777.3000	1347.6000	2390.3000	4297.0000	7681.1000
RADIO PROGRAM TRANSMISSION		1.0000	6.0000	7.0000	7.0000	8.0000
MOBILE RADIO TELEPHONE	5.0000	7.0000	23.2000	43.5000	67.0000	94.0000
TOTAL ALL APPLICATIONS	2570.0000	3068.8000	4960.5000	8049.3000	12843.8000	20371.2000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate and Intrastate Traffic)

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1376.7000	1748.7000	1931.7000	2986.2000	4692.5000	6601.8000
WTS (PUBLIC)	858.8000	1033.6000	1673.0000	2526.6000	3802.5000	5666.6000
WTS (BUSINESS)	631.5000	776.5000	1335.3000	2346.3000	4211.5000	7527.9000
RADIO PROGRAM TRANSMISSION		1.1000	6.6000	7.6000	7.6000	8.6000
MOBILE RADIO TELEPHONE	5.0000	7.0000	22.5000	41.2000	63.7000	89.2000
TOTAL ALL APPLICATIONS	2570.0000	3066.9000	4919.1000	7907.7000	12577.9000	19893.3000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

(Interstate and Intrastate Traffic)

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1074.7000	1252.4000	1975.8000	3109.0000	4700.4300	6907.2300
WTS (PUBLIC)	858.8000	1033.6000	1648.9000	2632.9000	4017.1000	6103.0000
WTS (BUSINESS)	631.5000	778.8000	1367.7000	2458.5000	4426.5000	7912.0000
RADIO PROGRAM TRANSMISSION		1.0000	6.0000	7.0000	7.0000	8.0000
MOBILE RADIO TELEPHONE	5.0000	7.0000	24.1000	45.4000	70.9030	99.4000
TOTAL ALL APPLICATIONS	2570.0000	3072.8000	5022.5000	8253.3000	13221.8000	21029.6000

SERVICE DEMAND ASSESSMENT

Balance After Removal of

IntraSMSA Traffic

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1029.5000	1186.9000	1849.3000	2878.5000	4341.1000	6379.3000
WTS (PUBLIC)	803.6000	966.9000	1530.5000	2410.6000	3647.2000	5490.8000
WTS (BUSINESS)	596.6000	731.6000	1270.8000	2258.3000	4063.0000	7272.2000
RADIO PROGRAM TRANSMISSION		1.0000	5.0000	6.0000	6.0000	7.0000
MOBILE RADIO TELEPHONE	4.0000	6.0000	22.7000	42.6000	65.7000	92.1000
TOTAL ALL APPLICATIONS	2423.4000	2893.3000	4677.2000	7596.0000	12126.0000	19247.2000

SERVICE DEMAND ASSESSMENT

Balance After Removal of

IntraSMSA Traffic

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1020.5000	1185.7000	1834.2000	2835.5000	4265.9000	6268.6000
WTS (PUBLIC)	803.4000	966.9000	1518.3000	2363.3000	3557.1000	5300.6000
WTS (BUSINESS)	594.6000	730.9000	1259.1000	2216.8000	3983.1000	7127.2000
RADIO PROGRAM TRANSMISSION		1.1000	6.5000	7.4000	7.4000	8.4000
MOBILE RADIO TELEPHONE	4.9000	6.9000	22.1000	40.4000	62.4000	87.4000
TOTAL ALL APPLICATIONS	2423.4000	2891.5000	4640.2000	7463.4000	11875.8000	18792.2000

SERVICE DEMAND ASSESSMENT

Balance After Removal of

IntraSMSA Traffic

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	1020.5000	1199.2000	1876.1000	2957.1000	4663.2000	6554.6000
WTS (PUBLIC)	893.4000	966.9000	1542.5000	2463.0000	3757.8000	5799.1000
WTS (BUSINESS)	594.6000	733.0000	1289.7000	2322.8000	4186.3000	7499.9000
RADIO PROGRAM TRANSMISSION		1.0000	5.0000	6.0000	6.0000	7.0000
MOBILE RADIO TELEPHONE	4.9000	6.9000	23.6000	45.0000	69.5000	97.4000
TOTAL ALL APPLICATIONS	2473.4000	2897.0000	4737.8000	7789.8000	12683.7000	19863.2000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA

Traffic of Less than 40 Miles

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	984.4000	1144.9000	1784.0000	2776.9000	4187.7000	6154.0000
WTS (PUBLIC)	775.0000	932.7000	1476.5000	2325.5000	3520.3000	5296.9000
WTS (BUSINESS)	573.6000	705.8000	1225.9000	2178.6000	3920.4000	7015.3000
RADIO PROGRAM TRANSMISSION		0.9000	5.7000	6.6000	6.6000	7.6000
MOBILE RADIO TELEPHONE	4.7000	6.6000	21.9000	41.1000	63.3000	98.9000
TOTAL ALL APPLICATIONS	2337.7000	2790.9000	4514.0000	7328.7000	11598.3000	18562.7000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA

Traffic of Less than 40 Miles

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1979	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	994.6000	1161.8000	1766.4000	2735.3000	4115.1000	6047.2000
WTS (PUBLIC)	775.0000	932.7000	1464.6300	2270.8000	3421.4000	5113.6000
WTS (BUSINESS)	573.6000	735.1000	1216.7000	2138.5000	3962.6000	6825.6000
RADIO PROGRAM TRANSMISSION		1.0000	6.2000	7.7000	7.2000	8.1000
MOBILE RADIO TELEPHONE	4.7000	5.6000	21.1000	38.9000	60.2000	94.1000
TOTAL ALL APPLICATIONS	2347.7000	2780.2300	4477.2000	7190.7000	11656.1000	18128.6000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA

Traffic of Less than 40 Miles

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	984.4000	1147.2000	1809.8000	2847.8000	4305.6000	6327.0000
WTS (PUBLIC)	775.0000	932.7000	1488.0000	2376.0000	3625.1000	5507.4000
WTS (BUSINESS)	573.6000	703.2000	1244.1000	2240.7000	4038.5000	7226.2000
RADIO PROGRAM TRANSMISSION		3.2000	5.7000	7.6000	6.6000	3.6000
MOBILE RADIO TELEPHONE	4.7000	6.6000	22.8000	43.4000	77.0000	94.3000
TOTAL ALL APPLICATIONS	2337.7000	2794.6000	4570.4000	7514.5000	12052.8000	19162.2000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Data Traffic

Carried on Voice Facilities

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1979	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	911.4000	1051.5000	1593.9000	2416.9000	3689.6000	5568.0000
MTS (PUBLIC)	775.0000	932.7000	1486.5000	2325.5000	3520.3000	5287.9000
MTS (BUSINESS)	531.1000	648.1000	1035.3000	1896.1000	3454.1000	6347.3000
RADIO PROGRAM TRANSMISSION		0.9000	5.7000	6.6000	6.6000	7.6000
MOBILE RADIO TELEPHONE	6.7000	6.6000	21.9000	41.1000	63.3000	98.9000
TOTAL ALL APPLICATIONS	2222.2000	2639.9000	4193.3000	6686.2000	10734.3000	17309.7000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Data Traffic

Carried on Voice Facilities

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	911.4000	1050.3000	1587.5000	2404.8000	3661.6000	5513.1000
WTS (PUBLIC)	775.0000	932.7000	1464.6000	2279.8000	3491.4000	5113.4000
WTS (BUSINESS)	531.1000	647.8000	1089.8000	1880.1000	3419.0000	6248.2000
RADIO PROGRAM TRANSMISSION		1.0000	6.2000	7.2000	7.2000	8.1000
MOBILE RADIO TELEPHONE	4.7000	6.6000	21.3000	38.9000	60.2000	94.3000
TOTAL ALL APPLICATIONS	2222.2000	2638.0000	4169.4000	6610.8000	10579.4000	16997.1000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Data Traffic

Carried on Voice Facilities

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	911.4000	1052.6000	1608.1000	2445.3000	3746.5000	5666.7000
WTS (PUBLIC)	775.0000	932.7000	1488.0000	2376.0000	3625.1000	5507.6000
WTS (BUSINESS)	531.1000	648.8000	1105.5000	1924.0000	3514.1000	6472.1000
RADIO PROGRAM TRANSMISSION		0.9000	5.7000	6.6000	6.6000	7.6000
MOBILE RADIO TELEPHONE	4.7000	6.6000	22.8000	43.4000	67.0000	94.0000
TOTAL ALL APPLICATIONS	7222.7000	7641.6000	4230.1000	6795.3000	10959.3000	17747.8000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic

(Balance After Removal of Hinterland Traffic)

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	765.6000	883.2000	1338.9000	2030.2000	3000.2000	4677.1000
MTS (PUBLIC)	573.5000	690.2000	1092.6000	1720.9000	2505.0000	3919.2000
MTS (BUSINESS)	424.8000	518.5000	876.2000	1516.9000	2263.3000	3577.9000
RADIO PROGRAM TRANSMISSION		5.9000	5.7000	6.4000	6.6000	7.4000
MOBILE RADIO TELEPHONE	4.7000	6.6000	21.9000	41.1000	63.3000	88.9000
TOTAL ALL APPLICATIONS	1768.6000	2099.4000	3335.3000	5315.7000	8537.4000	13271.1000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic

(Balance After Removal of Hinterland Traffic)

Voice Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	765.6000	892.7000	1333.5000	2020.9000	3075.7000	4631.0000
WTS (PUBLIC)	573.5000	690.2000	1083.8000	1687.1000	2539.3000	3783.9000
WTS (BUSINESS)	426.8000	518.2000	871.8000	1504.1000	2735.2000	5014.6000
RADIO PROGRAM TRANSMISSION		1.0000	6.2000	7.2000	7.2000	8.1000
MOBILE RADIO TELEPHONE	4.7000	6.6000	21.3000	38.9000	60.2000	94.3000
TOTAL ALL APPLICATIONS	1768.6000	2098.7000	3316.6000	5257.3000	8417.6000	13531.9000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic

(Balance After Removal of Hinterland Traffic)

Voice Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	765.6000	896.2000	1350.8000	2054.1000	3147.1000	4760.8000
WTS (PUBLIC)	573.5000	699.2000	1101.1000	1758.2000	2682.6000	4075.5000
WTS (BUSINESS)	426.8000	519.0000	886.4000	1539.2000	2811.3000	5177.7000
RADIO PROGRAM TRANSMISSION		0.2000	5.7000	6.4000	6.6000	7.4000
MOBILE RADIO TELEPHONE	4.7000	6.6000	22.8000	43.4000	67.0000	94.0000
TOTAL ALL APPLICATIONS	1768.6000	2100.9000	3366.8000	5401.3000	8714.6000	14114.8000

SERVICE DEMAND ASSESSMENT

Baseline Forecast

Data Category

(Terabits per Year)

	1977	1978	1979	1980	1981	1982	1983	1984
DATA TRANSMISSION APPLICATIONS								
HIGH SPEED/WIDE BAND								
DATA TRANSFER								
NON-GOVERNMENT	124.4	151.1	177.7	204.4	255.2	326.1	386.9	447.6
GOVERNMENT	116.0	134.6	153.3	171.9	206.7	241.4	276.2	311.9
BATCH PROCESSING								
NON-GOVERNMENT	154.9	181.8	208.7	235.6	279.2	322.8	366.4	410.0
GOVERNMENT	8.7	10.2	11.7	13.2	15.7	18.1	20.6	23.0
DATA ENTRY (HIGH SPEED)								
NON-GOVERNMENT	65.5	78.6	91.8	104.9	131.9	158.9	186.0	213.0
GOVERNMENT	14.3	16.6	18.9	21.2	25.5	29.8	34.2	38.5
TOTAL HIGH-SPEED/WIDE BAND	483.8	572.8	662.1	751.2	924.2	1097.1	1270.1	1443.4
LOW SPEED/MEDIUM SPEED								
DATA ENTRY	39.5	45.3	51.2	57.0	68.7	74.4	83.0	91.7
REMOTE JOB ENTRY								
NON-GOVERNMENT	144.8	168.0	191.3	214.5	260.7	280.9	323.0	365.1
GOVERNMENT	22.0	25.2	28.5	31.7	38.5	41.4	47.8	54.1
TOTAL LOW SPEED/MEDIUM SPEED	207.3	238.6	270.0	303.2	367.9	396.7	453.7	510.9
INTERACTIVE TRANSMISSION								
INQUIRY/RESPONSE	119.3	148.3	177.2	206.2	267.5	328.9	388.3	451.5
PRIVATE TIME SHARING	10.6	12.7	14.9	17.0	20.7	24.5	28.9	33.0
COMMERCIAL TIME SHARING	42.9	51.5	60.1	68.7	83.4	98.9	116.1	132.2
TOTAL INTERACTIVE	172.8	212.5	252.2	291.9	372.1	452.3	533.3	616.6
PACKET SWITCHING	5.4	7.6	9.7	11.7	15.6	21.0	27.1	33.3
TOTAL DATA TRANSMISSION	869.3	1031.6	1194.0	1358.2	1665.0	1973.6	2281.4	2589.1
ELECTRONIC MAIL APPLICATIONS								
[illegible] ACCESS MECHANISM								
ADMINISTRATIVE MESSAGE TRAFFIC								
NON-GOVERNMENT	72.7	87.3	101.9	116.4	144.2	172.0	199.7	227.5
GOVERNMENT	17.4	20.4	23.5	26.5	31.4	37.2	42.5	47.4
OPERATIONAL FACSIMILE	2.0	3.0	5.0	6.0	8.5	11.5	14.2	17.0
COMMUNICATING WORD PROCESSOR	1.7	2.5	3.4	4.2	5.5	6.7	11.5	12.5
CONVENIENCE FACSIMILE	30.9	34.5	38.2	41.7	47.9	49.7	51.2	52.7
VALIDATION SERVICES	0.7	1.0	1.4	1.8	2.0	1.7	1.8	1.8
TOTAL [illegible] ACCESS	124.9	148.9	173.5	196.9	239.5	278.8	321.7	364.1
OTHER ACCESS MEANS								
TWX AND TELEX	1.5	1.5	1.7	1.5	1.7	0.7	0.1	0.0
POSTAL AND SPECIAL	0.2	0.2	0.2	0.2	0.1	0.0	0.0	0.0
[illegible] MAIL						0.3	0.3	0.3
TOTAL OTHER ACCESS	1.7	1.8	1.9	2.0	2.2	1.0	0.4	0.3
TOTAL ELECTRONIC MAIL	126.6	144.1	158.1	198.9	241.5	279.8	322.7	364.1
VIDEO TEX APPLICATIONS								
[illegible] TV	15.5	31.4	35.9	40.1	49.8	74.4	[illegible]	124.7
DATA ENTRY/DATA TRANSFER	12.3	14.1	20.2	26.2	31.8	33.3	[illegible]	[illegible]
TOTAL VIDEO TEX	31.8	44.2	56.1	66.3	81.6	107.8	147.2	172.2
MISCELLANEOUS APPLICATIONS								
[illegible]	42.8	45.5	47.1	50.7	58.2	67.7	81.1	[illegible]
SECURE VOICE					5.0	11.4	33.5	47.2
MONITORING SERVICES								
TOTAL MISCELLANEOUS	42.8	45.5	47.1	50.7	63.2	79.1	[illegible]	[illegible]
TOTAL ALL APPLICATIONS	1069.0	1265.2	1457.3	1666.6	2052.3	2539.0	3127.2	3711.2

SERVICE DEMAND ASSESSMENT

Baseline Forecast

Data Category

(Terabits per Year)

	1985	1986	1987	1988	1989	1990	1991	1992
[illegible]								
[illegible]								
[illegible]	508.5	580.5	700.5	891.7	1072.7	1213.7	1553.2	1[illegible]5.7
[illegible]	348.7	415.6	498.5	555.5	625.9	695.9	826.0	9[illegible].7
[illegible]								
[illegible]	653.6	720.0	795.6	842.9	950.3	935.7	963.1	1099.5
[illegible]	35.5	39.9	39.1	38.3	42.6	45.9	54.1	61.2
[illegible]								
[illegible]	249.0	301.9	359.6	425.5	487.9	549.1	693.5	831.9
[illegible]	47.5	60.0	61.3	70.7	80.1	93.5	109.2	124.3
[illegible]	1511.9	1779.9	2341.7	2784.5	3057.4	3439.2	4131.1	4952.0
[illegible]								
[illegible]								
[illegible]	108.4	119.9	129.0	141.7	155.5	169.3	190.0	210.6
[illegible]								
[illegible]	395.9	455.5	515.4	576.1	636.3	696.5	792.0	887.5
[illegible]	55.9	63.5	71.3	78.2	86.6	93.3	105.8	117.3
[illegible]	551.4	637.3	715.8	795.8	878.5	959.2	1087.8	1215.4
[illegible]								
[illegible]	617.0	695.1	777.9	859.3	1041.4	1173.5	1451.4	1733.3
[illegible]	35.9	43.5	51.4	59.2	67.1	74.9	90.0	105.2
[illegible]	133.3	173.5	202.7	231.3	251.1	290.3	388.0	327.7
[illegible]	699.0	862.1	1031.3	1200.4	1359.6	1538.7	1887.4	2236.2
[illegible]	55.2	51.1	55.7	60.4	95.5	110.5	155.4	201.2
TOTAL DATA TRANSMISSION	**2805.9**	**3525.9**	**4153.9**	**4792.5**	**5411.0**	**6039.6**	**7322.2**	**8604.7**
[illegible]								
[illegible]								
[illegible]	355.3	415.7	477.1	537.9	598.9	559.7	682.9	806.0
[illegible]	69.2	83.1	99.3	82.9	92.5	102.5	119.9	137.0
[illegible]	10.9	20.3	19.2	27.5	59.0	47.5	95.3	123.1
[illegible]	15.5	21.9	28.3	34.5	41.0	47.9	61.5	75.6
[illegible]	59.1	71.0	79.7	87.5	95.9	103.2	111.5	119.8
[illegible]	13.7	17.0	20.2	23.5	26.7	30.0	37.1	38.3
[illegible]	521.5	610.9	617.1	719.9	812.6	910.9	1108.1	1305.9
[illegible]								
[illegible]	2.3	2.4	2.5	2.6	2.7	2.8	3.0	3.1
[illegible]	0.5	0.6	0.7	0.9	1.0	1.1	1.2	1.4
[illegible]	650.0	751.1	872.1	983.2	1099.2	1205.3	1230.4	1255.5
TOTAL DATA ACCESS	**652.8**	**754.1**	**875.4**	**986.6**	**1097.9**	**1209.2**	**1234.6**	**1260.0**
TOTAL TERRESTRIAL WIRE	**1079.4**	**1283.9**	**1492.5**	**1701.5**	**1910.6**	**2119.4**	**2342.7**	**2565.8**
[illegible]								
[illegible]	131.4	170.5	209.6	248.8	287.9	327.0	424.3	521.7
DATA ENTRY/DATA TRANSFER	68.1	85.3	100.5	115.8	130.1	140.3	178.2	221.5
TOTAL EDDT/DDT	**199.5**	**254.9**	**310.2**	**364.6**	**420.9**	**476.3**	**602.2**	**742.2**
[illegible]								
[illegible]	64.0	77.6	77.2	91.7	45.3	99.0	100.7	110.5
SECURE VOICE	62.6	81.2	99.9	118.5	137.2	155.8	202.2	248.5
[illegible]						0.1	0.2	0.3
TOTAL MISCELLANEOUS	**130.6**	**158.9**	**177.0**	**200.3**	**223.5**	**254.8**	**303.0**	**359.3**
TOTAL ALL APPLICATIONS	**5301.3**	**6217.5**	**6133.7**	**7050.9**	**7955.0**	**8992.3**	**10577.1**	**12271.9**

SERVICE DEMAND ASSESSMENT

Baseline Forecast

Data Category

(Terabits per Year)

	1993	1994	1995	1996	1997	1998	1999	2000
DATA TRANSMISSION APPLICATIONS								
HIGH SPEED/WIDE BAND								
DATA TRANSFER								
NON-GOVERNMENT	2223.3	2559.8	2905.3	3600.4	4502.4	5305.5	6105.5	[illegible]
GOVERNMENT	1091.3	1219.0	1336.7	1556.2	1785.9	2015.2	2240.9	2465.4
BATCH PROCESSING								
NON-GOVERNMENT	1218.0	1345.4	1472.8	1674.6	1876.4	2078.2	2280.0	2481.8
GOVERNMENT	68.4	75.5	82.7	94.0	105.4	116.7	128.1	139.4
DATA ENTRY (HIGH SPEED)								
NON-GOVERNMENT	973.2	1115.7	1256.1	1579.6	1903.1	2226.7	2550.2	2873.7
GOVERNMENT	148.6	166.3	188.0	225.4	270.7	312.1	353.4	395.1
TOTAL HIGH SPEED/WIDE BAND	5712.8	6473.7	7234.6	8841.2	10447.8	12054.5	13661.1	15267.7
LOW SPEED/MEDIUM SPEED								
DATA ENTRY	231.3	251.0	272.5	302.0	331.2	360.7	390.0	419.4
REMOTE JOB ENTRY								
NON-GOVERNMENT	982.0	1073.4	1173.8	1317.1	1460.4	1603.8	1747.1	[illegible]
GOVERNMENT	127.5	140.2	151.8	168.2	184.5	200.9	217.2	233.6
TOTAL LOW SPEED/MEDIUM SPEED	1343.0	1470.6	1598.2	1787.2	1976.3	2165.3	2354.4	2543.4
INTERACTIVE TRANSMISSION								
INQUIRY/RESPONSE	2013.1	2262.0	2572.9	3139.1	3705.4	4271.6	4837.9	5404.1
PRIVATE TIME SHARING	120.3	135.5	150.6	178.5	206.4	234.2	262.1	290.0
COMMERCIAL TIME SHARING	451.1	505.2	558.0	653.1	747.2	841.4	935.5	1029.7
TOTAL INTERACTIVE	2584.9	2902.7	3282.4	3970.7	4659.0	5347.2	6035.5	6723.8
PACKET SWITCHING	246.5	291.2	337.2	475.5	613.9	752.2	890.5	1029.0
TOTAL DATA TRANSMISSION	9887.3	11159.1	12452.4	15076.7	17697.0	20319.3	22941.6	25563.9
ELECTRONIC MAIL APPLICATIONS								
RESTRICTED ACCESS NETWORKS								
ADMINISTRATIVE MESSAGE TRAFF								
NON-GOVERNMENT	925.2	1052.3	1175.5	1413.3	1651.1	1888.8	2126.5	2364.4
GOVERNMENT	154.3	171.5	188.8	217.6	246.4	275.2	304.0	332.8
OPERATIONAL FACSIMILE	150.8	175.6	201.2	291.0	375.6	460.3	544.9	629.6
COMMUNICATING WORD PROCESSOR	80.7	103.5	117.9	148.3	178.7	209.0	239.4	269.8
CONVENIENCE FACSIMILE	125.1	135.4	144.7	152.7	160.7	168.7	176.7	184.7
MAILBOX SERVICES	51.4	53.5	55.7	81.4	97.1	112.7	128.4	144.1
TOTAL RESTRICTED ACCESS	1503.5	1701.2	1893.9	2304.2	2709.5	3114.8	3520.1	3925.4
OPEN ACCESS NETWORKS								
TWX AND TELEX	3.3	3.4	3.5	3.8	4.0	4.2	4.4	4.6
MAILGRAM AND TELEGRAM	1.5	1.7	1.8	2.0	2.2	2.5	2.7	2.9
USPS E-COM	1280.5	1305.6	1330.7	1355.6	1385.1	1413.9	1441.6	1469.2
TOTAL OPEN ACCESS	1285.3	1310.7	1336.1	1364.2	1392.4	1420.5	1448.7	1476.8
TOTAL ELECTRONIC MAIL	2788.8	3011.9	3235.0	3668.4	4101.9	4535.3	4968.8	5402.2
EFTS POS/APPLICATIONS								
INQUIRY/RESPONSE	619.0	716.4	813.7	1055.9	1298.1	1540.3	1782.5	2024.7
DATA ENTRY/DATA TRANSFER	256.1	291.7	327.3	405.4	483.4	561.5	639.5	717.6
TOTAL EFTS/POS	875.1	1008.1	1141.0	1461.3	1781.5	2101.8	2422.0	2742.3
MISCELLANEOUS APPLICATIONS								
SPECIAL PURPOSE FACSIMILE	120.3	130.1	139.9	155.0	170.0	185.4	200.1	215.2
SECURE VOICE	294.9	341.2	387.6	487.4	587.2	687.1	785.9	886.7
MONITORING SERVICES	0.3	0.4	0.5	1.0	1.5	2.0	2.4	2.9
TOTAL MISCELLANEOUS	415.5	471.8	528.0	643.4	758.7	874.1	989.4	1104.6
TOTAL ALL APPLICATIONS	13955.8	15651.6	17356.4	20947.0	24339.1	27930.5	31321.8	34913.2

SERVICE DEMAND ASSESSMENT

Impacted Baseline

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	151.1000	204.4000	549.7000	1504.4000	3674.4000	8221.1000
GOVERNMENT	134.6000	171.9000	371.6000	847.9000	1659.3000	3057.0000
BATCH PROCESSING						
NON-GOVERNMENT	175.4000	227.3000	473.2000	999.9000	1803.6000	3057.5000
GOVERNMENT	16.6000	21.5000	44.4000	92.6000	165.9000	279.4000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	78.6000	104.9000	259.5000	680.9000	1594.0000	3668.5000
GOVERNMENT	16.6000	21.2000	45.8000	109.3000	233.6000	490.4000
TOTAL HIGH SPEED/WIDE BAND	572.9000	751.2000	1744.2000	4235.0000	9130.7000	19373.9000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	45.3000	57.6000	109.7000	200.5000	328.1000	507.9000
REMOTE JOB ENTRY						
NON-GOVERNMENT	168.0000	215.8000	428.6000	831.6000	1414.6000	2278.2000
GOVERNMENT	25.2000	31.9000	60.5000	112.1000	182.3000	280.6000
TOTAL LOW SPEED/MEDIUM SPEED	238.5000	305.2000	598.8000	1144.2000	1925.0000	3066.7000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	133.5000	187.9000	526.9000	1303.9000	2864.8000	6114.8000
GOVERNMENT	14.8000	20.8000	58.4000	113.4000	248.6000	424.8000
PRIVATE TIME SHARING	12.7000	17.2000	39.1000	86.5000	174.1000	335.5000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	46.3000	62.7000	145.8000	311.0000	599.9000	1105.1000
GOVERNMENT	5.2000	7.0000	16.2000	34.6000	66.7000	122.8000
TOTAL INTERACTIVE	212.5000	295.6000	786.4000	1849.4000	3954.0000	8103.0000
PACKET SWITCHING	7.6000	11.9000	36.2000	110.5000	337.2000	1029.0000
TOTAL DATA TRANSMISSION	1031.5000	1364.0000	3165.6000	7339.1000	15347.0000	31572.6000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	87.3000	117.6000	297.1000	716.9000	1550.1000	3180.4000
GOVERNMENT	20.4000	26.6000	57.5000	119.5000	222.4000	391.9000
OPERATIONAL FACSIMILE	3.9000	6.1000	22.7000	92.4000	288.7000	886.3000
COMMUNICATING WORD PROCESSOR	2.5000	4.3000	19.1000	67.9000	172.2000	398.0000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	20.9000	27.7000	58.7000	99.8000	141.1000	186.6000
GOVERNMENT	3.7000	4.9000	10.2000	17.5000	24.8000	25.3000
MAILBOX SERVICES	3.6000	5.4000	16.3000	38.4000	85.1000	188.4000
TOTAL RESTRICTED ACCESS	142.3000	192.5000	481.5000	1152.5000	2484.5000	5256.9000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.6000	1.8000	2.2000	2.7000	3.5000	4.5000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.1000	1.8000	2.9000
USPS EMSS						
NON-GOVERNMENT			587.9000	1109.9000	1209.9000	1309.3000
GOVERNMENT			51.2000	96.5000	105.3000	114.0000
TOTAL OPEN ACCESS	1.8000	2.0000	641.9000	1210.2000	1320.5000	1430.6000
TOTAL ELECTRONIC MAIL	144.1000	194.5000	1123.4000	2362.7000	3804.9000	6687.5000
EFTS/POS/APPLICATIONS						
INQUIRY/RESPONSE	27.4000	43.7000	155.3000	395.2000	983.4000	2446.9000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	14.1000	21.7000	70.2000	161.8000	356.4000	781.5000
GOVERNMENT	2.5000	3.8000	12.1000	27.9000	61.4000	134.4000
TOTAL EFTS/POS	44.0000	69.2000	237.6000	584.8000	1401.2000	3362.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	34.1000	38.1000	54.4000	87.3000	137.8000	234.6000
GOVERNMENT	11.4000	12.7000	18.2000	21.9000	34.4000	32.0000
SECURE VOICE			62.5000	164.0000	411.7000	941.8000
MONITORING SERVICES				0.1000	0.5000	2.9000
TOTAL MISCELLANEOUS	45.5000	50.8000	135.1000	273.3000	584.3000	1211.3000
TOTAL ALL APPLICATIONS	1265.1000	1678.5000	4661.7000	10559.9000	21137.9000	42834.2000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

Data Category - Low Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	151.1000	204.4000	532.8000	1369.4000	3294.1000	7884.5000
GOVERNMENT	134.6000	163.3000	343.2000	735.9000	1419.6000	2615.3000
BATCH PROCESSING						
NON-GOVERNMENT	175.4000	227.3000	457.1000	900.1000	1595.1000	2695.9000
GOVERNMENT	16.6000	22.6000	45.4000	89.1000	157.5000	265.5000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	78.6000	104.9000	250.7000	613.1000	1410.3000	3236.1000
GOVERNMENT	16.6000	22.3000	46.6000	104.5000	219.9000	461.7000
TOTAL HIGH SPEED/WIDE BAND	572.9000	744.7000	1675.8000	3812.0000	8096.6000	17159.0000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	45.3000	57.3000	106.4000	189.3000	306.5000	473.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	168.0000	215.4000	413.8000	756.9000	1275.6000	2054.2000
GOVERNMENT	25.2000	31.2000	55.4000	96.7000	155.7000	239.5000
TOTAL LOW SPEED/MEDIUM SPEED	238.5000	302.9000	575.6000	1042.9000	1737.7000	2766.7000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	133.5000	186.9000	499.6000	1207.6000	2647.8000	5651.3000
GOVERNMENT	14.8000	20.7000	55.3000	104.8000	229.5000	392.2000
PRIVATE TIME SHARING	12.7000	17.1000	37.8000	81.8000	164.5000	316.9000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	46.3000	62.3000	139.1000	289.8000	558.0000	1028.2000
GOVERNMENT	5.2000	7.0000	15.4000	32.3000	62.2000	114.8000
TOTAL INTERACTIVE	212.5000	294.1000	747.2000	1716.3000	3662.0000	7503.3000
PACKET SWITCHING	7.6000	11.9000	36.2000	110.5000	337.2000	1029.0000
TOTAL DATA TRANSMISSION	1031.5000	1353.6000	3034.8000	6681.6000	13833.5000	28458.0000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	87.3000	117.1000	278.8000	637.6000	1355.0000	2758.1000
GOVERNMENT	20.4000	25.2000	52.7000	105.0000	193.3000	340.8000
OPERATIONAL FACSIMILE	3.9000	6.1000	21.3000	77.7000	237.7000	727.7000
COMMUNICATING WORD PROCESSOR	2.5000	4.2000	17.3000	56.7000	142.0000	326.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	20.9000	27.4000	56.6000	93.9000	131.7000	174.2000
GOVERNMENT	3.7000	4.9000	10.1000	16.8000	23.5000	24.0000
MAILBOX SERVICES	3.6000	5.4000	15.2000	34.6000	76.2000	168.1000
TOTAL RESTRICTED ACCESS	142.3000	190.2000	452.0000	1022.2000	2159.5000	4519.7000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.6000	1.8000	2.1000	2.6000	3.4000	4.4000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.1000	1.8000	2.9000
USPS EMSS						
NON-GOVERNMENT			570.7000	1054.9000	1150.7000	1255.5000
GOVERNMENT			49.4000	91.3000	99.7000	108.8000
TOTAL OPEN ACCESS	1.8000	2.0000	622.7000	1150.0000	1255.6000	1371.7000
TOTAL ELECTRONIC MAIL	144.1000	192.2000	1074.7000	2172.2000	3415.1000	5891.4000
EEIS POS/APPLICATIONS						
INQUIRY/RESPONSE	27.4000	43.5000	149.0000	378.1000	940.8000	2340.8000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	14.1000	21.5000	65.8000	146.9000	322.2000	706.5000
GOVERNMENT	2.5000	3.8000	11.5000	25.5000	55.7000	122.2000
TOTAL EEIS/POS	44.0000	68.8000	226.3000	550.6000	1318.7000	3169.5000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	34.1000	38.1000	52.3000	77.1000	119.5000	202.5000
GOVERNMENT	11.4000	12.7000	17.3000	19.1000	29.5000	27.5000
SECURE VOICE			60.4000	149.2000	371.0000	848.6000
MONITORING SERVICES				0.1000	0.5000	2.9000
TOTAL MISCELLANEOUS	45.5000	50.8000	130.0000	245.6000	520.5000	1081.5000
TOTAL ALL APPLICATIONS	1265.1000	1665.5000	4465.8000	9649.9000	19087.9000	38600.4000

SERVICE DEMAND ASSESSMENT

Impacted Baseline

Data Category - High Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	[illegible].1000	204.4000	563.4000	1628.5000	4014.3000	9637.1000
GOVERNMENT	[illegible].6000	149.1000	411.5000	989.1000	1939.6000	3573.5000
BATCH PROCESSING						
NON-GOVERNMENT	175.4000	227.3000	480.5000	1044.8000	1888.3000	3201.1000
GOVERNMENT	16.6000	21.5000	45.2000	97.1000	174.4000	293.9000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	78.6000	104.9000	263.5000	711.7000	1669.7000	3842.7000
GOVERNMENT	16.6000	23.3000	50.9000	125.0000	267.4000	561.5000
TOTAL HIGH SPEED/WIDE BAND	572.9000	770.5000	1820.9000	4596.2000	9953.7000	21109.8000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	45.3000	57.9000	117.4000	232.8000	383.7000	593.8000
REMOTE JOB ENTRY						
NON-GOVERNMENT	168.0000	216.6000	446.9000	900.6000	1535.0000	2472.1000
GOVERNMENT	25.2000	35.2000	69.1000	132.4000	215.4000	331.5000
TOTAL LOW SPEED/MEDIUM SPEED	238.5000	309.7000	633.3000	1265.9000	2134.0000	3397.4000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	133.5000	189.3000	564.6000	1465.8000	3226.9000	6887.4000
GOVERNMENT	14.8000	21.0000	62.6000	127.5000	280.3000	479.0000
PRIVATE TIME SHARING	12.7000	17.3000	41.2000	95.4000	192.6000	371.0000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	46.3000	62.9000	152.3000	341.0000	659.1000	1214.3000
GOVERNMENT	5.2000	7.0000	16.9000	38.0000	73.7000	135.8000
TOTAL INTERACTIVE	212.5000	297.6000	837.6000	2067.7000	4432.5000	9087.5000
PACKET SWITCHING	7.6000	11.9000	36.2000	110.5000	337.2000	1026.0000
TOTAL DATA TRANSMISSION	1031.5000	1389.7000	3328.0000	8040.2000	16857.4000	34623.6000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	87.3000	118.3000	319.1000	820.3000	1784.0000	3674.4000
GOVERNMENT	20.4000	29.3000	66.2000	146.1000	272.3000	476.8000
OPERATIONAL FACSIMILE	3.9000	6.2000	23.5000	98.3000	307.0000	942.5000
COMMUNICATING WORD PROCESSOR	2.5000	4.3000	20.1000	76.3000	194.6000	451.6000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	20.9000	27.9000	62.3000	115.1000	163.3000	215.8000
GOVERNMENT	3.7000	5.0000	11.1000	20.7000	29.2000	29.7000
MAILBOX SERVICES	3.6000	5.4000	16.9000	42.5000	94.8000	211.0000
TOTAL RESTRICTED ACCESS	142.3000	196.2000	519.1000	1319.2000	2845.3000	6004.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.6300	1.8000	2.4000	3.2000	4.0000	5.0000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.1000	1.8000	2.9000
USPS EMSS						
NON-GOVERNMENT			622.8000	1267.9000	1382.2000	1489.7000
GOVERNMENT			53.9000	109.6000	119.7000	129.0000
TOTAL OPEN ACCESS	1.8000	2.0000	679.6000	1381.8000	1507.7000	1626.6000
TOTAL ELECTRONIC MAIL	144.1000	198.2000	1198.7000	2701.0000	4353.0000	7631.4000
EFIS/EDS/APPLICATIONS						
INQUIRY/RESPONSE	27.4000	44.0000	170.2000	466.4000	1165.2000	2899.2000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	14.1000	21.9000	76.1000	185.5000	410.2000	899.5000
GOVERNMENT	2.5000	3.9000	13.4000	32.6000	72.2000	158.2000
TOTAL EFIS/EDS	44.0000	69.8000	259.7000	684.5000	1647.6000	3956.9000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	34.1000	38.1000	58.2000	101.0000	159.2000	270.7000
GOVERNMENT	11.4000	12.7000	18.4000	22.8000	35.8000	33.4000
SECURE VOICE			63.9000	175.0000	440.3000	1007.4000
MONITORING SERVICES				0.1000	0.5000	2.9000
TOTAL MISCELLANEOUS	45.5000	50.8000	140.5000	298.9000	635.9000	1314.4000
TOTAL ALL APPLICATIONS	1265.1000	1708.5000	4926.9000	11724.7000	23493.9000	47526.4000

SERVICE DEMAND ASSESSMENT

Balance After Removal of IntraSMSA Traffic

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	136.0000	194.3000	494.7000	1354.0000	3307.0000	7939.0000
GOVERNMENT	121.1000	154.7000	334.4000	763.1000	1493.4000	2751.1000
BATCH PROCESSING						
NON-GOVERNMENT	140.3000	181.8000	378.6000	799.9000	1442.9000	2446.0000
GOVERNMENT	13.3000	17.2000	35.5000	74.1000	132.7000	223.5000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	59.0000	78.7000	194.6000	510.7000	1195.5000	2751.4000
GOVERNMENT	12.5000	15.9000	34.4000	82.0000	175.2000	367.8000
TOTAL HIGH SPEED/WIDE BAND	482.2000	632.3000	1472.2000	3583.8000	7746.7000	16479.0000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	34.0000	43.2000	82.3000	150.4000	246.1000	380.9000
REMOTE JOB ENTRY						
NON-GOVERNMENT	134.4000	172.6000	342.9000	665.3000	1131.7000	1827.6000
GOVERNMENT	20.2000	25.5000	48.4000	89.7000	145.8000	224.5000
TOTAL LOW SPEED/MEDIUM SPEED	188.6000	241.3000	473.6000	905.4000	1523.6000	2428.0000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	93.5000	131.5000	368.8000	912.7000	2005.4000	4280.4000
GOVERNMENT	10.4000	14.6000	40.9000	79.4000	174.0000	297.4000
PRIVATE TIME SHARING	9.5000	12.9000	29.3000	64.9000	130.6000	251.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.5000	25.1000	58.3000	124.4000	240.0000	442.3000
GOVERNMENT	2.1000	2.8000	6.5000	13.8000	26.7000	49.1000
TOTAL INTERACTIVE	134.0000	186.9000	503.8000	1195.2000	2576.7000	5320.5000
PACKET SWITCHING	7.2000	11.3000	34.4000	105.0000	320.3000	977.6000
TOTAL DATA TRANSMISSION	812.0000	1071.8000	2484.0000	5789.4000	12167.3000	25205.1000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	61.1000	82.3000	208.0000	501.8000	1085.1000	2226.3000
GOVERNMENT	14.3000	18.6000	40.3000	83.7000	155.7000	274.3000
OPERATIONAL FACSIMILE	3.7000	5.8000	21.6000	87.8000	274.3000	842.2000
COMMUNICATING WORD PROCESSOR	2.3000	3.9000	17.2000	61.1000	155.0000	358.2000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.9000	26.3000	55.8000	94.8000	134.0000	177.3000
GOVERNMENT	3.5000	4.7000	9.7000	16.6000	23.6000	24.0000
MAILBOX SERVICES	3.4000	5.1000	15.5000	36.5000	80.8000	179.0000
TOTAL RESTRICTED ACCESS	108.2000	146.7000	368.1000	882.3000	1908.5000	4081.1000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.5000	1.7000	2.1000	2.6000	3.3000	4.3000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.8000
USPS EMSS						
NON-GOVERNMENT			587.9000	1109.9000	1709.9000	1309.3000
GOVERNMENT			51.2000	96.5000	105.3000	114.0000
TOTAL OPEN ACCESS	1.7000	1.9000	641.7000	1210.0000	1820.2000	1430.4000
TOTAL ELECTRONIC MAIL	109.9000	148.6000	1009.8000	2092.3000	3728.7000	5511.5000
EEIS POS/APPLICATIONS						
INQUIRY/RESPONSE	8.2000	13.1000	46.6000	118.6000	295.0000	734.1000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.6000	14.3000	52.7000	121.6000	267.3000	584.1000
GOVERNMENT	1.9000	2.9000	9.1000	20.9000	46.1000	100.8000
TOTAL EEIS/POS	20.7000	32.3000	108.4000	260.9000	608.4000	1421.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	32.4000	36.2000	51.7000	82.9000	130.9000	222.9000
GOVERNMENT	10.8000	12.1000	17.3000	20.8000	32.7000	30.4000
SECURE VOICE			56.3000	147.6000	370.5000	847.6000
MONITORING SERVICES				0.1000	0.3000	1.5000
TOTAL MISCELLANEOUS	43.2000	48.3000	125.3000	251.4000	534.4000	1102.4000
TOTAL ALL APPLICATIONS	985.8000	1301.0000	3727.5000	8394.0000	16538.8000	33240.0000

SERVICE DEMAND ASSESSMENT

Balance After Removal of IntraSMSA Traffic

Data Category - Low Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	136.0000	184.0000	479.5000	1232.5000	2964.7000	7096.1000
GOVERNMENT	121.1000	147.0000	308.9000	667.3000	1277.6000	2353.8000
BATCH PROCESSING						
NON-GOVERNMENT	140.3000	181.8000	365.7000	720.1000	1276.1000	2156.7000
GOVERNMENT	13.3000	18.1000	36.3000	71.3000	126.0000	212.6000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	59.0000	78.7000	188.0000	459.3000	1057.7000	2427.1000
GOVERNMENT	12.5000	16.7000	35.0000	78.4000	164.8000	346.3000
TOTAL HIGH SPEED/WIDE BAND	482.2000	626.3000	1413.4000	3224.4000	6867.0000	14592.4000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	34.0000	43.0000	79.8000	142.9000	229.9000	354.8000
REMOTE JOB ENTRY						
NON-GOVERNMENT	134.4000	172.3000	331.0000	605.5000	1020.5000	1643.4000
GOVERNMENT	20.2000	24.2000	44.3000	77.4000	124.6000	191.4000
TOTAL LOW SPEED/MEDIUM SPEED	188.6000	239.5000	455.1000	824.9000	1375.0000	2189.8000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	93.5000	130.8000	349.7000	845.3000	1853.5000	3955.9000
GOVERNMENT	10.4000	14.5000	38.7000	73.4000	160.7000	274.5000
PRIVATE TIME SHARING	9.5000	12.8000	28.4000	61.4000	123.4000	237.7000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.5000	24.9000	55.6000	115.9000	223.2000	411.3000
GOVERNMENT	2.1000	2.8000	6.2000	12.9000	24.9000	45.9000
TOTAL INTERACTIVE	134.0000	185.8000	478.6000	1108.9000	2385.7000	4925.3000
PACKET SWITCHING	7.2000	11.3000	34.4000	105.0000	320.3000	977.6000
TOTAL DATA TRANSMISSION	812.0000	1062.9000	2381.5000	5263.2000	10948.0000	22685.1000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	61.1000	82.0000	195.2000	446.3000	948.5000	1930.7000
GOVERNMENT	14.3000	17.6000	36.9000	73.5000	135.3000	238.6000
OPERATIONAL FACSIMILE	3.7000	5.8000	20.2000	73.8000	225.8000	691.3000
COMMUNICATING WORD PROCESSOR	2.3000	3.8000	15.6000	51.0000	127.8000	294.2000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.9000	26.0000	53.8000	89.2000	125.1000	165.5000
GOVERNMENT	3.5000	4.7000	9.6000	16.0000	22.3000	22.8000
MAILBOX SERVICES	3.4000	5.1000	14.4000	32.9000	72.4000	159.7000
TOTAL RESTRICTED ACCESS	108.2000	145.0000	345.7000	782.7000	1657.2000	3502.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.5000	1.7000	2.0000	2.5000	3.2000	4.2000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.8000
USPS EMSS						
NON-GOVERNMENT			570.7000	1054.9000	1150.7000	1255.5000
GOVERNMENT			49.4000	91.3000	99.7000	108.8000
TOTAL OPEN ACCESS	1.7000	1.9000	627.6000	1149.7000	1255.3000	1371.3000
TOTAL ELECTRONIC MAIL	109.9000	146.9000	968.3000	1932.4000	2912.5000	4874.1000
EFTS, POS/APPLICATIONS						
INQUIRY/RESPONSE	8.2000	13.1000	44.7000	113.4000	282.2000	702.2000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.6000	16.1000	49.4000	110.2000	241.7000	529.9000
GOVERNMENT	1.9000	2.9000	8.6000	19.1000	41.8000	91.7000
TOTAL EFTS/POS	20.7000	32.1000	102.7000	242.7000	565.7000	1323.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	32.4000	36.2000	49.7000	73.2000	113.5000	192.4000
GOVERNMENT	10.8000	12.1000	16.4000	18.1000	28.9000	26.1000
SECURE VOICE			54.4000	134.3000	353.9000	763.7000
MONITORING SERVICES				0.1000	0.3000	1.5000
TOTAL MISCELLANEOUS	43.2000	48.3000	120.5000	225.7000	475.7000	983.7000
TOTAL ALL APPLICATIONS	985.8000	1290.2000	3573.0000	7664.0000	14901.9000	29866.7000

SERVICE DEMAND ASSESSMENT

Balance After Removal of IntraSMSA Traffic

Data Category - High Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	136.2000	184.0000	507.1000	1465.7000	3612.9000	8673.6000
GOVERNMENT	121.1000	170.2000	375.8000	890.2000	1745.6000	3216.2000
BATCH PROCESSING						
NON-GOVERNMENT	140.3000	181.8000	384.4000	835.8000	1510.6000	2560.9000
GOVERNMENT	13.3000	17.2000	36.2000	77.7000	139.5000	235.1000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	59.0000	78.7000	197.6000	533.8000	1252.3000	2882.0000
GOVERNMENT	12.5000	17.5000	38.2000	93.8000	200.6000	421.1000
TOTAL HIGH SPEED/WIDE BAND	482.2000	649.4000	1539.3000	3897.0000	8461.5000	17988.7000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY						
REMOTE JOB ENTRY	34.0000	43.4000	88.1000	174.6000	287.9000	445.4000
NON-GOVERNMENT	134.4000	173.3000	357.5000	720.5000	1228.0000	1977.7000
GOVERNMENT	20.2000	29.2000	55.3000	105.9000	172.3000	265.2000
TOTAL LOW SPEED/MEDIUM SPEED	188.6000	244.9000	500.9000	1001.0000	1688.1000	2688.3000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	93.5000	132.5000	195.2000	1026.1000	2258.8000	4821.2000
GOVERNMENT	10.4000	14.7000	43.8000	89.3000	196.2000	335.3000
PRIVATE TIME SHARING	9.5000	13.0000	30.9000	71.6000	144.5000	278.3000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.5000	25.2000	60.9000	136.4000	263.6000	485.7000
GOVERNMENT	2.1000	2.8000	6.9000	15.2000	29.5000	54.3000
TOTAL INTERACTIVE	134.0000	188.2000	537.6000	1338.6000	2892.6000	5974.8000
PACKET SWITCHING	7.3000	11.3000	34.4000	105.0000	320.3000	977.6000
TOTAL DATA TRANSMISSION	812.0000	1093.8000	2612.2000	6341.6000	13362.5000	27629.4000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	61.1000	82.8000	223.4000	574.2000	1248.8000	2572.1000
GOVERNMENT	14.3000	20.5000	46.3000	102.3000	190.6000	335.9000
OPERATIONAL FACSIMILE	3.7000	5.9000	22.3000	93.4000	291.7000	895.4000
COMMUNICATING WORD PROCESSOR	2.3000	3.9000	18.1000	66.7000	175.1000	406.4000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.9000	26.5000	59.2000	109.3000	155.1000	205.0000
GOVERNMENT	3.5000	4.8000	10.5000	19.7000	27.7000	28.2000
MAILBOX SERVICES	3.4000	5.1000	16.1000	60.4000	90.1000	200.5000
TOTAL RESTRICTED ACCESS	108.2000	149.5000	395.9000	1008.0000	2179.1000	4643.5000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.5000	1.7000	2.3000	3.0000	3.8000	4.8000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.8000
USPS EMSS						
NON-GOVERNMENT			622.8000	1267.9000	1382.2000	1489.7000
GOVERNMENT			53.9000	109.6000	119.7000	129.0000
TOTAL OPEN ACCESS	1.7000	1.9000	679.5000	1381.5000	1507.4000	1626.3000
TOTAL ELECTRONIC MAIL	109.9000	151.4000	1075.4000	2389.5000	3686.5000	6269.8000
EFTS POS/APPLICATIONS						
INQUIRY/RESPONSE	8.2000	11.2000	51.1000	139.9000	349.6000	869.8000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.6000	16.4000	57.1000	139.1000	307.7000	674.6000
GOVERNMENT	1.9000	2.9000	10.1000	24.5000	54.2000	118.7000
TOTAL EFTS/POS	20.7000	32.5000	118.3000	303.5000	711.5000	1663.1000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	32.4000	36.2000	55.3000	96.0000	151.2000	257.2000
GOVERNMENT	10.8000	12.1000	17.5000	21.7000	34.0000	31.7000
SECURE VOICE			57.5000	157.5000	396.3000	906.7000
MONITORING SERVICES				0.1000	0.3000	1.5000
TOTAL MISCELLANEOUS	43.2000	48.3000	130.3000	275.3000	581.8000	1197.1000
TOTAL ALL APPLICATIONS	985.8000	1326.0000	3936.2000	9309.9000	18342.3000	36759.4000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA
Traffic of Less than 40 Miles

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	132.6000	179.4000	482.5000	1320.4000	3225.0000	7742.2000
GOVERNMENT	118.1000	150.9000	326.1000	744.2000	1456.3000	2683.1000
BATCH PROCESSING						
NON-GOVERNMENT	136.8000	177.3000	369.2000	780.1000	1407.1000	2385.4000
GOVERNMENT	13.0000	17.8000	34.6000	72.7000	129.4000	218.0000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	57.5000	76.7000	189.8000	498.6000	1165.9000	2683.2000
GOVERNMENT	12.1000	15.5000	33.5000	79.9000	170.9000	358.7000
TOTAL HIGH SPEED/WIDE BAND	470.1000	618.6000	1435.7000	3494.8000	7554.6000	16070.6000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	33.1000	42.1000	80.2000	146.6000	240.9000	371.5000
REMOTE JOB ENTRY						
NON-GOVERNMENT	131.1000	168.4000	334.4000	648.8000	1103.6000	1777.4000
GOVERNMENT	19.7000	24.9000	47.2000	87.5000	142.2000	218.9000
TOTAL LOW SPEED/MEDIUM SPEED	183.9000	235.4000	461.8000	882.9000	1485.8000	2367.8000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	91.1000	128.3000	350.7000	898.1000	1955.6000	4174.2000
GOVERNMENT	10.1000	14.2000	38.9000	97.4000	169.7000	290.0000
PRIVATE TIME SHARING	9.3000	12.6000	28.6000	63.3000	127.3000	245.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.1000	24.5000	56.9000	121.3000	234.0000	431.1000
GOVERNMENT	2.0000	2.7000	6.3000	13.5000	26.0000	47.9000
TOTAL INTERACTIVE	130.6000	182.3000	491.4000	1165.6000	2512.6000	5188.6000
PACKET SWITCHING	7.0000	11.0000	33.5000	102.4000	312.4000	953.3000
TOTAL DATA TRANSMISSION	791.6000	1045.3000	2422.4000	5645.7000	11865.4000	24580.3000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	59.6000	80.3000	202.8000	489.6000	1058.2000	2171.1000
GOVERNMENT	13.9000	18.2000	39.3000	81.6000	151.8000	267.5000
OPERATIONAL FACSIMILE	3.6000	5.7000	21.0000	85.6000	267.5000	821.1000
COMMUNICATING WORD PROCESSOR	2.2000	3.8000	16.8000	59.6000	151.1000	349.3000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.4000	25.7000	54.4000	92.5000	130.7000	172.9000
GOVERNMENT	3.4000	4.5000	9.4000	16.2000	23.0000	23.4000
MAILBOX SERVICES	3.3000	5.0000	15.1000	35.6000	78.8000	174.5000
TOTAL RESTRICTED ACCESS	105.4000	143.2000	358.8000	860.5000	1861.1000	3979.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.5000	1.7000	2.0000	2.5000	3.2000	4.2000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.7000
USPS EMSS						
NON-GOVERNMENT			573.3000	1082.4000	1179.9000	1276.8000
GOVERNMENT			49.9000	94.1000	102.7000	111.2000
TOTAL OPEN ACCESS	1.7000	1.9000	625.7000	1180.0000	1287.5000	1394.9000
TOTAL ELECTRONIC MAIL	107.2000	145.1000	984.5000	2040.5000	3148.6000	5374.7000
EFIS/EDS/APPLICATIONS						
INQUIRY/RESPONSE	8.0000	12.8000	45.4000	115.6000	267.7000	715.9000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.3000	15.9000	51.3000	118.3000	260.7000	571.6000
GOVERNMENT	1.8000	2.8000	8.9000	20.4000	44.9000	98.3000
TOTAL EFIS/EDS	20.1000	31.5000	105.6000	254.3000	593.3000	1385.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	31.6000	35.3000	50.4000	80.9000	127.7000	217.3000
GOVERNMENT	10.6000	11.8000	16.9000	28.3000	31.9000	29.6000
SECURE VOICE			54.9000	143.9000	361.3000	826.6000
MONITORING SERVICES					0.2000	1.4000
TOTAL MISCELLANEOUS	42.2000	47.1000	122.2000	245.1000	521.1000	1074.9000
TOTAL ALL APPLICATIONS	961.0000	1269.0000	3634.7000	8185.6000	16178.4000	32415.7000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA Traffic of Less than 40 Miles

Data Category - Low Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	132.6000	179.4000	467.6000	1201.9000	2891.2000	6920.1000
GOVERNMENT	118.1000	143.3000	301.2000	645.9000	1246.0000	2295.4000
BATCH PROCESSING						
NON-GOVERNMENT	136.8000	177.3000	356.6000	702.2000	1244.4000	2103.3000
GOVERNMENT	13.0000	17.6000	35.4000	69.5000	122.9000	207.1000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	57.5000	76.7000	183.4000	448.4000	1031.5000	2366.9000
GOVERNMENT	12.1000	16.3000	34.1000	76.4000	160.8000	337.7000
TOTAL HIGH SPEED/WIDE BAND	470.1000	610.6000	1378.3000	3144.3000	6696.8000	14230.5000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	33.1000	41.9000	77.8000	138.5000	224.2000	346.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	131.1000	168.0000	322.8000	590.5000	995.2000	1602.6000
GOVERNMENT	19.7000	23.6000	43.2000	75.4000	121.5000	188.9000
TOTAL LOW SPEED/MEDIUM SPEED	183.9000	233.5000	443.8000	804.4000	1340.9000	2135.5000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	91.1000	127.6000	341.1000	824.4000	1807.5000	3857.9000
GOVERNMENT	10.1000	14.1000	37.8000	71.5000	156.7000	267.7000
PRIVATE TIME SHARING	9.3000	12.5000	27.6000	59.8000	120.3000	231.8000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.1000	24.3000	54.3000	113.0000	217.7000	401.1000
GOVERNMENT	2.0000	2.7000	6.0000	12.6000	24.3000	44.8000
TOTAL INTERACTIVE	130.6000	181.2000	466.8000	1081.3000	2326.5000	4803.2000
PACKET SWITCHING	7.0000	11.0000	33.5000	102.4000	312.4000	953.3000
TOTAL DATA TRANSMISSION	791.6000	1036.3000	2322.4000	5132.4000	10676.6000	22122.5000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	59.6000	79.9000	190.3000	435.3000	925.0000	1882.8000
GOVERNMENT	13.9000	17.2000	36.0000	71.7000	132.0000	232.6000
OPERATIONAL FACSIMILE	3.6000	5.7000	19.7000	72.0000	220.2000	674.2000
COMMUNICATING WORD PROCESSOR	2.2000	3.7000	15.2000	49.8000	124.6000	286.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.4000	25.4000	52.4000	87.0000	122.0000	161.4000
GOVERNMENT	3.4000	4.5000	9.4000	15.6000	21.8000	27.2000
MAILGRAM SERVICES	3.3000	5.0000	14.1000	32.1000	70.6000	155.7000
TOTAL RESTRICTED ACCESS	105.4000	141.4000	337.1000	765.5000	1616.2000	3415.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.5000	1.7000	1.9000	2.4000	3.1000	4.1000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.7000
USPS EMSS						
NON-GOVERNMENT			556.6000	1028.7000	1122.2000	1224.4000
GOVERNMENT			48.2000	84.0000	97.2000	106.1000
TOTAL OPEN ACCESS	1.7000	1.9000	607.2000	1121.1000	1224.2000	1337.3000
TOTAL ELECTRONIC MAIL	107.1000	143.3000	944.3000	1884.6000	2840.4000	4753.1000
EEIS,POS/APPLICATIONS						
INQUIRY/RESPONSE	8.0000	12.7000	43.6000	110.6000	275.2000	684.8000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.3000	15.7000	48.1000	107.4000	235.7000	516.7000
GOVERNMENT	1.8000	2.8000	8.4000	18.7000	40.7000	89.4000
TOTAL EEIS/POS	20.1000	31.2000	100.1000	236.7000	551.6000	1290.9000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	31.6000	35.3000	48.5000	71.4000	110.7000	187.6000
GOVERNMENT	10.6000	11.8000	16.0000	17.7000	27.3000	75.5000
SECURE VOICE			53.0000	131.0000	325.6000	744.8000
MONITORING SERVICES					0.2000	1.4000
TOTAL MISCELLANEOUS	42.2000	47.1000	117.5000	220.1000	463.8000	959.3000
TOTAL ALL APPLICATIONS	961.0000	1257.9000	3484.3000	7473.8000	14532.4000	29125.8000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA Traffic of Less than 40 Miles

Data Category - High Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	152.6000	179.4000	494.5000	1429.3000	3523.3000	8458.4000
GOVERNMENT	118.1000	166.0000	366.4000	868.1000	1702.4000	3136.4000
BATCH PROCESSING						
NON-GOVERNMENT	136.8000	177.3000	374.9000	815.1000	1473.2000	2497.4000
GOVERNMENT	13.0000	16.8000	35.3000	75.8000	136.1000	229.3000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	57.5000	76.7000	192.7000	520.5000	1221.3000	2810.6000
GOVERNMENT	12.1000	17.0000	37.2000	91.4000	195.6000	410.7000
TOTAL HIGH SPEED/WIDE BAND	470.1000	633.2000	1501.0000	3800.2000	8251.8000	17542.8000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	33.1000	42.3000	85.9000	170.3000	280.6000	434.3000
REMOTE JOB ENTRY						
NON-GOVERNMENT	131.1000	165.9000	348.7000	702.6000	1197.6000	1928.7000
GOVERNMENT	19.7000	27.5000	53.9000	103.3000	168.0000	258.6000
TOTAL LOW SPEED/MEDIUM SPEED	183.9000	235.8000	488.5000	976.2000	1646.2000	2621.6000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	91.1000	129.2000	385.4000	1000.6000	2202.8000	4701.7000
GOVERNMENT	10.1000	14.3000	42.7000	87.0000	191.3000	327.0000
PRIVATE TIME SHARING	9.3000	12.7000	30.1000	69.8000	140.9000	271.4000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	18.1000	24.5000	59.4000	133.0000	257.1000	473.7000
GOVERNMENT	2.0000	2.7000	6.6000	14.8000	28.7000	53.0000
TOTAL INTERACTIVE	130.6000	183.4000	524.2000	1305.2000	2820.8000	5826.8000
PACKET SWITCHING	7.0000	11.0000	33.5000	102.4000	312.4000	953.3000
TOTAL DATA TRANSMISSION	791.6000	1066.4000	2547.2000	6184.0000	13031.2000	26944.5000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	59.6000	80.8000	217.8000	560.0000	1217.8000	2508.3000
GOVERNMENT	13.9000	20.0000	45.2000	99.7000	185.9000	327.5000
OPERATIONAL FACSIMILE	3.6000	5.7000	21.8000	91.1000	284.4000	873.2000
COMMUNICATING WORD PROCESSOR	2.2000	3.8000	17.6000	67.0000	170.8000	396.4000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	19.4000	25.8000	57.7000	106.6000	151.3000	199.9000
GOVERNMENT	3.4000	4.6000	10.3000	19.2000	27.1000	37.5000
MAILBOX SERVICES	3.3000	5.0000	15.7000	39.4000	87.8000	195.5000
TOTAL RESTRICTED ACCESS	105.4000	145.7000	386.1000	983.0000	2125.1000	4528.3000
OPEN ACCESS NETWORKS						
TAT AND TELEX	1.5000	1.7000	2.2000	3.0000	3.7000	4.6000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.5000	1.0000	1.7000	2.7000
USPS EMSS						
NON-GOVERNMENT			607.4000	1236.5000	1347.4000	1452.8000
GOVERNMENT			52.6000	106.9000	116.7000	125.8000
TOTAL OPEN ACCESS	1.7000	1.9000	662.7000	1347.4000	1470.0000	1585.9000
TOTAL ELECTRONIC MAIL	107.1000	147.6000	1048.8000	2330.4000	3595.1000	6114.2000
EFTS/POS/APPLICATIONS						
INQUIRY/RESPONSE	8.0000	12.9000	49.8000	136.5000	340.9000	848.2000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	10.3000	16.0000	55.7000	135.7000	300.0000	657.9000
GOVERNMENT	1.8000	2.9000	9.8000	23.8000	52.8000	115.7000
TOTAL EFTS/P/S	20.1000	31.8000	115.3000	296.0000	693.7000	1621.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	31.6000	35.3000	53.9000	93.6000	147.5000	250.8000
GOVERNMENT	10.6000	11.8000	17.0000	21.1000	33.2000	30.9000
SECURE VOICE			56.1000	153.6000	386.4000	884.2000
MONITORING SERVICES					0.2000	1.4000
TOTAL MISCELLANEOUS	42.2000	47.1000	127.0000	268.3000	567.3000	1167.3000
TOTAL ALL APPLICATIONS	961.0000	1292.9000	3838.3000	9078.7000	17887.3000	35847.8000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA
Traffic of Less than 40 Miles

Data Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.5000	6.1000	16.4000	44.9000	109.6000	263.2000
GOVERNMENT	4.0000	5.1000	11.1000	25.3000	49.5000	91.2000
BATCH PROCESSING						
NON-GOVERNMENT	4.7000	6.0000	12.6000	24.5000	47.8000	81.1000
GOVERNMENT	0.4000	0.6000	1.2000	2.5000	4.4000	7.4000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.3000	12.4000	30.7000	80.4000	188.3000	433.3000
GOVERNMENT	2.0000	2.5000	5.4000	12.9000	27.6000	57.9000
TOTAL HIGH SPEED/WIDE BAND	24.9000	32.7000	77.4000	192.5000	427.2000	934.1000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	5.4000	6.8000	13.0000	23.7000	38.8000	60.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	21.2000	27.2000	54.0000	104.8000	178.2000	287.0000
GOVERNMENT	3.2000	4.0000	7.6000	14.1000	23.0000	35.4000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	38.0000	74.6000	142.6000	240.0000	382.4000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.7000	58.1000	143.8000	315.8000	674.1000
GOVERNMENT	1.6000	2.3000	6.4000	12.5000	27.4000	46.8000
PRIVATE TIME SHARING	1.5000	2.0000	4.6000	10.2000	20.6000	39.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	4.0000	9.7000	19.6000	37.8000	69.6000
GOVERNMENT	0.3000	0.4000	1.0000	2.2000	4.2000	7.7000
TOTAL INTERACTIVE	21.0000	29.4000	79.3000	188.3000	405.8000	837.8000
PACKET SWITCHING	1.1000	1.8000	5.4000	16.5000	50.5000	154.0000
TOTAL DATA TRANSMISSION	76.8000	101.9000	236.7000	539.9000	1123.5000	2308.3000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	13.0000	32.8000	79.0000	170.9000	350.6000
GOVERNMENT	2.2000	2.9000	6.3000	13.2000	24.5000	43.2000
OPERATIONAL FACSIMILE	0.2000	0.3000	1.1000	4.4000	13.6000	41.9000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.7000	9.6000	24.4000	56.4000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.7000	43.9000	74.7000	105.6000	139.6000
GOVERNMENT	2.8000	3.7000	7.6000	13.1000	18.6000	18.9000
MAILBOX SERVICES	0.5000	0.8000	2.4000	5.7000	12.7000	28.2000
TOTAL RESTRICTED ACCESS	31.3000	42.0000	96.8000	199.7000	370.3000	678.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.2000	0.3000	0.3000	0.4000	0.5000	0.7000
MAILGRAM AND TELEGRAM			0.1000	0.2000	0.3000	0.4000
USPS EMSS						
NON-GOVERNMENT			19.5000	36.8000	49.1000	61.4000
GOVERNMENT			1.7000	3.2000	3.5000	3.8000
TOTAL OPEN ACCESS	0.2000	0.3000	21.6000	40.6000	44.4000	67.3000
TOTAL ELECTRONIC MAIL	31.5000	42.3000	118.4000	240.3000	414.7000	727.1000
EFTS/POS APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	7.3000	18.7000	46.5000	115.6000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.7000	4.0000	8.9000	19.4000
GOVERNMENT	0.1000	0.1000	0.3000	0.7000	1.5000	3.3000
TOTAL EFTS/POS	1.8000	2.7000	9.3000	23.4000	56.9000	138.3000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	5.1000	5.7000	8.1000	13.1000	20.6000	35.1000
GOVERNMENT	1.7000	1.9000	2.7000	3.3000	5.1000	4.8000
SECURE VOICE			8.9000	23.2000	58.4000	133.5000
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.8000	7.6000	19.7000	39.6000	84.1000	173.4000
TOTAL ALL APPLICATIONS	116.9000	154.5000	384.1000	843.2000	1679.2000	3347.1000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA Traffic of Less than 40 Miles

Data Category - Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.5000	6.1000	15.9000	40.9000	98.3000	235.3000
GOVERNMENT	4.0000	4.9000	10.2000	22.0000	42.4000	78.9000
BATCH PROCESSING						
NON-GOVERNMENT	4.7000	6.0000	12.1000	23.9000	42.3000	71.5000
GOVERNMENT	0.4000	0.6000	1.2000	2.4000	4.2000	7.0000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.3000	12.4000	29.6000	72.4000	166.6000	382.3000
GOVERNMENT	2.0000	2.6000	5.5000	12.3000	26.0000	54.5000
TOTAL HIGH SPEED/WIDE BAND	24.9000	32.6000	74.5000	173.9000	379.8000	828.6000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY						
REMOTE JOB ENTRY	5.4000	6.8000	12.6000	22.4000	36.2000	55.9000
NON-GOVERNMENT	21.2000	27.1000	52.1000	95.4000	160.7000	258.8000
GOVERNMENT	3.2000	3.8000	7.0000	12.2000	19.6000	30.2000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	37.7000	71.7000	130.0000	216.5000	344.9000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.6000	55.1000	133.1000	291.9000	623.9000
GOVERNMENT	1.6000	2.3000	6.1000	11.6000	25.3000	43.2000
PRIVATE TIME SHARING	1.5000	2.0000	4.5000	9.7000	19.4000	37.4000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	3.9000	8.8000	18.3000	35.2000	64.8000
GOVERNMENT	0.3000	0.4000	1.0000	2.0000	3.9000	7.2000
TOTAL INTERACTIVE	21.0000	29.2000	75.5000	174.7000	375.7000	775.6000
PACKET SWITCHING	1.1000	1.8000	5.4000	16.5000	50.5000	154.7000
TOTAL DATA TRANSMISSION	76.8000	101.3000	227.1000	495.1000	1022.5000	2103.1000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	12.9000	30.7000	70.3000	160.4000	304.1000
GOVERNMENT	2.2000	2.8000	5.8000	11.6000	21.3000	37.6000
OPERATIONAL FACSIMILE	0.2000	0.3000	1.0000	3.7000	11.2000	34.6000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.5000	8.0000	20.1000	48.3000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.5000	42.3000	70.7000	98.5000	130.3000
GOVERNMENT	2.8000	3.7000	7.6000	12.6000	17.6000	18.9000
MAILBOX SERVICES	0.5000	0.8000	2.3000	5.2000	11.6000	25.2000
TOTAL RESTRICTED ACCESS	31.3000	41.6000	92.2000	181.6000	329.5000	595.9000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.2000	0.3000	0.3000	0.4000	0.5000	0.7000
MAILGRAM AND TELEGRAM			0.1000	0.2000	0.3000	0.4000
USPS EMSS						
NON-GOVERNMENT			18.4000	35.0000	38.7000	41.6000
GOVERNMENT			1.6000	3.0000	3.3000	3.6000
TOTAL OPEN ACCESS	0.2000	0.3000	20.9000	38.6000	42.3000	46.3000
TOTAL ELECTRONIC MAIL	31.5000	41.9000	113.1000	220.2000	371.8000	642.2000
EFIS/EDS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	7.0000	17.9000	44.5000	110.6000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.6000	3.7000	8.0000	17.6000
GOVERNMENT	0.1000	0.1000	0.3000	0.6000	1.4000	3.0000
TOTAL EFIS/EDS	1.8000	2.7000	8.9000	22.2000	53.9000	131.2000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	5.1000	5.7000	7.8000	11.5000	17.6000	30.3000
GOVERNMENT	1.7000	1.9000	2.6000	2.9000	4.4000	4.1000
SECURE VOICE			8.6000	21.1000	52.6000	120.3000
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.8000	7.6000	19.0000	35.5000	74.9000	154.7000
TOTAL ALL APPLICATIONS	116.9000	153.5000	368.1000	773.0000	1523.1000	3031.2000

SERVICE DEMAND ASSESSMENT

Balance After Removal of InterSMSA Traffic of Less than 40 Miles

Data Category - High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.5000	6.1000	16.8000	48.6000	119.8000	287.6000
GOVERNMENT	4.0000	5.6000	12.5000	29.5000	57.9000	104.6000
BATCH PROCESSING						
NON-GOVERNMENT	4.7000	6.0000	12.7000	27.7000	50.1000	84.9000
GOVERNMENT	0.4000	0.6000	1.2000	2.6000	4.6000	7.8000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.3000	12.6000	31.1000	84.1000	197.2000	453.3000
GOVERNMENT	2.0000	2.8000	6.0000	14.8000	31.6000	68.1000
TOTAL HIGH SPEED/WIDE BAND	24.9000	33.9000	80.3000	207.3000	661.2000	1037.1000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	5.4000	6.8000	13.9000	27.5000	51.1000	89.1000
REMOTE JOB ENTRY						
NON-GOVERNMENT	21.2000	27.3000	56.3000	113.5000	193.6000	311.5000
GOVERNMENT	3.2000	4.4000	8.7000	16.7000	27.1000	41.4000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	38.5000	78.9000	157.7000	265.8000	423.6000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.9000	62.2000	161.6000	355.8000	749.1000
GOVERNMENT	1.6000	2.3000	6.9000	14.1000	30.9000	63.8000
PRIVATE TIME SHARING	1.5000	2.0000	4.9000	11.3000	22.8000	43.8000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	4.0000	9.6000	21.5000	41.5000	76.5000
GOVERNMENT	0.3000	0.4000	1.1000	2.4000	4.6000	8.4000
TOTAL INTERACTIVE	21.0000	29.6000	84.7000	210.9000	455.6000	941.0000
PACKET SWITCHING	1.1000	1.8000	5.4000	16.5000	50.5000	154.0000
TOTAL DATA TRANSMISSION	76.8000	103.4000	249.3000	592.4000	1233.1000	2525.9000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	13.0000	35.2000	90.4000	196.7000	405.1000
GOVERNMENT	2.2000	3.2000	7.3000	16.1000	30.3000	52.9000
OPERATIONAL FACSIMILE	0.2000	0.3000	1.1000	4.6000	14.5000	44.5000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.8000	10.8000	27.6000	64.0000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.9000	46.6000	86.1000	122.2000	161.6000
GOVERNMENT	2.8000	3.7000	8.3000	15.5000	21.8000	22.2000
MAILBOX SERVICES	0.5000	0.8000	2.5000	6.4000	14.2000	31.6000
TOTAL RESTRICTED ACCESS	31.3000	42.5000	103.8000	229.9000	427.0000	781.7000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.2000	0.3000	0.4000	0.5000	0.6000	0.7000
MAILGRAM AND TELEGRAM			0.1000	0.2000	0.3000	0.4000
USPS EMSS						
NON-GOVERNMENT			20.7000	42.0000	45.8000	49.4000
GOVERNMENT			1.8000	3.6000	4.0000	4.3000
TOTAL OPEN ACCESS	0.2000	0.3000	23.0000	46.3000	50.7000	54.8000
TOTAL ELECTRONIC MAIL	31.5000	42.8000	126.8000	276.2000	477.7000	836.5000
EFTS POS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	8.0000	22.0000	55.1000	137.0000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.9000	4.6000	10.2000	22.4000
GOVERNMENT	0.1000	0.1000	0.3000	0.8000	1.8000	3.9000
TOTAL EFTS/POS	1.8000	2.7000	10.2000	27.4000	67.1000	163.3000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	5.1000	5.7000	8.7000	15.1000	23.8000	40.5000
GOVERNMENT	1.7000	1.9000	2.8000	3.4000	5.4000	5.0000
SECURE VOICE			9.1000	24.8000	62.4000	142.8000
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.8000	7.6000	20.6000	43.3000	91.6000	188.3000
TOTAL ALL APPLICATIONS	116.9000	156.5000	406.9000	939.3000	1869.5000	3713.6000

SERVICE DEMAND ASSESSMENT

Data Traffic Carried on Voice Facilities

Data/Voice Category
Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.3000	5.5000	11.5000	22.4000	37.9000	56.3000
GOVERNMENT	3.8000	4.6000	7.8000	12.7000	14.9000	9.1000
BATCH PROCESSING						
NON-GOVERNMENT	4.8000	5.7000	10.0000	17.2000	21.5000	20.3000
GOVERNMENT	0.4000	0.5000	0.9000	1.6000	2.0000	1.0000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.1000	11.8000	23.8000	48.3000	75.3000	81.7000
GOVERNMENT	1.9000	2.4000	4.2000	7.7000	11.9000	11.6000
TOTAL HIGH SPEED/WIDE BAND	24.1000	30.5000	58.2000	109.9000	157.6000	155.9000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	5.4000	6.8000	12.3000	21.3000	29.1000	36.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	21.2000	27.2000	48.6000	83.8000	98.2000	86.1000
GOVERNMENT	3.2000	4.0000	6.9000	11.3000	12.6000	10.6000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	38.0000	67.8000	116.4000	139.7000	132.7000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.7000	58.1000	143.8000	252.7000	404.5000
GOVERNMENT	1.6000	2.3000	6.4000	12.5000	21.9000	28.1000
PRIVATE TIME SHARING	1.5000	2.0000	4.2000	8.2000	10.3000	7.9000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	4.0000	8.7000	17.6000	24.6000	27.8000
GOVERNMENT	0.3000	0.4000	1.0000	2.0000	2.7000	3.1000
TOTAL INTERACTIVE	21.0000	29.4000	78.4000	184.1000	312.2000	471.4000
PACKET SWITCHING	1.1000	1.7000	3.9000	8.3000	16.4000	23.1000
TOTAL DATA TRANSMISSION	76.0000	99.6000	208.3000	418.7000	625.9000	783.1000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	13.0000	31.1000	71.1000	119.6000	175.3000
GOVERNMENT	2.2000	2.9000	6.0000	11.9000	17.7000	21.6000
OPERATIONAL FACSIMILE	0.2000	0.3000	0.9000	2.8000	6.1000	10.5000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.6000	8.7000	17.1000	28.2000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.7000	43.9000	74.7000	95.0000	111.7000
GOVERNMENT	2.8000	3.7000	7.6000	13.1000	16.7000	15.1000
MAILBOX SERVICES	0.5000	0.8000	2.3000	5.2000	8.3000	11.3000
TOTAL RESTRICTED ACCESS	31.3000	42.9000	94.4000	187.5000	280.0000	373.7000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000					
MAILGRAM AND TELEGRAM						
USPS EMSS						
NON-GOVERNMENT			1.0000	1.7000	2.0000	
GOVERNMENT			0.1000	0.3000	0.2000	
TOTAL OPEN ACCESS	0.1000		1.1000	2.0000	2.2000	
TOTAL ELECTRONIC MAIL	31.4000	42.0000	95.5000	191.5000	282.2000	373.7000
EFIS/EDS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	7.3000	18.7000	40.7000	86.7000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.4000	2.6000	3.8000	3.9000
GOVERNMENT	0.1000	0.1000	0.2000	0.5000	0.6000	0.7000
TOTAL EFIS/EDS	1.8000	2.7000	8.9000	21.8000	45.1000	91.3000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	4.8000	5.1000	5.7000	6.5000	6.7000	5.3000
GOVERNMENT	1.6000	1.7000	1.9000	1.6000	1.7000	0.7000
SECURE VOICE			0.4000	2.3000	2.9000	
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.4000	6.8000	8.0000	10.4000	11.3000	6.0000
TOTAL ALL APPLICATIONS	115.6000	151.1000	320.7000	642.4000	964.5000	1254.1000

SERVICE DEMAND ASSESSMENT

Data Traffic Carried on Voice Facilities

Data/Voice Category
Low Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.3000	5.5000	11.1000	20.4000	29.5000	33.5000
GOVERNMENT	3.8000	4.4000	7.2000	11.3000	12.7000	7.8000
BATCH PROCESSING						
NON-GOVERNMENT	4.6000	5.7000	9.7000	15.5000	19.0000	17.9000
GOVERNMENT	0.4000	0.6000	1.0000	1.5000	1.9000	1.8000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.1000	11.8000	23.0000	43.5000	96.6000	76.5000
GOVERNMENT	1.9000	2.5000	4.3000	7.4000	10.6000	10.9000
TOTAL HIGH SPEED/WIDE BAND	24.1000	30.5000	56.3000	99.3000	140.1000	138.4000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	5.4000	6.8000	11.9000	20.1000	27.2000	33.5000
REMOTE JOB ENTRY						
NON-GOVERNMENT	21.2000	27.1000	46.9000	76.3000	88.4000	77.6000
GOVERNMENT	3.2000	3.8000	6.3000	9.7000	10.8000	9.1000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	37.7000	65.1000	106.1000	126.4000	120.2000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.6000	55.1000	133.1000	233.5000	373.8000
GOVERNMENT	1.6000	2.3000	6.1000	11.6000	20.2000	25.9000
PRIVATE TIME SHARING	1.5000	2.0000	4.0000	7.7000	9.7000	7.5000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	3.9000	8.3000	16.4000	22.8000	25.9000
GOVERNMENT	0.3000	0.4000	0.9000	1.8000	2.5000	2.9000
TOTAL INTERACTIVE	21.0000	29.2000	74.4000	170.6000	288.7000	436.0000
PACKET SWITCHING	1.1000	1.7000	3.9000	8.3000	16.4000	23.1000
TOTAL DATA TRANSMISSION	76.0000	99.1000	199.7000	384.3000	571.6000	717.7000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	12.9000	29.2000	63.3000	104.6000	152.0000
GOVERNMENT	2.2000	2.8000	5.5000	10.4000	14.9000	18.8000
OPERATIONAL FACSIMILE	0.2000	0.3000	0.8000	2.4000	5.1000	8.6000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.3000	7.2000	14.1000	23.2000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.5000	42.3000	70.2000	88.7000	104.3000
GOVERNMENT	2.8000	3.7000	7.6000	12.6000	15.8000	14.4000
MAILBOX SERVICES	0.5000	0.8000	2.2000	4.7000	7.4000	10.1000
TOTAL RESTRICTED ACCESS	31.3000	41.6000	89.9000	170.8000	250.6000	331.4000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000					
MAILGRAM AND TELEGRAM						
USPS EMSS						
NON-GOVERNMENT			0.9000	3.5000	1.9000	
GOVERNMENT			0.1000	0.3000	0.2000	
TOTAL OPEN ACCESS	0.1000		1.0000	3.8000	2.1000	
TOTAL ELECTRONIC MAIL	31.4000	41.6000	90.9000	174.6000	252.7000	331.4000
EFTS/POS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	7.0000	17.9000	38.9000	83.0000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.3000	2.4000	3.4000	3.5000
GOVERNMENT	0.1000	0.1000	0.2000	0.4000	0.6000	0.6000
TOTAL EFTS/POS	1.8000	2.7000	8.5000	20.7000	42.9000	87.1000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	4.8000	5.1000	5.5000	5.8000	5.8000	4.5000
GOVERNMENT	1.6000	1.7000	1.8000	1.4000	1.4000	0.6000
SECURE VOICE			0.4000	2.1000	2.6000	
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.4000	6.8000	7.7000	9.3000	9.8000	5.1000
TOTAL ALL APPLICATIONS	115.6000	150.2000	306.8000	588.9000	877.0000	1141.3000

SERVICE DEMAND ASSESSMENT

Data Traffic Carried on Voice Facilities

Data/Voice Category
High Range Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	4.3000	5.5000	11.8000	24.3000	35.9000	24.8000
GOVERNMENT	1.8000	5.1000	8.7000	14.8000	17.4000	10.7000
BATCH PROCESSING						
NON-GOVERNMENT	4.6000	5.7000	10.2000	18.0000	23.5000	21.1000
GOVERNMENT	0.4000	0.5000	1.0000	1.7000	2.1000	1.8000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	9.1000	11.8000	24.1000	50.4000	78.9000	90.8000
GOVERNMENT	1.9000	2.6000	4.7000	8.9000	17.6000	13.3000
TOTAL HIGH SPEED/WIDE BAND	24.1000	31.2000	60.5000	118.1000	169.4000	166.7000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	5.4000	6.8000	13.2000	24.7000	34.0000	42.1000
REMOTE JOB ENTRY						
NON-GOVERNMENT	21.3000	27.3000	50.7000	90.8000	106.4000	93.6000
GOVERNMENT	3.2000	4.6000	7.8000	13.3000	14.9000	12.5000
TOTAL LOW SPEED/MEDIUM SPEED	29.8000	38.5000	71.7000	128.8000	155.3000	148.0000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.7000	20.9000	62.2000	161.6000	284.6000	455.6000
GOVERNMENT	1.6000	2.3000	6.9000	14.1000	24.7000	31.7000
PRIVATE TIME SHARING	1.5000	2.0000	4.4000	9.0000	11.4000	8.8000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	2.9000	4.0000	9.1000	19.3000	27.0000	[illegible]
GOVERNMENT	0.3000	0.4000	1.0000	2.2000	3.0000	[illegible]
TOTAL INTERACTIVE	21.0000	29.6000	83.6000	206.7000	350.7000	530.1000
PACKET SWITCHING	1.1000	1.7000	3.9000	8.3000	16.4000	23.1000
TOTAL DATA TRANSMISSION	76.0000	101.0000	219.7000	461.4000	691.8000	867.9000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	9.6000	13.0000	33.4000	81.4000	137.7000	202.5000
GOVERNMENT	2.2000	3.2000	6.9000	14.5000	21.0000	26.4000
OPERATIONAL FACSIMILE	0.2000	0.3000	0.9000	3.0000	6.5000	11.1000
COMMUNICATING WORD PROCESSOR	0.4000	0.6000	2.7000	9.7000	19.3000	32.0000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	15.6000	20.9000	46.6000	86.1000	109.9000	129.2000
GOVERNMENT	2.8000	3.7000	8.3000	15.5000	19.7000	17.8000
MAILBOX SERVICES	0.5000	0.8000	2.4000	5.7000	9.2000	12.6000
TOTAL RESTRICTED ACCESS	31.3000	42.5000	101.2000	215.9000	323.3000	431.6000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000					
MAILGRAM AND TELEGRAM						
USPS EMSS						
NON-GOVERNMENT			1.0000	4.2000	2.3000	
GOVERNMENT			0.1000	0.4000	0.2000	
TOTAL OPEN ACCESS	0.1000		1.1000	4.6000	2.5000	
TOTAL ELECTRONIC MAIL	31.4000	42.5000	102.3000	220.5000	325.8000	431.6000
EFTS/POS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.1000	8.0000	22.0000	48.2000	102.7000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.4000	0.5000	1.5000	3.0000	4.3000	4.5000
GOVERNMENT	0.1000	0.1000	0.3000	0.5000	0.8000	0.8000
TOTAL EFTS/POS	1.8000	2.7000	9.8000	25.5000	53.3000	108.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	4.8000	5.1000	6.1000	7.6000	7.7000	6.1000
GOVERNMENT	1.6000	1.7000	1.9000	1.7000	1.7000	0.7000
SECURE VOICE			0.5000	2.5000	3.1000	
MONITORING SERVICES						
TOTAL MISCELLANEOUS	6.4000	6.8000	8.5000	11.8000	12.5000	6.8000
TOTAL ALL APPLICATIONS	115.6000	153.0000	340.3000	719.2000	1083.4000	1414.3000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic (Balance After Removal of Hinterland Traffic)

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	112.7000	152.5000	410.1000	1122.3000	2741.2000	6580.9000
GOVERNMENT	100.4000	128.2000	277.2000	632.6000	1237.9000	2280.6000
BATCH PROCESSING						
NON-GOVERNMENT	116.3000	150.7000	313.8000	663.1000	1196.0000	2027.6000
GOVERNMENT	11.0000	14.3000	29.4000	61.4000	110.0000	185.3000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	68.9000	85.2000	161.3000	423.3000	991.0000	2280.7000
GOVERNMENT	10.3000	13.2000	28.5000	68.0000	145.2000	304.9000
TOTAL HIGH SPEED/WIDE BAND	399.6000	524.1000	1220.3000	2970.7000	6421.3000	13660.0000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	28.2000	35.8000	68.2000	124.7000	204.9000	315.8000
REMOTE JOB ENTRY						
NON-GOVERNMENT	111.4000	143.1000	284.2000	551.5000	938.1000	1510.8000
GOVERNMENT	16.7000	21.2000	40.1000	74.3000	120.9000	188.1000
TOTAL LOW SPEED/MEDIUM SPEED	156.3000	200.1000	392.5000	750.5000	1263.8000	2012.7000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	77.5000	109.0000	305.7000	756.6000	1662.3000	3548.1000
GOVERNMENT	8.6000	12.1000	33.9000	65.8000	144.3000	246.5000
PRIVATE TIME SHARING	7.9000	10.7000	24.3000	53.8000	108.2000	208.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	15.4000	20.8000	48.3000	103.1000	198.9000	366.4000
GOVERNMENT	1.7000	2.3000	5.4000	11.5000	22.1000	40.7000
TOTAL INTERACTIVE	111.1000	154.9000	417.6000	990.8000	2135.8000	4410.3000
PACKET SWITCHING	6.0000	9.4000	28.5000	87.0000	265.5000	810.3000
TOTAL DATA TRANSMISSION	673.0000	888.5000	2058.9000	4799.0000	10085.6000	20893.3000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	50.7000	68.2000	172.4000	416.0000	899.4000	1845.4000
GOVERNMENT	11.8000	15.4000	33.4000	69.3000	129.0000	227.4000
OPERATIONAL FACSIMILE	3.1000	4.8000	17.9000	72.8000	227.3000	697.9000
COMMUNICATING WORD PROCESSOR	1.9000	3.2000	14.2000	50.7000	128.5000	296.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	16.5000	21.8000	46.2000	78.6000	111.1000	146.9000
GOVERNMENT	2.9000	3.9000	8.0000	13.8000	19.5000	19.9000
MAILBOX SERVICES	2.8000	4.3000	12.8000	30.2000	67.0000	148.4000
TOTAL RESTRICTED ACCESS	89.7000	121.6000	304.9000	731.4000	1581.8000	3382.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.3000	1.4000	1.7000	2.1000	2.8000	3.5000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.4000	0.9000	1.4000	2.3000
USPS EMSS						
NON-GOVERNMENT			487.3000	920.0000	1002.9000	1085.3000
GOVERNMENT			42.4000	80.0000	87.3000	94.5000
TOTAL OPEN ACCESS	1.5000	1.6000	531.8000	1003.0000	1094.4000	1185.6000
TOTAL ELECTRONIC MAIL	91.2000	123.2000	836.7000	1734.4000	2676.2000	4568.4000
EFTS, POS/APPLICATIONS						
INQUIRY/RESPONSE	6.8000	10.9000	38.6000	86.3000	244.6000	608.5000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	8.8000	13.5000	43.6000	100.6000	221.6000	485.9000
GOVERNMENT	1.6000	2.4000	7.5000	17.3000	38.2000	83.6000
TOTAL EFTS/POS	17.2000	26.8000	89.7000	216.2000	504.4000	1178.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	26.9000	30.0000	42.8000	68.7000	108.5000	184.7000
GOVERNMENT	9.0000	10.0000	14.3000	17.2000	27.1000	25.2000
SECURE VOICE			46.6000	122.3000	307.1000	702.6000
MONITORING SERVICES					0.2000	1.2000
TOTAL MISCELLANEOUS	35.9000	40.0000	103.7000	208.2000	442.9000	913.7000
TOTAL ALL APPLICATIONS	817.3000	1078.4000	1089.0000	6957.8000	13709.1000	27553.4000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic (Balance After Removal of Hinterland Traffic)

Data Category - Low Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	112.7000	152.5000	397.5000	1021.6000	2457.5000	5882.1000
GOVERNMENT	100.4000	121.8000	256.0000	549.0000	1049.1000	1951.1000
BATCH PROCESSING						
NON-GOVERNMENT	116.3000	150.7000	303.1000	596.9000	1057.8000	1787.8000
GOVERNMENT	11.0000	15.0000	30.1000	59.1000	104.4000	176.1000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	48.9000	65.2000	155.9000	381.2000	876.8000	2011.9000
GOVERNMENT	10.3000	13.9000	29.0000	65.0000	136.7000	287.0000
TOTAL HIGH SPEED/WIDE BAND	399.6000	519.1000	1171.6000	2672.8000	5582.3000	12096.0000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	28.2000	35.6000	66.1000	117.7000	190.5000	294.1000
REMOTE JOB ENTRY						
NON-GOVERNMENT	111.4000	142.8000	274.4000	501.9000	845.9000	1362.2000
GOVERNMENT	16.7000	20.0000	36.7000	64.1000	103.3000	158.8000
TOTAL LOW SPEED/MEDIUM SPEED	156.3000	198.4000	377.2000	683.7000	1139.7000	1815.1000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	77.5000	108.4000	289.9000	700.7000	1536.4000	3279.2000
GOVERNMENT	8.6000	12.0000	32.1000	60.8000	133.2000	227.6000
PRIVATE TIME SHARING	7.9000	10.6000	23.5000	50.9000	102.3000	197.0000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	15.4000	20.7000	46.1000	96.1000	185.0000	340.9000
GOVERNMENT	1.7000	2.3000	5.1000	10.7000	20.6000	38.1000
TOTAL INTERACTIVE	111.1000	154.0000	396.7000	919.2000	1977.5000	4082.8000
PACKET SWITCHING	6.0000	9.4000	28.5000	87.0000	265.5000	810.3000
TOTAL DATA TRANSMISSION	673.0000	880.9000	1974.0000	4362.7000	9075.0000	18804.2000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	50.7000	67.9000	161.8000	370.0000	786.2000	1600.4000
GOVERNMENT	11.8000	14.6000	30.6000	60.9000	112.2000	197.7000
OPERATIONAL FACSIMILE	3.1000	4.8000	16.8000	61.2000	187.2000	573.1000
COMMUNICATING WORD PROCESSOR	1.9000	3.1000	12.9000	42.3000	105.9000	243.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	16.5000	21.6000	44.6000	73.9000	103.7000	137.2000
GOVERNMENT	2.9000	3.9000	8.0000	13.2000	18.5000	18.9000
MAILBOX SERVICES	2.8000	4.3000	12.0000	27.2000	60.0000	132.4000
TOTAL RESTRICTED ACCESS	89.7000	120.2000	286.7000	648.7000	1373.7000	2903.6000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.3000	1.4000	1.7000	2.0000	2.7000	3.5000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.4000	0.9000	1.4000	2.3000
USPS EMSS						
NON-GOVERNMENT			473.1000	874.4000	953.8000	1040.7000
GOVERNMENT			40.9000	75.7000	82.6000	90.2000
TOTAL OPEN ACCESS	1.5000	1.6000	516.1000	953.0000	1040.5000	1136.7000
TOTAL ELECTRONIC MAIL	91.2000	121.8000	802.8000	1601.7000	2414.2000	4040.3000
EFTS-POS/APPLICATIONS						
INQUIRY/RESPONSE	6.8000	10.8000	37.1000	94.0000	234.0000	582.1000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	8.8000	13.4000	40.9000	91.9000	200.9000	439.2000
GOVERNMENT	1.6000	2.4000	7.1000	15.9000	34.6000	76.0000
TOTAL EFTS/POS	17.2000	26.6000	85.1000	201.7000	468.9000	1097.3000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	26.9000	30.0000	41.2000	60.7000	94.1000	159.5000
GOVERNMENT	9.0000	10.0000	13.6000	15.0000	23.2000	21.7000
SECURE VOICE			45.1000	111.3000	276.8000	633.1000
MONITORING SERVICES					0.2000	1.2000
TOTAL MISCELLANEOUS	35.9000	40.0000	99.9000	187.0000	394.3000	815.5000
TOTAL ALL APPLICATIONS	817.3000	1069.3000	2961.8000	6352.6000	12352.4000	24757.3000

SERVICE DEMAND ASSESSMENT

Net Long Haul Traffic (Balance After Removal of Hinterland Traffic)

Data Category - High Range Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	112.7000	157.5000	420.3000	1214.0000	2994.8000	7189.6000
GOVERNMENT	100.4000	141.1000	311.5000	737.9000	1447.0000	2666.0000
BATCH PROCESSING						
NON-GOVERNMENT	116.3000	150.7000	318.6000	692.9000	1252.2000	2122.8000
GOVERNMENT	11.0000	14.3000	30.0000	64.4000	115.7000	194.9000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	48.9000	65.2000	163.8000	442.5000	1038.0000	2389.0000
GOVERNMENT	10.3000	14.5000	31.6000	77.7000	166.2000	349.1000
TOTAL HIGH SPEED/WIDE BAND	399.6000	538.3000	1275.8000	3230.3000	7013.9000	14911.4000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	28.2000	36.0000	73.0000	144.7000	238.5000	369.2000
REMOTE JOB ENTRY						
NON-GOVERNMENT	111.4000	143.6000	296.4000	597.2000	1017.9000	1639.4000
GOVERNMENT	16.7000	23.3000	45.8000	87.8000	142.9000	219.8000
TOTAL LOW SPEED/MEDIUM SPEED	156.3000	203.9000	415.2000	829.7000	1399.3000	2228.4000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	77.5000	109.8000	327.6000	850.5000	1972.4000	3996.4000
GOVERNMENT	8.6000	12.2000	36.3000	94.0000	162.6000	277.9000
PRIVATE TIME SHARING	7.9000	10.8000	25.6000	59.3000	119.7000	230.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	15.4000	20.9000	50.5000	113.1000	218.5000	402.6000
GOVERNMENT	1.7000	2.3000	5.6000	12.6000	24.4000	45.0000
TOTAL INTERACTIVE	111.1000	156.0000	445.6000	1129.5000	2397.6000	4952.5000
PACKET SWITCHING	6.0000	9.4000	28.5000	87.0000	265.5000	810.3000
TOTAL DATA TRANSMISSION	673.0000	906.6000	2165.1000	5256.5000	11076.2000	22902.4000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	50.7000	68.6000	185.2000	476.0000	1035.2000	2132.1000
GOVERNMENT	11.8000	17.0000	38.4000	84.8000	158.0000	278.4000
OPERATIONAL FACSIMILE	3.1000	4.9000	18.5000	77.4000	241.8000	742.2000
COMMUNICATING WORD PROCESSOR	1.9000	3.2000	15.0000	56.9000	145.2000	336.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	16.5000	22.0000	49.1000	90.6000	128.6000	169.9000
GOVERNMENT	2.9000	3.9000	8.7000	16.3000	23.0000	23.4000
MAILBOX SERVICES	2.8000	4.3000	13.3000	33.5000	74.7000	166.2000
TOTAL RESTRICTED ACCESS	89.7000	123.9000	328.2000	835.5000	1806.5000	3849.1000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.3000	1.4000	1.9000	2.5000	3.1000	3.9000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.4000	0.9000	1.4000	2.1000
USPS EMSS						
NON-GOVERNMENT			516.3000	1051.0000	1145.7000	1214.3000
GOVERNMENT			44.7000	90.9000	99.2000	106.9000
TOTAL OPEN ACCESS	1.5000	1.6000	563.3000	1145.3000	1249.4000	1348.0000
TOTAL ELECTRONIC MAIL	91.2000	125.5000	891.5000	1980.8000	3055.9000	5197.1000
EFIS/POS APPLICATIONS						
INQUIRY/RESPONSE	6.8000	10.9000	42.3000	116.0000	289.8000	721.0000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	8.8000	13.6000	47.3000	115.3000	255.0000	559.2000
GOVERNMENT	1.6000	2.4000	8.3000	20.3000	44.9000	98.4000
TOTAL EFIS/POS	17.2000	26.9000	97.9000	251.6000	589.7000	1378.6000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	26.9000	30.0000	45.8000	79.5000	125.4000	213.2000
GOVERNMENT	9.0000	10.0000	14.5000	18.0000	28.2000	26.3000
SECURE VOICE			47.7000	130.6000	328.5000	751.6000
MONITORING SERVICES					0.2000	1.2000
TOTAL MISCELLANEOUS	35.9000	40.0000	108.0000	228.1000	482.3000	992.3000
TOTAL ALL APPLICATIONS	817.3000	1099.0000	3262.5000	7717.0000	15204.1000	30470.6000

APPENDIX C

MARKET DETERMINANT FACTORS

The baseline forecast reflected predictable events and orderly growth. Scenarios which describe less predictable events which have a high probability of occurrence were generated through the use of market determinant factors (Task 2A).

There were a total of twenty two factors used in modifying the data service category baseline forecast; ten separate factors in the voice services category; and seven events in the video services group.

The market determinant factors cover such areas as introduction of new technology, socio-economic and regulatory environment changes, competitive and price elasticity market changes. The events may have varying degrees of impact on different services.

The list of market events includes only those which are expected to have widespread market acceptance or impact. Therefore, the impact of a new transmission alternative would only be included when it was in use on a widespread basis.

Also identified are a group of events which were considered but deemed inappropriate for inclusion in the impact model. The reasons for their omission are listed in Table E.

MARKET DETERMINANT FACTORS

DATA SERVICES

No.	Events	Year	Probability
D-1	Fiber optics installed for local interconnection (20 or more metropolitan cities)	1985 1987 1990	30 25 20
D-2	Fiber optics installed for Intercity Transmission between 10 SMSA's	1988 1990 1995	20 10 20
D-3	Dedicated Earth Stations (widespread and low cost) Ku Band or higher frequency	1984 1986 1990	30 30 30
D-4	High Speed (9.6 + Kbps) Packet Switched Electronic Message Systems (20 SMSA's)	1984 1986 1988	30 30 30
D-5	High Power and Capacity Satellites (Incl. Platforms)	1988 1990 1995 2000	25 25 25 25
D-6	Digital Satellite Improvements (TDMA, BURST MODEMS)	1982 1983 1985 1987	20 25 25 30

Table A

MARKET DETERMINANT FACTORS

DATA SERVICES (CONT'D)

No.	Events	Year	Probability
D-7	Facsimile Improvements	1980	30
	(VF) Advance Compression	1982	25
	Techniques - High	1984	20
	Resolution	1985	25
D-8	Trend toward Office	1985	15
	Work at Home	1987	10
	Electronic Inter-	1989	10
	connection with the office	1995	20
D-9	FM Subcarrier Broad-	1981	25
	cast Message in Use	1985	20
D-10	Public Acceptance of	1990	15
	Electronic Mail to	1995	20
	Home (incl. cost)	2000	20
	Carrier provided by CATV lines		
D-11	Connection of Domestic	1990	25
	Satellite systems to	1995	35
	international via inter-	2000	30
	satellite links		
D-12	Transoceanic cable use	1988	20
	optical fiber providing	1990	20
	lower costs and greater	1994	30
	capacity	2000	10

Table A

MARKET DETERMINANT FACTORS

DATA SERVICES (CONT'D)

No.	Events	Year	Probability
D-13	Secure Voice Standardized at 32 Kbps (instead of 56 Kbps)	1984 1986 1990	20 20 20
D-14	AT&T ACS Acceptance by Users 100 Markets	1980 1982 1985	20 40 40
D-15	SBS Acceptance (100 Low Cost Earth Stations)	1983 1985 1987 1989	15 30 30 25
D-16	AT&T Transaction Network Service provided interstate	1979 1981 1983 1985	5 20 25 0
D-17	Management Acceptance of Office Automation Practices (Equipment used by Managers and Clerical)	1981 1983 1985 1987 1990	30 25 20 15 10
D-18	Centralized Database Access	1982 1984 1986 1988	20 30 20 30

Table A

MARKET DETERMINANT FACTORS

DATA SERVICES (CONT'D)

No.	Events	Year	Probability
D-19	Use of EFT Services by the Public	1981 1983 1985 1987 1990	10 20 30 20 20
D-20	Rapid Rise in Energy Cost (Transportation) Promote use of Electronic Info. Services (Teleconferencing, video, audio, computer	1982 1984 1987 1990	20 25 30 25
D-21	Terminal Compatibility Standards adopted by various terminal types	1985 1988 1990 1995	20 20 10
D-22	Widespread implementation of Digital Radio Network (e.g. DDS)	1982 1984 1986 1988 1990	20 20 30 20 10

Table A

MARKET DETERMINANT FACTORS

VOICE SERVICES

No.	Events	Year	Probability
VO-1	Digital Telephone Keysets	1985	30
	- (Microcomputer based)	1987	25
	- additional data services	1990	30
	- home services	1995	15
	. call transfer/forwarding		
	. recording		
VO-2	Viewdata/Prestel direct to	1983	20
	home telephones	1985	20
		1987	20
		1990	10
VO-3	Intelligent digital PBX's	1980	10
	with additional functions	1982	20
		1985	30
		1988	30
		1990	10
VO-4	Fiber Optic cable use for	1985	30
	local telephone service	1987	25
	distribution	1990	20
		2000	25

Table B

MARKET DETERMINANT FACTORS

MOBILE RADIO SERVICES

No.	Events	Year	Probability
M-1	Cellular radio telephone systems widespread	1981 1983 1985 1987	25 25 25 25
M-2	Packet Radio systems using short bursts/channel sharing	1982 1985 1988	30 30 30
M-3	Nationwide paging services available	1982 1984 1986 1988	20 20 30 30
M-4	Mobile radio telephone via satellite	1982 1984 1986 1988	10 30 20 30

Table B

MARKET DETERMINANT FACTORS

RADIO PROGRAM TRANSMISSION

No.	Events	Year	Probability
R-1	FCC disapproves use of 3 meter antennas for radio program receiving	1980	15

Table B

MARKET DETERMINANT FACTORS

VIDEO SERVICES

No.	Events	Year	Probability
V-1	Significant Tech. improvements permit digital bandwidth reduction (17 MHz or less) for network quality	1985 1988 1990	50 30 20
V-2	Change in communications act permits networks to acquire and offer CATV services	1982 1984 1986	20 30 40
V-3	Emergence of many new independent networks offering new programming because of profitability of new alternatives	1985 1987 1990	50 25 25
V-4	Dramatic change in fuel prices results in increased use of video transmission for business conferences	1988 1995 2000	10 30 10
V-5	CATV orgs. deliver new programming via optical fiber T.V. systems (25% homes)	1985 1990 1995	20 25 45
V-6	In-home video equipment reduces network/CATV programming demand ($400 recorder $5 disc/tape)	1984 1988 1990	25 45 30
V-7	Slow scan video on digital voice grade lines becomes widely used	1984 1986 1990	15 20 35

Table C

MARKET DETERMINANT FACTORS

EXCLUDED EVENTS

Reason Code		
A	1.	Changes in level of government spending; availability of investment capital
B	2.	Increased use of hand-held portable telephones.
E	3.	Video compression to less than 56 Kbps.
B	4.	Voice activated switching and DSI (Digital Speech Interpolation) employed.
E	5.	Demand assignment for video conferencing.
E	6.	Multiple spot beam antennas and increased frequency reuse.
C	7.	Regional banks permitted nationwide operations.
E	8.	15 KHz stereo a.m. channels permitted by the FCC.
B	9.	Low cost receive-only stereo E.S. in widespread use for audio program channels
F	10.	Conversion of telephone key sets to direct digititation.
E	11.	Execunet type services become widely available.
F	12.	Use of high powered, multiple beam satellites for narrow-band mobile telephone.
F	13.	Integration of computers and communications in the 1980's create new services/markets.
B	14.	Use of video disks for digital data storage.
G	15.	Development of simple home terminal for pay TV, alarm services, ordering of advertised merchandise, and interactive games.

Table D

MARKET DETERMINANT FACTORS

EXCLUDED EVENTS (CONT'D)

Reason Code		
D	16.	Inexpensive video screens that respond to the touch of a finger, a pointer or light pen.
D	17.	Voice recognition devices become inexpensive and reliable.
D	18.	Development of voice identification equipment, (e.g., for authorizing financial transactions, etc.).
B	19.	Development of a "voicewriter" that can prepare draft copy from dictatiion.
D	20.	Voice response systems become widespread and more reliable - new uses created by mass storage systems.
B	21.	CRT's succeeded by flat, solid-state panels for both alpha-numeric and image displays. Used in large screen TV and portable computer terminals. Types: plasma, LED, LCD, ferroelectric ceramics, electroluminescent materials, magneto optic films.
C/G	22.	TV receivers with microprocessors allow other uses as information displaying devices.
B	23.	Microprocessors incorporated into all office typewriters, copying machines, facsimile devices, data terminals, and PABX's during 1980's. (Automated office)
C/B	24.	Remote use of intelligent copiers from digital data, using internal character generator and a laser imaging system.
F	25.	Facsimile transmission will be limited largely to documents containing handwriting, graphics or other non-standard characters.
F	26.	Widespread use of computer based PABX.
F	27.	Interconnection of terminals from different organizations (via telephone lines) for computer based teleconferencing, electronic mailbox and electronic text processing (Domestic and International).

MARKET DETERMINANT FACTORS

EXCLUDED EVENTS (CONT'D)

Reason Code

E/F	28. Switched video becomes available in 1990. Video telephones will not be commercially viable until after 1980's.
F	29. Picturephone Meeting Service (R) becomes a widely used alternative for face-to-face meetings.
C	30. Audioconferencing becomes widely used.
D/G	31. Development/evolution of the combined home terminal from: 1) the telephone, 2) television, 3) typewriter, 4) pay TV terminal, 5) video recorder/player, 6) the hand calculator, TV game and home computer.
B	32. Development and use of the intelligent telephone containing microprocessor, memory, mag card (or other data entry device) and LCD or LED readout.
E	33. Development of home Telex/TWX terminal for system access on public lines. (e.g. mailbox services)
F	34. Home facsimile terminals in widespread use prior to 1990.

Table D

REASON EVENT NOT INCLUDED AS DETERMINANT FACTOR

A. Event doesn't affect the domestic communications market demand

B. Event is equipment oriented and doesn't directly impact transmission

C. The market demand impact of event is trivial

D. Significant impact of event won't occur until after year 2000

E. Event is implementation oriented and doesn't significantly affect market demand

F. Effects of event included elsewhere or combined with larger/more general event

G. Effects of event are essentially local or short haul in nature

Table E

APPENDIX D

USER SURVEY DATA

All of the intermediate steps and final results of the user traffic study (Task 3) have been presented in Volume II, Section 3.

For market research purpose, a sample of the survey questionnaire given to median users from the top three quintiles of each user group is presented. The questionnaire was designed to determine both the user's present and projected expenditures and growth rates for transmission services. The questionnaire was sent to communication managers of representative user organizations.

The data on their present as well as future telecommunications requirements for voice, data and video communications were received and analyzed to support the evaluation of the typical communications user profile.

Figure III

SURVEY QUESTIONNAIRE

Date _____ Company _____
Interviewer _____ Address _____

Name/Title _____

1. What is your company-wide estimate of annual expenditures for:

   a) Telecommunications Transmission Services? _____
   b) Leased Communications Equipment? _____

2. At what rate (approx.) have the transmission expenditures been increasing over the past few years? 0-3%___, 4-7%___, 8-10%___, 11-15%___, 15% or more ___, No Increase ____.

3. What proportion of your total transmission expenditures are for voice, data, video and what is the rate of increase in each of these areas?

Portion of Traffic (Fill in Percent)		Service	Average Annual Rate of Increase in Expenditure (Check 1 rate per Serv.) 0-3%	4-7%	8-10%	11-15%	15% or more	No increase
Voice	_____%	Voice	_____	_____	_____	_____	_____	_____
Data	_____%	Data	_____	_____	_____	_____	_____	_____
Video	_____%	Video	_____	_____	_____	_____	_____	_____

4. What proportion of Transmission expenditures is for local (0-25 Miles), intrastate and interstate traffic?

Service	Percent of Total Expenditure Local	Interstate	Intrastate
Voice	_____ % +	_____ % +	_____ % = 100%
Data	_____ % +	_____ % +	_____ % = 100%

APPENDIX E

METROPOLITAN AREA SURVEY DATA

The primary market research data on the Phoenix SMSA traffic profile was collected through the use of a personal interview survey. The questionnaire supporting the personal survey was prepared to collect data on a variety of subject areas:

- Flow of traffic between Phoenix and other cities
- Local traffic patterns within the Phoenix metropolitan area
- Estimates of telecommunication expenditures and its distribution by service
- Present and planned use of earth stations, fiber optics, high speed data electronic mail and videoconferencing by users in Phoenix
- Total numbers of communications equipment in use

The length of the questionnaire was also designed to allow the interviewer to complete the interview in one visit with the user. Each question was carefully pretested to eliminate leading, ambiguous or intimidating questions.

PHOENIX METROPOLITAN AREA STUDY

USER QUESTIONNAIRE

Date _____

Company
Organization
Institution _____ Name and Title _____

Address _____ WU Interviewer _____

1. Identify those locations outside Phoenix with significant telecommunications traffic?

1.	_____	6.	_____
2.	_____	7.	_____
3.	_____	8.	_____
4.	_____	9.	_____
5.	_____	10.	_____

2. Identify those locations* within Phoenix with significant telecommunications traffic?

1.	_____	4.	_____
2.	_____	5.	_____
3.	_____	6.	_____

*Street address including zip code.

3. What percentage of sales do your telecommunications expenditures represent?

_____%

a) How much is spent on telecommunications annually? _____

4. What percentage of your telecommunications expenditures are related to:

Date _____ Voice _____ Video _____

5. How have your telecommunications expenditures grown over the last five years?

_____ %/year

6. How do you project telecommunication expenditures growth over the next five years?

_____%/Year

DATA TRAFFIC DISTRIBUTION BY CITY

(FROM PHOENIX)

City	Terminal Transmission Speed	Terminals	Transmission Hr/Day Per Terminal	Busy Hour

VOICE TRAFFIC DISTRIBUTION BY CITY
(FROM PHOENIX)

City	Type of Switch*	Number of Trunks	Number of Telephones	Busy Hour

*Type and number of switch (within Phoenix)/address.

USER CHARACTERISTICS

1. Have you considered installing your own Earth Station? Yes _____ No _____

   a) If yes, at what location(s)? _____

   _____

   _____

   b) If no, what were the constraints? (Cost, volume or traffic, etc.)

   _____

   _____

   _____

2. Have you considered employing fiber optics? Yes _____ No _____

   a) If yes, at what location(s)? _____

   _____

   _____

   b) If no, what were the constraints?

   _____

   _____

   _____

TRANSMISSION SPEEDS EXPECTED

Speed	Present	1980	1990	2000
300				
1200				
2400				
4800				
9600				
56 KBPS				
High Speed Fax				
1.544 MBPS				
Other (specify)				

ELECTRONIC MAIL

1. Has your company or organization studied the feasibility of electronic mail?

   Yes _____ No _____

   If yes, what percentage of your mail could be handled electronically?

   _____%

2. What percentage of your communicating word processors are used to communicate?

   Now _____% In 2 years (end 1980) _____%

   Divide the communication by: Intracompany _____%

   Intercompany _____%

   How do you expect these percentages to change:

	Next Five Years	Next Ten Years
Intracompany	_____	_____
Intercompany	_____	_____

3. Do you presently employ high speed facsimile? Yes _____ No _____

If not, do you plan to use high speed facsimile in the next five years?

Yes _____ NO _____

If yes:	Pages Per Month	Location/Location
	_____	_____
	_____	_____

VIDEOCONFERENCING

1. Please describe your anticipated usage of videoconferencing over the following time periods?

Year	Application	Origin/Destination	Hours/Wk	Busy Hour
1980				
1990				
2000				

2. Please rank in order of importance how the following factors will affect your use of videoconferencing over the next 10 years (1 meaning most important)?

Cost _____ Locations Serviced _____

Reliability _____ Acceptance by Other Users _____

Securtiy _____ Other _____

3. What percentage of those applications suitable to videoconferencing could be satisfied by a combination of audioconferencing and high speed facsimile?

_____%

HIGH SPEED DATA

(GREATER THAN 9600 BAUD)

Speed	Application	Origin	Destination	Hours/Day	Busy Hour

LOCAL PHOENIX TRAFFIC

1978:

Service	Origin/Destination	Percent of Traffic/Location	Number of Lines/Trunks

Key

Service: voice, data, video
Origin/Destination: street address and zip code

LOCAL PHOENIX TRAFFIC

1982:

Service	Origin/Destination	Percent of Traffic/Location	Number of Lines/Trunks

Key

Service: voice, data, video
Origin/Destination: street address and zip code

LOCAL PHOENIX TRAFFIC

1985:

Service	Origin/Destination	Percent of Traffic/Location	Number of Lines/Trunks

Key

Service: voice, data, video
Origin/Destination: street address and zip code

LOCAL PHOENIX TRAFFIC

1990:

Service	Origin/Destination	Percent of Traffic/Location	Number of Lines/Trunks

Key

Service: voice, data, video
Origin/Destination: street address and zip code

APPENDIX F

PARAMETRIC SATELLITE COST MODEL

Task 5A involved the projection of C and Ku-band satellite service costs. The methodology for the construction of the Parametric Satellite Cost Model is discussed in Section 5, part 3. The computer model results are displayed in Appendix E.

The results display three sets of satellite cost data and crossover distances in comparison to terrestrial service alternatives.

The first set of cost model results show the base case costs for three time periods - 1980, 1990 and 2000 and for the C and Ku-band transmission service alternatives.

The second set of results are for the same three years and transmission service alternatives, but crossover distances are where satellite costs are 20% higher than terrestrial costs. This alternative was developed to reflect market considerations which require satellite rates to be 20% below terrestrial service to influence a significant traffic movement to satellite.

The third set of satellite cost model results were in support of the 18/30 GHz traffic separation. Scenario 3 in which 18/30 GHz system service costs were assumed to be 30% below Ku-band service are reflected in the cost crossover distances.

All three sets of cost modelling take into account a steadily declining trend of terrestrial service costs. A reduction in the satellite service crossover distances is due to satellite costs projected to decline at a faster overall rate.

In addition, a schedule also found in Appendix F reflects the current terrestrial service rates for voice, low, medium and high speed data channel services on a private line basis. This schedule shows both the monthly fixed and mileage charges incorporated in the parametric model as the base year costs. Adjustments were made to these costs to reflect the anticipated decline of terrestrial rates based on historical trend analysis.

Parametric Facility Cost Model
18/30 GHz Scenario 3 (30% Lower Cost)
Crossover Distances Where
Terrestrial Costs are Equal
To 70% of Ku-Band Satellite Costs
2000

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	FS+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	# DIST
10 E S	2000	C - BAND TDMA	VOICE	49.94	1686602	168	1598098	142464	3427164	3427	942	4369	360
10 E S	2000	C - BAND FDM	VOICE	32.10	864561	168	1540695	540600	2945857	2946	942	3888	290
10 E S	2000	K - BAND TDMA	VOICE	49.94	1272845	168	3795482	159000	5227326	5228	942	6170	610
10 E S	2000	K - BAND FDM	VOICE	32.10	600332	168	3659152	540600	4800084	4800	942	5742	550
10 E S	2000	C - BAND TDMA	300 B	14.98	505981	504	479429	1587456	2572866	858	536	1394	0
10 E S	2000	C - BAND FDM	300 B	9.63	259368	504	462209	1709568	2431145	811	536	1347	0
10 E S	2000	K - BAND TDMA	300 B	14.98	381853	504	1138644	1587456	3107954	1036	536	1572	10
10 E S	2000	K - BAND FDM	300 B	9.63	180100	504	1097746	1709568	2987413	995	536	1531	10
10 E S	2000	C - BAND TDMA	9.6KB	30.02	1013969	101	960761	940262	2914993	4848	1677	6525	0
10 E S	2000	C - BAND FDM	9.6KB	19.30	519766	101	926251	1179144	2625161	4367	1677	6044	0
10 E S	2000	K - BAND TDMA	9.6KB	30.02	765222	101	2281807	950184	3997213	6649	6341	12990	720
10 E S	2000	K - BAND FDM	9.6KB	19.30	360914	101	2199847	1179144	3739905	6221	6341	12562	660
10 E S	2000	C - BAND TDMA	56 KB	5.05	170668	17	161712	42739	375120	3707	18967	22674	60
10 E S	2000	C - BAND FDM	56 KB	38.98	1049824	17	1870844	750480	3671149	36280	18967	55247	960
10 E S	2000	K - BAND TDMA	56 KB	5.05	128800	17	384067	47700	560566	5540	18967	24507	90
10 E S	2000	K - BAND FDM	56 KB	38.98	728975	17	4443256	750480	5922710	58531	18967	77498	1990

NASA - EARTH STATION COSTING MODEL

9:42:22AM MARCH 29,1979
[1978 DOLLARS]

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	X DIST
10 E S	1980	C - BAND TDMA	VOICE	80.13	3477576	269	2564194	382771	6424542	4012	942	4954	390
10 E S	1980	C - BAND FDM	VOICE	72.96	2328678	269	2334689	1452480	6115847	3819	942	4761	360
10 E S	1980	K - BAND TDMA	VOICE	80.13	2972350	269	6089961	427200	9489511	5926	942	6868	640
10 E S	1980	K - BAND FDM	VOICE	72.96	1875164	269	5544887	1452480	8872532	5541	942	6483	590
10 E S	1980	C - BAND TDMA	300 B	13.02	564945	437	416562	2310298	3291805	1266	536	1802	30
10 E S	1980	C - BAND FDM	300 B	11.85	378302	437	379279	2488013	3245593	1247	536	1783	30
10 E S	1980	K - BAND TDMA	300 B	13.02	482869	437	989336	2310298	3782502	1454	536	1990	50
10 E S	1980	K - BAND FDM	300 B	11.85	304627	437	900787	2488013	3693426	1420	536	1956	40
10 E S	1980	C - BAND TDMA	9.6KB	5.96	258556	20	190646	317979	767181	6444	1677	8121	40
10 E S	1980	C - BAND FDM	9.6KB	5.42	173136	20	173583	398765	745483	6262	1677	7939	30
10 E S	1980	K - BAND TDMA	9.6KB	5.96	220993	20	452785	321335	995112	8359	6341	14700	840
10 E S	1980	K - BAND FDM	9.6KB	5.42	139417	20	412259	398765	950441	7984	6341	14325	810
10 E S	1980	C - BAND TDMA	56 KB	0.89	38783	3	28597	14952	82332	4611	18967	23578	60
10 E S	1980	C - BAND FDM	56 KB	9.76	311645	3	312449	262550	886644	49652	18967	68619	1330
10 E S	1980	K - BAND TDMA	56 KB	0.89	33149	3	67918	16608	117754	6594	18967	25561	90
10 E S	1980	K - BAND FDM	56 KB	9.76	250951	3	742067	262550	1255568	70312	18967	89279	2210

Parametric Facility Cost Model
18/30 GHz Scenario 3 (30% Lower Cost)
Crossover Distances Where
Terrestrial Costs are Equal
To 70% of Ku-Band Satellite Costs
1990

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	% DIST
10 E S	1990	C - BAND TDMA	VOICE	65.07	2423926	218	2082388	230630	4736944	3651	942	4593	390
10 E S	1990	C - BAND FDM	VOICE	48.99	1407663	218	1959551	875160	4242373	3269	942	4211	330
10 E S	1990	K - BAND TDMA	VOICE	65.07	1931311	218	4945672	257400	7134382	5498	942	6440	650
10 E S	1990	K - BAND FDM	VOICE	48.99	1040051	218	4653933	875160	6569144	5062	942	6004	590
10 E S	1990	C - BAND TDMA	300 B	14.03	522589	470	448955	1845043	2816588	1007	536	1543	10
10 E S	1990	C - BAND FDM	300 B	10.56	303487	470	422472	1986970	2712928	970	536	1506	10
10 E S	1990	K - BAND TDMA	300 B	14.03	416384	470	1066269	1845043	3327695	1189	536	1725	30
10 E S	1990	K - BAND FDM	300 B	10.56	224231	470	1003371	1986970	3214572	1149	536	1685	20
10 E S	1990	C - BAND TDMA	9.6KB	17.91	667136	60	573134	699283	1939553	5431	1677	7108	0
10 E S	1990	C - BAND FDM	9.6KB	13.48	387430	60	539326	876942	1803698	5050	1677	6727	0
10 E S	1990	K - BAND TDMA	9.6KB	17.91	531553	60	1361194	706662	2599409	7279	6341	13620	810
10 E S	1990	K - BAND FDM	9.6KB	13.48	286253	60	1280899	876942	2444093	6843	6341	13184	750
10 E S	1990	C - BAND TDMA	56 KB	2.99	111189	10	95522	31046	237758	3994	18967	22961	60
10 E S	1990	C - BAND FDM	56 KB	26.97	774860	10	1078652	545160	2398672	40298	18967	59265	1130
10 E S	1990	K - BAND TDMA	56 KB	2.99	88592	10	226866	34650	350108	5881	18967	24848	100
10 E S	1990	K - BAND FDM	56 KB	26.97	572505	10	2561798	545160	3679463	61815	18967	80782	2140

Parametric Facility Cost Model
Crossover Distances Where
Terrestrial Costs are 20% Higher Than Satellite Costs
1990

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	X DIST
10 E S	1990	C - BAND TDMA	VOICE	65.07	2423926	218	2082388	230630	4736944	5215	1346	6561	670
10 E S	1990	C - BAND FDM	VOICE	48.99	1407663	218	1959551	875160	4242373	4670	1346	6016	590
10 E S	1990	K - BAND TDMA	VOICE	65.07	1931311	218	4945672	257400	7134382	7854	1346	9200	1080
10 E S	1990	K - BAND FDM	VOICE	48.99	1040051	218	4653933	875160	6569144	7232	1346	8578	960
10 E S	1990	C - BAND TDMA	300 B	14.03	522589	470	448955	1845043	2816588	1439	766	2205	70
10 E S	1990	C - BAND FDM	300 B	10.56	303487	470	422472	1986970	2712928	1385	766	2151	70
10 E S	1990	K - BAND TDMA	300 B	14.03	416384	470	1066269	1845043	3327695	1699	766	2465	100
10 E S	1990	K - BAND FDM	300 B	10.56	224231	470	1003371	1986970	3214572	1642	766	2408	100
10 E S	1990	C - BAND TDMA	9.6KB	17.91	667136	60	573134	699283	1939553	7758	2395	10153	320
10 E S	1990	C - BAND FDM	9.6KB	13.48	387430	60	539326	876942	1803698	7214	2395	9609	240
10 E S	1990	K - BAND TDMA	9.6KB	17.91	531553	60	1361194	706662	2599409	10398	9058	19456	2060
10 E S	1990	K - BAND FDM	9.6KB	13.48	286253	60	1280899	876942	2444093	9776	9059	18834	1920
10 E S	1990	C - BAND TDMA	56 KB	2.99	111189	10	95522	31046	237758	5706	27096	32802	320
10 E S	1990	C - BAND FDM	56 KB	26.97	774860	10	1078652	545160	2398672	57568	27096	84664	2320
10 E S	1990	K - BAND TDMA	56 KB	2.99	88592	10	226866	34650	350108	8402	27096	35498	400
10 E S	1990	K - BAND FDM	56 KB	26.97	572505	10	2561798	545160	3679463	88307	27096	115403	2500

Parametric Facility Cost Model
Crossover Distances Where
Terrestrial Costs are 20% Higher Than Satellite Costs
1980

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	X DIST
10 E S	1980	C - BAND TDMA	VOICE	80.13	3477576	269	2564194	382771	6424542	5732	1346	7078	660
10 E S	1980	C - BAND FDM	VOICE	72.96	2328678	269	2334689	1452480	6115847	5456	1346	6802	630
10 E S	1980	K - BAND TDMA	VOICE	80.13	2972350	269	6089961	427200	9489511	8466	1346	9812	1030
10 E S	1980	K - BAND FDM	VOICE	72.96	1875164	269	5544887	1452480	8872532	7916	1346	9262	940
10 E S	1980	C - BAND TDMA	300 B	13.02	564945	437	416562	2310298	3291805	1808	766	2574	100
10 E S	1980	C - BAND FDM	300 B	11.85	378302	437	379279	2488013	3245593	1782	766	2548	100
10 E S	1980	K - BAND TDMA	300 B	13.02	482869	437	989336	2310298	3782502	2077	766	2843	130
10 E S	1980	K - BAND FDM	300 B	11.85	304627	437	900787	2488013	3693426	2028	766	2794	130
10 E S	1980	C - BAND TDMA	9.6KB	5.96	258556	20	190646	317979	767181	9206	2395	11601	460
10 E S	1980	C - BAND FDM	9.6KB	5.42	173136	20	173583	398765	745483	8946	2395	11341	420
10 E S	1980	K - BAND TDMA	9.6KB	5.96	220993	20	452785	321335	995112	11941	9058	20999	2100
10 E S	1980	K - BAND FDM	9.6KB	5.42	139417	20	412259	398765	950441	11405	9058	20463	1990
10 E S	1980	C - BAND TDMA	56 KB	0.89	38783	3	28597	14952	82332	6587	27096	33683	300
10 E S	1980	C - BAND FDM	56 KB	9.76	311645	3	312449	262550	886644	70932	27096	98028	2500
10 E S	1980	K - BAND TDMA	56 KB	0.89	33149	3	67918	16688	117754	9420	27096	36516	370
10 E S	1980	K - BAND FDM	56 KB	9.76	250951	3	742067	262550	1255568	100446	27096	127542	2500

Parametric Facility Cost Model
Crossover Distances Where
Terrestrial Costs are 20% Higher Than Satellite Costs
2000

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	% DIST
10	E S	2000 C - BAND	TDMA VOICE	49.94	1686602	168	1598098	142464	3427164	4896	1346	6242	620
10	E S	2000 C - BAND	FDM VOICE	32.10	864561	168	1540695	540600	2945857	4208	1346	5554	530
10	E S	2000 K - BAND	TDMA VOICE	49.94	1272845	168	3795482	159000	5227326	7468	1346	8814	990
10	E S	2000 K - BAND	FDM VOICE	32.10	600332	168	3659152	540600	4800084	6857	1346	8203	900
10	E S	2000 C - BAND	TDMA 300 B	14.98	505981	504	479429	1587456	2572866	1225	766	1991	50
10	E S	2000 C - BAND	FDM 300 B	9.63	259368	504	462709	1709568	2431145	1158	766	1924	50
10	E S	2000 K - BAND	TDMA 300 B	14.98	381853	504	1138644	1587456	3107954	1480	766	2246	80
10	E S	2000 K - BAND	FDM 300 B	9.63	180100	504	1097746	1709568	2987413	1422	766	2188	70
10	E S	2000 C - BAND	TDMA 9.6KB	30.02	1013969	101	960761	940262	2914993	6926	2395	9321	200
10	E S	2000 C - BAND	FDM 9.6KB	19.30	519766	101	926251	1179144	2625161	6238	2395	8633	100
10	E S	2000 K - BAND	TDMA 9.6KB	30.02	765222	101	2281807	950184	3997213	9498	9058	18556	1850
10	E S	2000 K - BAND	FDM 9.6KB	19.30	360914	101	2199847	1179144	3739905	8887	9058	17945	1710
10	E S	2000 C - BAND	TDMA 56 KB	5.05	170668	17	161712	42739	375120	5296	27096	32392	310
10	E S	2000 C - BAND	FDM 56 KB	38.98	1049824	17	1870844	750480	3671149	51828	27096	78924	2050
10	E S	2000 K - BAND	TDMA 56 KB	5.05	128800	17	384067	47700	560566	7914	27096	35010	390
10	E S	2000 K - BAND	FDM 56 KB	38.98	728975	17	4443256	750480	5922710	83615	27096	110711	2500

Parametric Facility Cost Model
Crossover Distances Where
Satellite and Terrestrial Costs Equal
2000

MODEL	YEAR	F S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	% DIST
10 E S	2000	C - BAND TDMA	VOICE	49.94	1686602	168	1598098	142464	3427164	4080	1122	5202	400
10 E S	2000	C - BAND FDM	VOICE	32.10	864561	168	1540695	540600	2945857	3507	1122	4629	390
10 E S	2000	K - BAND TDMA	VOICE	49.94	1272845	168	3795482	159000	5227326	6223	1122	7345	780
10 E S	2000	K - BAND FDM	VOICE	32.10	600332	168	3659152	540600	4800084	5714	1122	6836	710
10 E S	2000	C - BAND TDMA	300 B	14.98	505981	504	479429	1587456	2572866	1021	638	1659	20
10 E S	2000	C - BAND FDM	300 B	9.63	259368	504	462209	1709568	2431145	965	638	1603	20
10 E S	2000	K - BAND TDMA	300 B	14.98	381853	504	1138644	1587456	3107954	1233	638	1871	40
10 E S	2000	K - BAND FDM	300 B	9.63	180100	504	1097746	1709568	2987413	1185	638	1823	40
10 E S	2000	C - BAND TDMA	9.6KB	30.02	1013969	101	960761	940262	2914993	5772	1996	7768	30
10 E S	2000	C - BAND FDM	9.6KB	19.30	519766	101	926251	1179144	2625161	5198	1996	7194	0
10 E S	2000	K - BAND TDMA	9.6KB	30.02	765222	101	2281807	950184	3997213	7915	7548	15463	1120
10 E S	2000	K - BAND FDM	9.6KB	19.30	360914	101	2199847	1179144	3739905	7406	7548	14954	1000
10 E S	2000	C - BAND TDMA	56 KB	5.05	170668	17	161712	42739	375120	4413	22580	26993	160
10 E S	2000	C - BAND FDM	56 KB	38.98	1049824	17	1870844	750480	3671149	43190	22580	65770	2430
10 E S	2000	K - BAND TDMA	56 KB	5.05	128800	17	384067	47700	560566	6595	22580	29175	220
10 E S	2000	K - BAND FDM	56 KB	38.98	728975	17	4443256	750480	5922710	69679	22580	92259	2500

Parametric Facility Cost Model
Crossover Distances Where
Satellite and Terrestrial Costs Equal
1990

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EI	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	X DIST
10 E S	1990	C - BAND TDMA	VOICE	65.07	2423926	218	2082388	230630	4736944	4346	1122	5468	510
10 E S	1990	C - BAND FDM	VOICE	48.99	1407663	218	1959551	875160	4242373	3892	1122	5014	450
10 E S	1990	K - BAND TDMA	VOICE	65.07	1931311	218	4945672	257400	7134382	6545	1122	7667	830
10 E S	1990	K - BAND FDM	VOICE	48.99	1040051	218	4653933	875160	6569144	6027	1122	7149	750
10 E S	1990	C - BAND TDMA	300 B	14.03	522589	470	448955	1845043	2816588	1199	638	1837	40
10 E S	1990	C - BAND FDM	300 B	10.56	303487	470	422472	1986970	2712928	1154	638	1792	30
10 E S	1990	K - BAND TDMA	300 B	14.03	416384	470	1066269	1845043	3327695	1416	638	2054	60
10 E S	1990	K - BAND FDM	300 B	10.56	224231	470	1003371	1986970	3214572	1368	638	2006	50
10 E S	1990	C - BAND TDMA	9.6KB	17.91	667136	60	573134	699283	1939553	6465	1996	8461	80
10 E S	1990	C - BAND FDM	9.6KB	13.48	387430	60	539326	876942	1803698	6012	1996	8008	50
10 E S	1990	K - BAND TDMA	9.6KB	17.91	531553	60	1361194	706662	2599409	8665	7548	16213	1300
10 E S	1990	K - BAND FDM	9.6KB	13.48	286253	60	1280899	876942	2444093	8147	7548	15695	1180
10 E S	1990	C - BAND TDMA	56 KB	2.99	111189	10	95522	31046	237758	4755	22580	27335	170
10 E S	1990	C - BAND FDM	56 KB	26.97	774860	10	1078652	545160	2398672	47973	22580	70553	1660
10 E S	1990	K - BAND TDMA	56 KB	2.99	88592	10	226866	34650	350108	7002	22580	29582	230
10 E S	1990	K - BAND FDM	56 KB	26.97	572505	10	2561798	545160	3679463	73589	22580	96169	2500

Parametric Facility Cost Model
Crossover Distances Where
Satellite and Terrestrial Costs Equal
1980

MODEL	YEAR	E S SYSTEM	SPEED	WEIGHT	ES+EL	CHAN/ES	SPACE	CH COST	TOTAL	TOTAL/CH	LOOP	CH+LOOP	= DIST
10 E S	1980	C - BAND TDMA	VOICE	80.13	3477576	269	2564194	382771	6424542	4777	1122	5899	510
10 E S	1980	C - BAND FDM	VOICE	72.96	2328678	269	2334689	1452480	6115847	4547	1122	5669	480
10 E S	1980	K - BAND TDMA	VOICE	80.13	2972350	269	6089961	427200	9489511	7055	1122	8177	800
10 E S	1980	K - BAND FDM	VOICE	72.96	1875164	269	5544887	1452480	8872532	6597	1122	7719	750
10 E S	1980	C - BAND TDMA	300 B	13.02	564945	437	416562	2310298	3291805	1507	638	2145	60
10 E S	1980	C - BAND FDM	300 B	11.85	378302	437	379279	2488013	3245593	1485	638	2123	60
10 E S	1980	K - BAND TDMA	300 B	13.02	482869	437	989336	2310298	3782502	1731	638	2369	80
10 E S	1980	K - BAND FDM	300 B	11.85	304627	437	900787	2488013	3693426	1690	638	2328	80
10 E S	1980	C - BAND TDMA	9.6KB	5.96	258556	20	190646	317979	767181	7672	1996	9668	210
10 E S	1980	C - BAND FDM	9.6KB	5.42	173136	20	173583	398765	745483	7455	1996	9451	180
10 E S	1980	K - BAND TDMA	9.6KB	5.96	220993	20	452785	321335	995112	9951	7548	17499	1360
10 E S	1980	K - BAND FDM	9.6KB	5.42	139417	20	412259	398765	950441	9504	7548	17052	1270
10 E S	1980	C - BAND TDMA	56 KB	0.89	38783	3	28597	14952	82332	5489	22580	28069	150
10 E S	1980	C - BAND FDM	56 KB	9.76	311645	3	312449	262550	886644	59110	22580	81690	1890
10 E S	1980	K - BAND TDMA	56 KB	0.89	33149	3	67918	16608	117754	7850	22580	30430	210
10 E S	1980	K - BAND FDM	56 KB	9.76	250951	3	742067	262550	1255568	83705	22580	106285	2500

TERRESTRIAL SERVICE CHANNEL RATES

VOICE CHANNEL (4 KHz)

Source: Type 2001 AT&T/WU Private Line Tariffs

FIXED CHARGE	STATION TERMINAL CHARGE	TOTAL CIRCUIT CHARGE
$ 49.20/End	$ 25.00/Terminal	$ 148.20

INTEREXCHANGE MILEAGE (SCHEDULE 1)

1 - 15 miles	$ 1.80
16 - 25	1.50
26 - 40	1.12
41 - 60	1.12
61 - 80	1.12
81 - 100	1.12
101 - 1000	.66
1000 and over	.40

LOW SPEED DATA (150 BAUD)

Source: Type 1006 AT&T/WU Private Line Tariffs

CHANNEL TERMINAL	STATION TERMINAL	TOTAL CIRCUIT CHARGE
$ 30/Terminal	$ 60/Terminal	$ 180.00

IXC MILEAGE (MONTHLY)

1- 100 MILES	101-250	250-500	501-1000	1000 +
$ 1.55	$ 1.25	$ .80	$ .50	$ .30

APPENDIX G

SATELLITE ADDRESSABLE MARKET DEMAND

The computer printouts of the detailed satellite addressable market forecasts for voice and data service applications are found in Appendix F. The intermediate step forecasts which segregate traffic meeting user and technical constraints are also shown. These forecasts of traffic relate to efforts found in Tasks 5C and 6C in Sections 5 and 6 of Volume II.

For both the voice and data service forecasts, the following similar traffic reports are shown:

- C-band service demand after removal of unacceptable user and technical considerations
- Ku-band service demand after removal of the same two factors
- 18/30 GHz Scenarios 2 and 3 (similar service quality) after removal of the same two factors
- C-band addressable market after removal of traffic below cost crossover distance
- Ku-band net addressable market after removal of traffic below cost crossover distance
- Scenarios 2 and 3 net addressable markets after removal of traffic below cost crossover distance
- Scenario 3 forecasts reflecting the effect of the 30% price reduction

The voice services market forecast is shown in thousands of half circuits. Data services traffic demand for the C and Ku-band and 18/30 GHz scenarios is displayed in both terabits per year and megabits per second.

Video service forecasts were calculated without use of the computer model and did not generate forecasts in a greater detail than those already found in part 6.0 of Section 2.

SERVICE DEMAND ASSESSMENT

Balance After Addition of Price/Demand Elasticity Advantage

18/30 GHz - Scenario 3

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	279.8000	340.1000	581.0000	980.1000	1647.6000	2715.1000
MTS (PUBLIC)						
MTS (BUSINESS)		3.0000	18.0000	53.4000	137.7000	327.5000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE	0.8000	1.1000	4.2000	8.8000	14.9000	22.9000
TOTAL ALL APPLICATIONS	280.6000	344.2000	603.2000	1042.3000	1800.2000	3065.5000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Unacceptable User and Application Characteristics

C-Band

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	585.7000	682.9000	1062.6000	1652.8000	2586.4000	3998.9000
MTS (PUBLIC)	91.8000	115.5000	202.6000	350.4000	577.8000	940.7000
MTS (BUSINESS)	68.9000	99.6000	179.2000	359.5000	741.1000	1523.3000
RADIO PROGRAM TRANSMISSION		0.8000	5.1000	6.0000	6.0000	6.9000
MOBILE RADIO TELEPHONE	3.9000	5.3000	17.7000	33.2000	51.1000	71.8000
TOTAL ALL APPLICATIONS	749.3000	894.1000	1467.2000	2400.9000	3962.4000	6541.6000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below
Terrestrial/Satellite Cost Separations)

Ku-Band

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	105.5000	124.1000	192.5000	298.1000	499.5000	824.0000
WTS (PUBLIC)	5.3000	7.6000	16.2000	31.9000	61.8000	115.1000
WTS (BUSINESS)	7.9000	10.4000	20.3000	39.7000	86.4000	186.4000
RADIO PROGRAM TRANSMISSION			0.2000	0.2000	0.3000	0.3000
MOBILE RADIO TELEPHONE	0.3000	0.4000	1.4000	2.8000	4.9000	7.8000
TOTAL ALL APPLICATIONS	119.0000	142.5000	230.6000	372.7000	652.9000	1133.6000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Unacceptable
User and Application Characteristics

18/30 GHz - Scenarios 2 and 3

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	260.3000	316.3000	540.4000	911.7000	1532.7000	2525.6000
MTS (PUBLIC)		2.8000	16.7000	49.6000	128.1000	304.7000
MTS (BUSINESS)						
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE	0.7000	1.0000	3.9000	8.2000	13.9000	21.3000
TOTAL ALL APPLICATIONS	261.0000	320.1000	561.0000	969.5000	1674.7000	2851.6000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below Terrestrial/Satellite Cost Separations)

C-Band

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1979	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	226.4000	263.9000	422.7000	674.1000	1103.4000	1775.9000
MTS (PUBLIC)	35.5000	44.6000	80.6000	143.4000	246.5000	417.8000
WTS (BUSINESS)	26.3000	34.6000	71.3000	146.7000	316.1000	676.5000
RADIO PROGRAM TRANSMISSION		0.3000	2.0000	2.4000	2.5000	3.0000
MOBILE RADIO TELEPHONE	1.5000	2.1000	7.0000	13.6000	21.8000	31.9000
TOTAL ALL APPLICATIONS	289.7000	345.5000	583.6000	982.2000	1690.3000	2905.1000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below Terrestrial/Satellite Cost Separations)

18/30 GHz - Scenario 3

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	107.0000	130.0000	220.5000	369.2000	635.9000	1073.0000
MTS (PUBLIC)						
MTS (BUSINESS)		1.2000	6.8000	20.1000	53.2000	129.4000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE	0.3000	0.4000	1.6000	3.3000	5.8000	9.1000
TOTAL ALL APPLICATIONS	107.3000	131.6000	228.9000	392.6000	694.9000	1211.5000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Unacceptable User and Application Characteristics

Ku-Band

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	86.2000	117.9000	325.5000	913.7000	2287.7000	5626.7000
GOVERNMENT	76.8000	99.1000	220.0000	515.0000	1033.1000	1949.9000
BATCH PROCESSING						
NON-GOVERNMENT	88.4000	113.7000	232.5000	482.5000	853.5000	1410.3000
GOVERNMENT	8.4000	10.8000	21.8000	44.7000	78.5000	129.7000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	37.4000	50.7000	130.5000	335.6000	863.4000	2098.9000
GOVERNMENT	7.9000	10.3000	23.0000	57.1000	126.5000	275.2000
TOTAL HIGH SPEED/WIDE BAND	305.1000	402.5000	953.3000	2348.4000	5242.7000	11489.1000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	20.1000	25.8000	50.7000	95.3000	160.3000	255.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	80.5000	104.5000	213.0000	424.0000	739.4000	1220.0000
GOVERNMENT	12.1000	15.5000	30.1000	57.1000	95.3000	150.3000
TOTAL LOW SPEED/MEDIUM SPEED	112.7000	145.8000	293.8000	576.4000	995.0000	1625.3000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	26.4000	42.8000	160.5000	497.1000	1144.5000	3554.6000
GOVERNMENT	2.9000	4.8000	17.8000	43.2000	99.4000	177.5000
PRIVATE TIME SHARING	5.7000	7.7000	17.6000	38.9000	78.2000	150.7000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	9.8000	13.4000	32.1000	70.5000	139.9000	244.7000
GOVERNMENT	1.1000	1.5000	3.6000	7.9000	15.5000	27.4000
TOTAL INTERACTIVE	45.9000	70.2000	231.6000	657.6000	1477.5000	3154.9000
PACKET SWITCHING	3.8000	6.1000	18.9000	59.5000	186.7000	545.4000
TOTAL DATA TRANSMISSION	467.5000	624.6000	1497.6000	3661.9000	7901.9000	16844.7000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	36.6000	49.5000	126.9000	310.2000	679.4000	1411.7000
GOVERNMENT	8.5000	11.2000	24.6000	51.7000	97.4000	174.0000
OPERATIONAL FACSIMILE	2.8000	4.3000	16.2000	65.7000	205.1000	623.9000
COMMUNICATING WORD PROCESSOR	1.4000	2.3000	10.4000	37.7000	97.0000	227.1000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	1.7000	2.6000	7.6000	16.4000	28.3000	44.1000
GOVERNMENT	0.3000	0.5000	1.3000	2.9000	5.0000	8.0000
MAILBOX SERVICES	2.4000	3.7000	10.9000	25.8000	57.3000	126.9000
TOTAL RESTRICTED ACCESS	53.7000	74.1000	197.9000	510.4000	1169.5000	2619.7000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.2000	1.3000	1.5000	1.9000	2.5000	3.2000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.4000	0.8000	1.3000	2.1000
USPS EMSS						
NON-GOVERNMENT			487.3000	920.0000	1002.9000	1085.3000
GOVERNMENT			42.4000	80.0000	87.3000	94.5000
TOTAL OPEN ACCESS	1.4000	1.5000	531.6000	1002.7000	1094.0000	1185.1000
TOTAL ELECTRONIC MAIL	55.1000	75.6000	729.5000	1513.1000	2263.5000	3804.8000
EFTS /POS/APPLICATIONS						
INQUIRY/RESPONSE	2.3000	4.3000	20.3000	64.6000	168.4000	438.1000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	5.9000	9.2000	30.7000	72.8000	169.0000	371.7000
GOVERNMENT	1.1000	1.6000	5.3000	12.5000	28.4000	64.0000
TOTAL EFTS/POS	9.3000	15.1000	56.3000	149.9000	361.8000	873.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	24.3000	27.1000	38.6000	62.0000	97.9000	166.7000
GOVERNMENT	8.1000	9.0000	12.9000	15.5000	24.5000	22.7000
SECURE VOICE			38.2000	101.7000	258.9000	600.7000
MONITORING SERVICES					0.2000	1.0000
TOTAL MISCELLANEOUS	32.4000	36.1000	89.7000	179.2000	381.5000	791.1000
TOTAL ALL APPLICATIONS	564.3000	751.4000	2373.1000	5504.1000	10908.7000	22316.4000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Unacceptable
User and Application Characteristics

C-Band

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	91.0000	124.5000	343.6000	964.4000	2414.7000	5939.3000
GOVERNMENT	81.1000	104.6000	232.2000	543.6000	1090.5000	2056.2000
BATCH PROCESSING						
NON-GOVERNMENT	93.9000	120.2000	242.7000	496.6000	866.4000	1419.3000
GOVERNMENT	8.9000	11.4000	22.7000	46.0000	79.7000	129.7000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	39.5000	53.2000	135.1000	363.7000	873.0000	2038.3000
GOVERNMENT	8.3000	10.8000	23.9000	58.4000	127.9000	275.2000
TOTAL HIGH SPEED/WIDE BAND	322.7000	424.7000	1000.2000	2472.7000	5452.2000	11880.0000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	20.1000	25.8000	50.7500	95.3000	160.3000	255.0000
REMOTE JOB ENTRY						
NON-GOVERNMENT	80.5000	104.5000	213.0000	474.4000	739.4000	1220.0000
GOVERNMENT	12.1000	15.5000	30.1000	57.1000	95.3000	150.3000
TOTAL LOW SPEED/MEDIUM SPEED	112.7000	145.8000	293.8000	626.8000	994.9000	1625.3000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	27.9000	45.3000	166.7000	525.5000	1206.9000	2690.4000
GOVERNMENT	3.1000	5.0700	18.8000	45.7000	104.0000	187.3000
PRIVATE TIME SHARING	5.7000	7.7000	17.6000	36.9000	78.2000	150.7000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	9.8000	13.4000	32.1000	70.5000	139.9000	264.7000
GOVERNMENT	1.1000	1.5000	3.6000	7.9000	15.6000	29.6000
TOTAL INTERACTIVE	47.6000	72.9000	241.8000	686.5000	1547.6000	3328.7000
PACKET SWITCHING	4.1000	6.4000	20.1000	63.0000	197.7000	619.9000
TOTAL DATA TRANSMISSION	487.1000	649.8000	1955.9000	3800.6000	8192.3000	17453.9000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	38.8000	52.7000	136.8000	338.7000	750.6000	1577.8000
GOVERNMENT	9.0000	11.9000	26.5000	56.4000	107.7000	194.4000
OPERATIONAL FACSIMILE	3.1000	4.8000	17.9000	72.8000	227.3000	697.9000
COMMUNICATING WORD PROCESSOR	1.5000	2.6000	11.7000	42.3000	108.5000	253.8000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	16.5000	21.8000	46.2000	78.6000	111.1000	146.9000
GOVERNMENT	2.9000	3.9000	8.0000	13.8000	19.5000	19.9000
MAILBOX SERVICES	2.5000	3.9000	11.5000	27.2000	60.3000	133.6000
TOTAL RESTRICTED ACCESS	74.3000	101.6000	258.6000	629.8000	1385.0000	3024.3000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.9000	1.4000	1.7000	2.1000	2.8000	3.5000
MAILGRAM AND TELEGRAM	0.2000	0.7000	0.4000	0.4000	1.4000	2.9000
USPS EMSS						
NON-GOVERNMENT			487.3000	970.0000	1007.9000	1085.3000
GOVERNMENT			42.4000	80.0000	87.3000	94.5000
TOTAL OPEN ACCESS	1.9000	1.6000	531.8000	1003.0000	1094.4000	1185.6000
TOTAL ELECTRONIC MAIL	75.8000	103.2000	790.4000	1632.8000	2479.4000	4209.9000
BEIS IIS/APPLICATIONS						
INQUIRY/RESPONSE	2.4000	4.5000	21.4000	68.3000	177.9000	462.5000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	6.7000	10.3000	33.8000	79.1000	176.5000	392.4000
GOVERNMENT	1.2000	1.8000	5.8000	13.6000	30.4000	67.5000
TOTAL BEIS/POS	10.3000	16.6000	61.0000	161.0000	384.8000	922.4000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	26.9000	30.0000	42.8000	68.7000	108.5000	184.7000
GOVERNMENT	9.0000	10.0000	14.3000	17.2000	27.1000	25.2000
SECURE VOICE			40.3000	107.9000	273.3000	634.1000
MONITORING SERVICES					0.2000	1.0000
TOTAL MISCELLANEOUS	35.9000	40.0000	97.4000	193.2000	409.1000	845.0000
TOTAL ALL APPLICATIONS	609.1000	809.6000	2904.7000	5787.6000	11465.6000	23431.2000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below Terrestrial/Satellite Cost Separations)

18/30 GHz - Scenario 2

Voice Category - Expected Case Summary

(half voice circuits x 1000)

	1978	1980	1985	1990	1995	2000
PRIVATE LINE (INCL TELPAK)	60.3000	73.3000	122.4000	201.9000	357.2000	618.0000
MTS (PUBLIC)						
MTS (BUSINESS)		0.7000	3.8000	11.0000	29.9000	74.6000
RADIO PROGRAM TRANSMISSION						
MOBILE RADIO TELEPHONE	0.2000	0.2000	0.9000	1.8000	3.2000	5.2000
TOTAL ALL APPLICATIONS	60.5000	74.2000	127.1000	214.7000	390.3000	697.8000

SERVICE DEMAND ASSESSMENT

Balance After Removal of Unacceptable User and Application Characteristics

18/30 GHz - Scenarios 2 and 3

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	76.6000	104.9000	290.0000	815.2000	2044.1000	5034.4000
GOVERNMENT	68.3000	88.2000	196.0000	459.5000	929.1000	1744.7000
BATCH PROCESSING						
NON-GOVERNMENT	83.7000	109.1000	279.9000	691.4000	898.1000	1441.0000
GOVERNMENT	7.9000	10.3000	21.5000	45.4000	82.6000	140.8000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	33.3000	45.1000	116.4000	317.9000	773.4000	1847.4000
GOVERNMENT	7.0000	9.1000	20.6000	51.1000	113.3000	247.0000
TOTAL HIGH SPEED/WIDE BAND	276.8000	366.7000	874.4000	2181.1000	4834.6000	10655.3000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	15.6000	20.1000	39.5000	74.7000	126.1000	201.3000
REMOTE JOB ENTRY						
NON-GOVERNMENT	62.4000	81.0000	165.5000	329.9000	576.1000	951.8000
GOVERNMENT	9.4000	12.0000	23.3000	44.4000	74.2000	117.2000
TOTAL LOW SPEED/MEDIUM SPEED	87.4000	113.1000	228.3000	449.0000	776.4000	1270.3000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	14.0000	21.1000	69.3000	196.7000	507.0000	1241.8000
GOVERNMENT	1.9000	2.3000	7.7000	17.1000	44.0000	86.3000
PRIVATE TIME SHARING	4.1000	5.7000	13.0000	29.3000	58.7000	116.8000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	6.0000	8.2000	19.8000	43.6000	86.8000	164.9000
GOVERNMENT	0.7000	0.9000	2.2000	4.9000	9.6000	18.3000
TOTAL INTERACTIVE	26.3000	38.2000	112.0000	291.6000	707.1000	1628.1000
PACKET SWITCHING	2.7000	4.3000	13.6000	42.9000	135.2000	425.4000
TOTAL DATA TRANSMISSION	393.2000	522.9000	1228.3000	2964.6000	6453.3000	13979.1000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	30.4000	41.7000	110.7000	277.4000	624.8000	1333.3000
GOVERNMENT	7.1000	9.4000	21.3000	46.2000	89.6000	164.3000
OPERATIONAL FACSIMILE	2.7000	4.1000	15.3000	62.2000	194.3000	596.7000
COMMUNICATING WORD PROCESSOR	1.3000	2.2000	10.0000	36.8000	95.8000	227.1000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	1.7000	2.6000	7.6000	16.4000	28.3000	44.1000
GOVERNMENT	0.3000	0.5000	1.3000	2.9000	5.0000	6.0000
MAILBOX SERVICES	2.1000	3.3000	9.9000	23.7000	53.4000	119.8000
TOTAL RESTRICTED ACCESS	45.6000	63.8000	175.6000	465.6000	1091.2000	2491.3000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.1000	1.2000	1.5000	1.9000	2.4000	3.0900
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.3000	0.8000	1.2000	2.0000
USPS EMSS						
NON-GOVERNMENT			467.0000	894.4000	989.0000	1085.3000
GOVERNMENT			40.6000	77.8000	86.1000	94.5000
TOTAL OPEN ACCESS	1.3000	1.4000	509.4000	974.8000	1078.7000	1184.8000
TOTAL ELECTRONIC MAIL	46.9000	65.2000	685.0000	1440.4000	2169.9000	3676.1000
EFTS EFS/APPLICATIONS						
INQUIRY/RESPONSE	1.2000	2.1000	8.7000	25.6000	74.6000	213.0000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	4.9000	7.6000	25.3000	60.2000	137.0000	309.8000
GOVERNMENT	0.9000	1.3000	4.3000	10.4000	23.6000	53.3000
TOTAL EFTS/POS	7.0000	11.0000	38.3000	96.2000	235.2000	576.1000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	20.4000	22.8000	32.5000	52.2000	82.5000	140.4000
GOVERNMENT	6.8000	7.6000	10.9000	13.1000	20.6000	19.2000
SECURE VOICE			33.9000	90.4000	230.2000	534.0000
MONITORING SERVICES					0.1000	0.8000
TOTAL MISCELLANEOUS	27.2000	30.4000	77.3000	155.7000	333.4000	694.4000
TOTAL ALL APPLICATIONS	474.3000	628.9000	2028.9000	4656.9000	9191.8000	18825.7000

SERVICE DEMAND ASSESSMENT

Balance After Addition of Price/Demand Elasticity Advantage

18/30 GHz - Scenario 3

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	82.4000	112.7000	311.7000	876.3000	2197.4000	5412.0000
GOVERNMENT	73.4000	94.8000	210.7000	494.0000	992.3000	1875.5000
BATCH PROCESSING						
NON-GOVERNMENT	90.0000	117.2000	247.2000	528.8000	965.4000	1656.5000
GOVERNMENT	8.5000	11.1000	23.2000	49.0000	88.8000	151.4000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	35.7000	48.5000	125.1000	341.7000	831.4000	1985.9000
GOVERNMENT	7.5000	9.8000	22.1000	54.9000	121.8000	265.5000
TOTAL HIGH SPEED/WIDE BAND	297.5000	394.1000	940.0000	2344.7000	5197.1000	11346.8000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	16.7000	21.6000	42.5000	80.3000	139.6000	216.4000
REMOTE JOB ENTRY						
NON-GOVERNMENT	67.1000	87.1000	177.9000	354.6000	619.3000	1023.2000
GOVERNMENT	10.1000	12.9000	25.1000	47.8000	79.8000	126.0000
TOTAL LOW SPEED/MEDIUM SPEED	93.9000	121.6000	245.5000	482.7000	834.7000	1365.6000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	15.0000	22.7000	74.5000	211.5000	545.0000	1335.0000
GOVERNMENT	1.7000	2.5000	8.3000	18.4000	47.3000	92.7000
PRIVATE TIME SHARING	4.5000	6.1000	14.0000	31.5000	64.2000	125.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	6.5000	8.8000	21.2000	46.9000	93.3000	177.2000
GOVERNMENT	0.7000	1.0000	2.4000	5.2000	10.4000	19.7000
TOTAL INTERACTIVE	28.4000	41.1000	120.4000	313.5000	760.2000	1750.2000
PACKET SWITCHING	2.9000	4.7000	14.6000	46.1000	145.3000	457.1000
TOTAL DATA TRANSMISSION	422.7000	561.5000	1320.5000	3187.0000	6937.3000	14919.9000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	32.7000	44.8000	116.4000	298.2000	671.6000	1433.3000
GOVERNMENT	7.6000	10.1000	22.9000	49.7000	96.3000	176.6000
OPERATIONAL FACSIMILE	8.8000	4.4000	16.5000	66.9000	208.9000	641.5000
COMMUNICATING WORD PROCESSOR	1.4000	2.4000	10.8000	39.6000	103.0000	244.2000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	1.8000	2.8000	8.1000	17.7000	30.4000	47.4000
GOVERNMENT	0.3000	0.5000	1.4000	3.1000	5.3000	6.4000
MAILBOX SERVICES	2.3000	3.5000	10.7000	25.5000	57.4000	128.8000
TOTAL RESTRICTED ACCESS	48.9000	68.5000	188.8000	500.7000	1172.9000	2678.2000
OPEN ACCESS NETWORKS						
TWX AND TELEX	1.2000	1.3000	1.6000	1.9000	2.6000	3.2000
MAILGRAM AND TELEGRAM	0.2000	0.2000	0.4000	0.8000	1.3000	2.1000
USPS EMSS						
NON-GOVERNMENT			502.0000	961.5000	1063.1000	1166.7000
GOVERNMENT			43.7000	83.6000	92.5000	101.6000
TOTAL OPEN ACCESS	1.4000	1.5000	547.7000	1047.8000	1159.5000	1273.6000
TOTAL ELECTRONIC MAIL	50.3000	70.0000	736.5000	1548.5000	2332.4000	3951.8000
EFTS, EIS/APPLICATIONS						
INQUIRY/RESPONSE	1.9000	2.3000	9.4000	27.5000	80.2000	228.9000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	5.2000	8.1000	27.2000	64.8000	147.3000	333.0000
GOVERNMENT	1.0000	1.4000	4.7000	11.1000	25.4000	57.3000
TOTAL EFTS/EDS	7.9000	11.8000	41.3000	103.4000	252.9000	619.2000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	22.0000	24.5000	35.0000	56.1000	88.6000	150.9000
GOVERNMENT	7.4000	8.2000	11.7000	14.1000	22.1000	20.6000
SECURE VOICE			36.5000	97.2000	247.4000	574.0000
MONITORING SERVICES					0.1000	0.9000
TOTAL MISCELLANEOUS	29.4000	32.7000	83.2000	167.4000	358.2000	746.4000
TOTAL ALL APPLICATIONS	509.9000	676.0000	2181.5000	5006.3000	9880.8000	20237.3000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below
Terrestrial/Satellite Cost Separations)

C-Band

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	36.2000	49.4000	147.9000	444.9000	1075.9000	2510.8000
GOVERNMENT	32.2000	41.6000	94.9000	250.7000	485.8000	870.1000
BATCH PROCESSING						
NON-GOVERNMENT	40.2000	51.5000	136.5000	351.3000	597.4000	939.6000
GOVERNMENT	3.8000	4.9000	12.8000	32.3000	54.9000	85.9000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	25.4000	34.3000	95.1000	277.8000	693.6000	1691.0000
GOVERNMENT	5.4000	6.9000	16.8000	44.6000	101.6000	226.1000
TOTAL HIGH SPEED/WIDE BAND	143.7000	188.6000	509.0000	1401.8000	3009.2000	6323.5000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	18.1000	23.3000	46.7000	90.0000	152.3000	243.7000
REMOTE JOB ENTRY						
NON-GOVERNMENT	52.4000	68.1000	153.7000	334.8000	611.8000	1054.7000
GOVERNMENT	7.9000	10.1000	21.7000	45.1000	78.8000	129.9000
TOTAL LOW SPEED/MEDIUM SPEED	78.4000	101.5000	222.1000	469.9000	842.9000	1427.8000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	22.6000	34.8000	137.7000	435.0000	1051.7000	2467.1000
GOVERNMENT	2.5000	4.1000	15.3000	37.8000	91.3000	171.4000
PRIVATE TIME SHARING	5.1000	7.0000	16.2000	36.7000	73.8000	143.2000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	8.8000	12.1000	29.6000	66.6000	131.7000	250.9000
GOVERNMENT	1.0000	1.3000	3.3000	7.4000	14.6000	27.9000
TOTAL INTERACTIVE	40.0000	61.3000	202.1000	583.5000	1363.1000	3060.5000
PACKET SWITCHING	2.2000	3.1000	11.8000	22.2000	106.3000	466.6000
TOTAL DATA TRANSMISSION	264.8000	356.5000	945.0000	2477.4000	5321.5000	11278.4000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	29.0000	39.4000	104.5000	269.1000	610.3000	1304.8000
GOVERNMENT	6.7000	8.9000	20.2000	44.8000	87.5000	160.8000
OPERATIONAL FACSIMILE	2.0000	3.1000	11.0000	41.3000	122.6000	350.7000
COMMUNICATING WORD PROCESSOR	1.4000	2.3000	10.3000	37.1000	96.5000	232.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	10.6000	14.0000	32.8000	61.1000	93.3000	132.4000
GOVERNMENT	1.9000	2.5000	5.7000	10.7000	16.4000	17.9000
MAILBOX SERVICES	2.3000	3.5000	10.6000	25.7000	56.6000	126.2000
TOTAL RESTRICTED ACCESS	53.9000	73.7000	195.1000	489.8000	1083.2000	2325.7000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.8000	0.9000	1.2000	1.6000	2.4000	3.2000
MAILGRAM AND TELEGRAM	0.1000	0.1000	0.3000	0.7000	1.2000	2.1000
USPS EMSS						
NON-GOVERNMENT			24.9000	68.4000	89.3000	112.5000
GOVERNMENT			2.2000	6.0000	7.8000	9.8000
TOTAL OPEN ACCESS	0.9000	1.0000	28.6000	76.7000	100.7000	127.6000
TOTAL ELECTRONIC MAIL	54.8000	74.7000	223.7000	566.5000	1183.9000	2453.3000
BETS ISS/APPLICATIONS						
INQUIRY/RESPONSE	2.2000	4.1000	19.1000	61.1000	162.1000	431.9000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	4.6000	7.2000	23.6000	55.9000	108.5000	197.2000
GOVERNMENT	0.8000	1.3000	4.1000	9.6000	18.7000	33.9000
TOTAL BETS/DDS	7.6000	12.6000	46.8000	126.6000	289.3000	663.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	14.0000	15.6000	20.5000	29.3000	42.2000	63.3000
GOVERNMENT	4.7000	5.2000	6.9000	7.3000	10.5000	8.6000
SECURE VOICE			2.1000	8.0000	24.3000	65.8000
MONITORING SERVICES					0.1000	0.9000
TOTAL MISCELLANEOUS	18.7000	20.8000	29.5000	44.6000	77.1000	138.6000
TOTAL ALL APPLICATIONS	345.9000	464.6000	1245.0000	3215.1000	6871.8000	14533.3000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market

C-Band

Data Category - Expected Case Summary

(megabits per second)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	7.4000	10.1000	30.2000	90.8000	219.5000	512.2000
GOVERNMENT	6.6000	8.5000	20.4000	51.2000	99.1000	177.5000
BATCH PROCESSING						
NON-GOVERNMENT	8.2000	10.5000	27.8000	71.7000	121.9000	191.7000
GOVERNMENT	0.8000	1.0000	2.6000	6.6000	11.2000	17.5000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	24.7000	33.2000	92.3000	269.5000	672.8000	1640.3000
GOVERNMENT	3.2000	6.7000	16.3000	43.3000	98.6000	219.3000
TOTAL HIGH SPEED/WIDE BAND	52.9000	70.0000	189.6000	533.1000	1223.1000	2798.5000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	17.6000	22.6000	45.3000	87.3000	147.8000	236.4000
REMOTE JOB ENTRY						
NON-GOVERNMENT	50.9000	66.0000	149.1000	324.7000	593.4000	1022.6000
GOVERNMENT	7.6000	9.8000	21.0000	43.7000	76.5000	126.0000
TOTAL LOW SPEED/MEDIUM SPEED	76.1000	98.4000	215.4000	455.7000	817.7000	1385.0000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	27.0000	35.7000	133.6000	421.9000	1020.1000	2393.1000
GOVERNMENT	2.4000	4.0000	14.8000	36.7000	88.6000	166.3000
PRIVATE TIME SHARING	5.0000	6.8000	15.7000	35.6000	71.6000	138.9000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	8.6000	11.7000	28.7000	64.6000	127.8000	243.3000
GOVERNMENT	0.9000	1.3000	3.2000	7.2000	14.2000	27.0000
TOTAL INTERACTIVE	38.9000	59.5000	196.0000	566.0000	1322.3000	2968.6000
PACKET SWITCHING	3.1000	5.0000	11.4000	21.6000	103.1000	452.6000
TOTAL DATA TRANSMISSION	171.0000	232.9000	612.4000	1576.4000	3466.2000	7564.7000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	28.1000	38.2000	101.4000	261.0000	592.0000	1265.7000
GOVERNMENT	6.5000	8.6000	19.6000	43.5000	84.4000	156.0000
OPERATIONAL FACSIMILE	0.2000	0.3000	1.1000	4.2000	12.5000	35.8000
COMMUNICATING WORD PROCESSOR	1.3000	2.3000	10.0000	36.0000	93.6000	226.0000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	5.2000	6.8000	15.9000	29.7000	45.2000	64.2000
GOVERNMENT	0.9000	1.2000	2.8000	5.2000	7.9000	8.7000
MAILBOX SERVICES	2.2000	3.4000	10.3000	24.9000	54.9000	122.4000
TOTAL RESTRICTED ACCESS	44.4000	60.8000	161.1000	404.5000	891.0000	1878.8000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.8000	0.9000	1.2000	1.6000	2.3000	3.1000
MAILGRAM AND TELEGRAM	0.1000	0.1000	0.3000	0.7000	1.1000	2.0000
USPS EMSS						
NON-GOVERNMENT			2.5000	7.0000	9.1000	11.5000
GOVERNMENT			0.2000	0.6000	0.8000	1.0000
TOTAL OPEN ACCESS	0.9000	1.0000	4.2000	9.9000	13.3000	17.6000
TOTAL ELECTRONIC MAIL	45.3000	61.8000	165.3000	414.4000	904.3000	1896.4000
EEIS/FIS/APPLICATIONS						
INQUIRY/RESPONSE	2.1000	4.0000	18.5000	99.2000	157.3000	419.0000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.9000	1.5000	4.8000	11.4000	22.1000	40.2000
GOVERNMENT	0.2000	0.3000	0.8000	2.0000	3.8000	6.9000
TOTAL EEIS/POS	3.2000	5.8000	24.1000	72.6000	183.2000	466.1000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	6.8000	7.6000	10.0000	14.2000	20.5000	30.7000
GOVERNMENT	2.3000	2.5000	3.3000	3.6000	5.1000	4.2000
SECURE VOICE			2.0000	7.7000	23.6000	63.8000
MONITORING SERVICES						0.2000
TOTAL MISCELLANEOUS	9.1000	10.1000	15.3000	25.5000	49.2000	98.9000
TOTAL ALL APPLICATIONS	228.6000	310.6000	817.1000	2088.9000	4602.9000	10026.1000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below Terrestrial/Satellite Cost Separations)

Ku-Band

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	28.4000	38.8000	111.1000	322.6000	926.1000	2559.0000
GOVERNMENT	25.9000	32.6000	75.1000	181.8000	418.2000	886.8000
BATCH PROCESSING						
NON-GOVERNMENT	26.5000	34.1000	53.0000	76.4000	194.5000	418.8000
GOVERNMENT	2.9000	3.2000	5.0000	7.1000	17.9000	38.3000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	3.7000	5.0000	13.9000	40.5000	131.0000	388.1000
GOVERNMENT	0.8000	1.0000	2.5000	6.5000	19.2000	51.9000
TOTAL HIGH SPEED/WIDE BAND	87.2000	114.7000	260.6000	634.9000	1706.9000	4342.9000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	17.7000	22.7000	45.1000	85.9000	147.3000	238.8000
REMOTE JOB ENTRY						
NON-GOVERNMENT	9.8000	12.8000	29.9000	67.3000	133.6000	246.4000
GOVERNMENT	1.9000	1.9000	4.2000	9.1000	17.2000	30.4000
TOTAL LOW SPEED/MEDIUM SPEED	29.0000	37.4000	79.2000	162.3000	298.1000	515.6000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	16.0000	26.0000	76.4000	170.2000	388.0000	857.9000
GOVERNMENT	1.8000	2.9000	6.5000	14.8000	33.7000	59.6000
PRIVATE TIME SHARING	5.0000	6.8000	15.6000	35.0000	68.7000	129.1000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	8.6000	11.8000	28.6000	63.5000	120.1000	214.1000
GOVERNMENT	1.0000	1.3000	3.2000	7.1000	13.3000	24.0000
TOTAL INTERACTIVE	32.4000	48.8000	132.3000	290.6000	623.8000	1286.1000
PACKET SWITCHING	2.2000	3.4000	7.7000	14.3000	96.3000	235.4000
TOTAL DATA TRANSMISSION	190.8000	204.3000	479.8000	1107.1000	2688.1000	6380.0000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	15.1000	20.4000	37.8000	96.7000	193.7000	379.3000
GOVERNMENT	3.9000	4.6000	7.3000	9.4000	22.0000	46.7000
OPERATIONAL FACSIMILE	0.3000	0.4000	3.0000	17.7000	66.1000	252.9000
COMMUNICATING WORD PROCESSOR	1.2000	2.0000	7.6000	22.0000	46.5000	85.3000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.2000	0.3000	0.8000	1.7000	3.4000	6.0000
GOVERNMENT			0.1000	0.3000	0.6000	0.8000
MAILBOX SERVICES	2.1000	3.2000	9.7000	23.3000	48.1000	98.5000
TOTAL RESTRICTED ACCESS	22.4000	30.9000	66.3000	131.1000	343.4000	869.5000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000	0.1000	0.2000	0.2000	0.3000	0.4000
MAILGRAM AND TELEGRAM				0.1000	0.2000	0.3000
USPS EMSS						
NON-GOVERNMENT			324.9000	606.3000	669.3000	724.9000
GOVERNMENT			28.3000	52.7000	57.9000	63.1000
TOTAL OPEN ACCESS	0.1000	0.1000	353.4000	659.3000	723.7000	788.6000
TOTAL ELECTRONIC MAIL	22.5000	31.0000	419.7000	790.4000	1067.1000	1658.1000
EFTS/POS/APPLICATIONS						
INQUIRY/RESPONSE	2.0000	3.8000	15.6000	42.7000	107.6000	269.9000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	1.5000	2.4000	6.4000	11.5000	46.4000	149.3000
GOVERNMENT	0.3000	0.4000	1.1000	2.0000	8.0000	25.7000
TOTAL EFTS/POS	3.8000	6.6000	23.1000	56.2000	162.2000	444.9000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	5.2000	5.8000	11.5000	23.6000	43.6000	84.7000
GOVERNMENT	1.7000	1.9000	3.9000	5.9000	10.9000	11.6000
SECURE VOICE			25.5000	67.0000	171.8000	401.2000
MONITORING SERVICES						0.1000
TOTAL MISCELLANEOUS	6.9000	7.7000	40.9000	96.5000	226.3000	497.6000
TOTAL ALL APPLICATIONS	184.0000	249.6000	963.5000	2045.2000	4143.7000	8980.6000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market

Ku-Band

Data Category - Expected Case Summary

(megabits per second)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	5.8000	7.9000	22.7000	65.8000	188.9000	522.0000
GOVERNMENT	5.2000	6.7000	15.3000	37.1000	85.3000	180.9000
BATCH PROCESSING						
NON-GOVERNMENT	5.4000	7.0000	10.8000	15.6000	39.7000	85.4000
GOVERNMENT	0.5000	0.7000	1.0000	1.4000	3.6000	7.8000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	3.6000	4.6000	13.5000	39.3000	127.1000	376.5000
GOVERNMENT	0.8000	1.0000	2.4000	6.3000	18.6000	50.3000
TOTAL HIGH SPEED/WIDE BAND	21.3000	28.2000	65.7000	165.5000	463.2000	1222.9000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	17.1000	22.0000	43.7000	83.3000	142.9000	231.6000
REMOTE JOB ENTRY						
NON-GOVERNMENT	9.5000	12.4000	29.0000	65.3000	129.6000	239.0000
GOVERNMENT	1.4000	1.8000	4.1000	8.8000	16.7000	29.4000
TOTAL LOW SPEED/MEDIUM SPEED	28.0000	36.2000	76.8000	157.4000	289.2000	500.0000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	19.5000	25.2000	74.1000	165.1000	376.3000	831.6000
GOVERNMENT	1.7000	2.8000	8.2000	14.4000	32.7000	57.8000
PRIVATE TIME SHARING	4.9000	6.6000	15.2000	34.0000	66.6000	125.2000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	8.4000	11.4000	27.7000	61.6000	116.5000	209.6000
GOVERNMENT	0.9000	1.3000	3.1000	6.9000	12.9000	23.3000
TOTAL INTERACTIVE	31.4000	47.3000	128.3000	282.0000	605.0000	1247.5000
PACKET SWITCHING	2.1000	3.3000	7.5000	13.4000	57.5000	228.3000
TOTAL DATA TRANSMISSION	82.8000	115.0000	278.3000	618.8000	1414.9000	3198.7000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	14.6000	19.8000	36.7000	55.0000	149.1000	367.9000
GOVERNMENT	3.4000	4.5000	7.1000	9.2000	21.6000	49.3000
OPERATIONAL FACSIMILE			0.3000	1.8000	7.0000	25.8000
COMMUNICATING WORD PROCESSOR	1.2000	2.0000	7.4000	21.3000	45.1000	82.8000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.1000	0.1000	0.4000	0.8000	1.6000	2.9000
GOVERNMENT			0.1000	0.1000	0.3000	0.4000
MAILBOX SERVICES	2.0000	3.1000	9.5000	22.6000	46.6000	95.5000
TOTAL RESTRICTED ACCESS	21.3000	29.9000	61.5000	110.8000	271.1000	620.6000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000	0.1000	0.2000	0.2000	0.3000	0.4000
MAILGRAM AND TELEGRAM				0.1000	0.1000	0.3000
USPS EMSS						
NON-GOVERNMENT			33.1000	61.8000	67.9000	73.9000
GOVERNMENT			2.9000	5.4000	5.9000	6.4000
TOTAL OPEN ACCESS	0.1000	0.1000	36.2000	67.5000	74.2000	81.0000
TOTAL ELECTRONIC MAIL	21.4000	29.6000	97.7000	178.3000	345.3000	701.6000
EFTS/POS APPLICATIONS						
INQUIRY/RESPONSE	2.0000	3.7000	15.7000	41.5000	104.4000	261.8000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.3000	0.5000	1.3000	2.4000	9.5000	30.4000
GOVERNMENT	0.1000	0.1000	0.2000	0.4000	1.6000	5.2000
TOTAL EFTS/POS	2.4000	4.3000	16.7000	44.3000	115.5000	297.4000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	2.5000	2.8000	5.6000	11.5000	21.2000	41.1000
GOVERNMENT	0.8000	0.9000	1.9000	2.9000	5.3000	9.6000
SECURE VOICE			24.7000	65.0000	166.6000	389.1000
MONITORING SERVICES						
TOTAL MISCELLANEOUS	3.3000	3.7000	32.2000	79.4000	193.1000	439.8000
TOTAL ALL APPLICATIONS	109.9000	152.6000	424.9000	920.8000	2068.8000	4633.5000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below Terrestrial/Satellite Cost Separations)

18/30 GHz - Scenario 2

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	25.2000	34.5000	99.0000	287.8000	827.5000	2289.6000
GOVERNMENT	22.5000	29.0000	66.9000	162.2000	373.7000	793.5000
BATCH PROCESSING						
NON-GOVERNMENT	25.1000	32.7000	52.5000	77.9000	204.7000	454.7000
GOVERNMENT	2.4000	3.1000	4.9000	7.2000	18.8000	41.6000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	3.3000	4.5000	12.4000	36.2000	117.3000	348.3000
GOVERNMENT	0.7000	0.9000	2.2000	5.8000	17.2000	46.6000
TOTAL HIGH SPEED/WIDE BAND	79.2000	104.7000	237.9000	577.1000	1559.2000	3974.3000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	13.7000	17.6000	35.2000	67.9000	115.9000	188.5000
REMOTE JOB ENTRY						
NON-GOVERNMENT	7.6000	9.9000	23.2000	52.4000	104.1000	192.7000
GOVERNMENT	1.1000	1.5000	3.3000	7.1000	13.4000	23.7000
TOTAL LOW SPEED/MEDIUM SPEED	22.4000	29.0000	61.7000	126.8000	233.4000	404.4000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	8.5000	12.8000	33.0000	67.3000	171.9000	416.7000
GOVERNMENT	0.9000	1.4000	3.7000	5.9000	14.9000	29.0000
PRIVATE TIME SHARING	3.6000	5.0000	11.6000	26.4000	52.5000	100.0000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	5.3000	7.2000	17.6000	39.3000	74.5000	134.6000
GOVERNMENT	0.6000	0.8000	2.0000	4.4000	8.3000	14.9000
TOTAL INTERACTIVE	18.9000	27.2000	67.9000	143.3000	322.1000	695.2000
PACKET SWITCHING	1.9000	2.5000	5.5000	10.3000	42.9000	171.0000
TOTAL DATA TRANSMISSION	122.0000	163.4000	373.0000	857.5000	2157.6000	5244.9000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	12.5000	17.1000	32.8000	50.7000	141.4000	358.2000
GOVERNMENT	2.9000	3.9000	6.4000	8.4000	20.3000	44.1000
OPERATIONAL FACSIMILE	0.3000	0.4000	2.8000	16.8000	65.5000	239.6000
COMMUNICATING WORD PROCESSOR	1.1000	1.9000	7.4000	21.4000	45.9000	85.3000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.2000	0.3000	0.8000	1.7000	3.4000	6.0000
GOVERNMENT			0.1000	0.3000	0.6000	0.8000
MAILBOX SERVICES	1.9000	2.9000	8.8000	21.4000	44.8000	93.0000
TOTAL RESTRICTED ACCESS	18.9000	26.5000	59.1000	120.7000	321.9000	827.0000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000	0.1000	0.1000	0.2000	0.3000	0.4000
MAILGRAM AND TELEGRAM				0.1000	0.1000	0.3000
USPS RMSS						
NON-GOVERNMENT			311.3000	989.4000	656.1000	724.8000
GOVERNMENT			27.1000	51.3000	57.1000	63.1000
TOTAL OPEN ACCESS	0.1000	0.1000	338.5000	641.0000	713.6000	788.6000
TOTAL ELECTRONIC MAIL	19.0000	26.6000	397.6000	761.7000	1035.5000	1615.6000
EFTS/POS APPLICATIONS						
INQUIRY/RESPONSE	1.1000	1.9000	6.8000	16.9000	47.7000	131.2000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	1.2000	1.9000	5.3000	9.5000	38.7000	124.4000
GOVERNMENT	0.2000	0.3000	0.9000	1.6000	6.7000	21.4000
TOTAL EFTS/POS	2.5000	4.1000	13.0000	28.0000	93.1000	277.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	4.4000	4.9000	9.7000	19.9000	36.7000	71.3000
GOVERNMENT	1.5000	1.6000	3.2000	5.0000	9.2000	9.7000
SECURE VOICE			22.6000	99.6000	152.7000	356.6000
MONITORING SERVICES						0.1000
TOTAL MISCELLANEOUS	5.9000	6.5000	35.5000	84.5000	198.6000	437.7000
TOTAL ALL APPLICATIONS	149.4000	200.6000	819.1000	1731.7000	3484.8000	7575.2000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market

18/30 GHz - Scenario 2

Data Category - Expected Case Summary

(megabits per second)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	5.1000	7.0000	20.2000	58.7000	168.8000	467.1000
GOVERNMENT	4.6000	5.9000	13.6000	33.1000	76.2000	141.9000
BATCH PROCESSING						
NON-GOVERNMENT	5.1000	6.7000	10.7000	15.9000	41.8000	92.8000
GOVERNMENT	0.9000	0.6000	1.0000	1.5000	3.8000	8.5000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	3.2000	4.3000	12.0000	35.1000	113.8000	337.9000
GOVERNMENT	0.7000	0.9000	2.1000	5.6000	16.7000	45.2000
TOTAL HIGH SPEED/WIDE BAND	19.2000	25.4000	59.6000	149.9000	421.1000	1113.4000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	13.3000	17.1000	34.1000	65.3000	112.4000	182.9000
REMOTE JOB ENTRY						
NON-GOVERNMENT	7.4000	9.6000	22.5000	50.8000	100.9000	186.5000
GOVERNMENT	1.1000	1.4000	3.2000	6.8000	15.0000	23.0000
TOTAL LOW SPEED/MEDIUM SPEED	21.8000	28.1000	59.8000	122.9000	226.3000	392.4000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	8.2000	12.4000	32.0000	65.3000	186.7000	404.2000
GOVERNMENT	0.9000	1.4000	3.5000	5.7000	14.5000	28.1000
PRIVATE TIME SHARING	3.5000	4.8000	11.3000	25.6000	50.9000	97.0000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	5.1000	7.0000	17.1000	38.1000	72.3000	130.5000
GOVERNMENT	0.6000	0.8000	1.9000	4.3000	8.0000	14.5000
TOTAL INTERACTIVE	18.9000	26.4000	65.8000	139.0000	312.4000	674.3000
PACKET SWITCHING	1.9000	2.4000	5.4000	10.0000	41.7000	165.9000
TOTAL DATA TRANSMISSION	60.8000	82.3000	190.6000	421.8000	1001.5000	2346.0000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFFIC						
NON-GOVERNMENT	12.1000	16.6000	31.9000	49.1000	137.1000	347.5000
GOVERNMENT	2.8000	3.8000	6.2000	8.2000	19.7000	42.8000
OPERATIONAL FACSIMILE			0.3000	1.7000	6.7000	24.4000
COMMUNICATING WORD PROCESSOR	1.1000	1.9000	7.1000	20.8000	44.5000	82.8000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.1000	0.1000	0.4000	0.8000	1.6000	2.9000
GOVERNMENT			0.1000	0.1000	0.3000	0.4000
MAILBOX SERVICES	1.8000	2.8000	8.6000	20.8000	43.4000	90.2000
TOTAL RESTRICTED ACCESS	17.9000	25.2000	54.6000	101.5000	253.3000	591.0000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.1000	0.1000	0.1000	0.2000	0.3000	0.4000
MAILGRAM AND TELEGRAM				0.1000	0.1000	0.3000
USPS EMSS						
NON-GOVERNMENT			31.8000	60.1000	66.9000	73.9000
GOVERNMENT			2.8000	5.2000	5.8000	6.4000
TOTAL OPEN ACCESS	0.1000	0.1000	34.7000	65.6000	73.1000	81.0000
TOTAL ELECTRONIC MAIL	18.0000	25.3000	89.3000	167.1000	326.4000	672.0000
EBIS-BIS/APPLICATIONS						
INQUIRY/RESPONSE	1.0000	1.8000	6.6000	16.4000	46.2000	177.2000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.3000	0.4000	1.1000	1.9000	7.9000	25.4000
GOVERNMENT		0.1000	0.2000	0.3000	1.4000	4.4000
TOTAL EBIS/BDS	1.3000	2.3000	7.9000	18.6000	55.5000	197.0000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	2.1000	2.4000	4.7000	9.6000	17.8000	34.6000
GOVERNMENT	0.7000	0.8000	1.6000	2.4000	4.9000	4.7000
SECURE VOICE			22.0000	57.8000	148.1000	345.9000
MONITORING SERVICES						
TOTAL MISCELLANEOUS	2.8000	3.2000	28.3000	69.8000	170.4000	385.2000
TOTAL ALL APPLICATIONS	82.9000	113.1000	316.1000	677.3000	1553.8000	3960.2000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market

18/30 GHz - Scenario 3

Data Category - Expected Case Summary

(megabits per second)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	10.1000	13.8000	39.3000	113.5000	307.0000	808.8000
GOVERNMENT	9.0000	11.6000	26.6000	64.0000	138.6000	280.3000
BATCH PROCESSING						
NON-GOVERNMENT	10.6000	13.8000	26.1000	50.2000	104.8000	201.5000
GOVERNMENT	1.0000	1.3000	2.4000	4.6000	9.6000	18.4000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	13.6000	18.5000	49.7000	141.4000	376.3000	973.6000
GOVERNMENT	2.9000	3.7000	8.0000	22.7000	55.1000	130.7000
TOTAL HIGH SPEED/WIDE BAND	47.2000	62.7000	152.9000	396.4000	991.4000	2412.8000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	15.5000	20.0000	40.3000	77.9000	131.5000	209.9000
REMOTE JOB ENTRY						
NON-GOVERNMENT	26.7000	34.6000	74.8000	157.4000	290.6000	505.9000
GOVERNMENT	4.0000	5.1000	10.6000	21.2000	37.5000	62.3000
TOTAL LOW SPEED/MEDIUM SPEED	46.2000	59.7000	125.7000	256.5000	459.6000	778.1000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	11.0000	16.7000	48.9000	121.4000	313.4000	770.5000
GOVERNMENT	1.2000	1.9000	5.4000	10.6000	27.2000	53.5000
PRIVATE TIME SHARING	4.1000	5.6000	13.3000	30.5000	60.5000	115.2000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	6.0000	8.2000	20.1000	45.4000	86.7000	158.0000
GOVERNMENT	0.7000	0.9000	2.3000	5.1000	9.6000	17.6000
TOTAL INTERACTIVE	23.0000	33.3000	90.0000	213.0000	497.4000	1114.8000
PACKET SWITCHING	2.1000	3.3000	7.5000	14.0000	67.7000	292.3000
TOTAL DATA TRANSMISSION	118.5000	159.0000	376.1000	879.9000	2016.1000	4598.0000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	19.6000	26.9000	63.0000	137.4000	337.5000	777.8000
GOVERNMENT	4.6000	6.1000	12.2000	22.9000	48.4000	95.8000
OPERATIONAL FACSIMILE	0.1000	0.2000	0.8000	3.8000	13.3000	45.0000
COMMUNICATING WORD PROCESSOR	1.3000	2.2000	9.0000	29.4000	69.1000	147.3000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.3000	0.5000	1.6000	3.6000	6.5000	10.6000
GOVERNMENT	0.1000	0.1000	0.3000	0.6000	1.1000	1.4000
MAILBOX SERVICES	2.1000	3.3000	10.1000	24.7000	52.5000	111.5000
TOTAL RESTRICTED ACCESS	28.1000	39.3000	97.0000	222.4000	528.4000	1189.4000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.5000	0.5000	0.6000	0.8000	1.1000	1.4000
MAILGRAM AND TELEGRAM	0.1000	0.1000	0.1000	0.3000	0.5000	0.9000
USPS EMSS						
NON-GOVERNMENT			46.5000	80.4000	98.4000	108.8000
GOVERNMENT			4.0000	7.7000	8.6000	9.5000
TOTAL OPEN ACCESS	0.6000	0.6000	51.2000	97.2000	108.6000	120.6000
TOTAL ELECTRONIC MAIL	28.7000	39.9000	148.2000	319.6000	637.0000	1310.0000
EFTS/POS APPLICATIONS						
INQUIRY/RESPONSE	1.2000	2.1000	8.1000	22.0000	62.5000	174.1000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	0.5000	0.8000	2.7000	6.1000	17.4000	46.7000
GOVERNMENT	0.1000	0.1000	0.5000	1.1000	3.0000	8.0000
TOTAL EFTS/POS	1.8000	3.0000	11.3000	29.2000	82.9000	228.8000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	5.3000	5.9000	9.9000	17.9000	31.0000	56.9000
GOVERNMENT	1.8000	2.0000	3.3000	4.5000	7.7000	7.8000
SECURE VOICE			32.1000	84.9000	217.9000	509.1000
MONITORING SERVICES						0.1000
TOTAL MISCELLANEOUS	7.1000	7.9000	45.3000	107.3000	256.6000	573.9000
TOTAL ALL APPLICATIONS	156.1000	209.8000	580.9000	1336.0000	2992.6000	6710.7000

SERVICE DEMAND ASSESSMENT

Net Addressable Satellite Market
(Balance After Removal of Traffic Below
Terrestrial/Satellite Cost Separations)

18/30 GHz - Scenario 3

Data Category - Expected Case Summary

(Terabits per Year)

	1978	1980	1985	1990	1995	2000
DATA TRANSMISSION APPLICATIONS						
HIGH SPEED/WIDE BAND						
DATA TRANSFER						
NON-GOVERNMENT	49.6000	67.8000	192.8000	556.3000	1504.8000	3964.7000
GOVERNMENT	44.2000	57.0000	130.3000	313.6000	679.6000	1374.0000
BATCH PROCESSING						
NON-GOVERNMENT	51.8000	67.5000	128.1000	246.0000	513.9000	987.8000
GOVERNMENT	4.9000	6.4000	12.0000	22.8000	47.3000	90.3000
DATA ENTRY (HIGH SPEED)						
NON-GOVERNMENT	14.1000	19.1000	51.3000	145.7000	387.9000	1003.7000
GOVERNMENT	3.0000	3.9000	9.1000	23.4000	56.8000	134.2000
TOTAL HIGH SPEED/WIDE BAND	167.6000	221.7000	523.6000	1307.8000	3190.3000	7554.7000
LOW SPEED/MEDIUM SPEED						
DATA ENTRY	16.0000	20.6000	41.6000	80.3000	135.6000	216.4000
REMOTE JOB ENTRY						
NON-GOVERNMENT	27.5000	35.7000	77.1000	162.3000	299.6000	521.5000
GOVERNMENT	4.1000	5.3000	10.9000	21.9000	38.6000	64.2000
TOTAL LOW SPEED/MEDIUM SPEED	47.6000	61.6000	129.6000	264.5000	473.8000	802.1000
INTERACTIVE TRANSMISSION						
INQUIRY/RESPONSE						
NON-GOVERNMENT	11.4000	17.2000	50.4000	125.1000	323.1000	794.3000
GOVERNMENT	1.3000	1.9000	5.6000	10.9000	28.0000	55.2000
PRIVATE TIME SHARING	4.3000	5.8000	13.7000	31.5000	62.4000	118.6000
COMMERCIAL TIME SHARING						
NON-GOVERNMENT	6.2000	8.5000	20.8000	46.9000	85.4000	162.9000
GOVERNMENT	0.7000	0.9000	2.3000	5.2000	9.9000	18.1000
TOTAL INTERACTIVE	23.9000	34.3000	92.8000	219.6000	512.8000	1149.1000
PACKET SWITCHING	2.1000	3.4000	7.7000	14.4000	69.8000	391.3000
TOTAL DATA TRANSMISSION	241.2000	321.0000	753.7000	1806.3000	4246.7000	9807.4000
ELECTRONIC MAIL APPLICATIONS						
RESTRICTED ACCESS NETWORKS						
ADMINISTRATIVE MESSAGE TRAFF						
NON-GOVERNMENT	20.2000	27.7000	64.9000	141.7000	347.9000	801.8000
GOVERNMENT	4.7000	6.3000	12.6000	23.6000	49.9000	98.8000
OPERATIONAL FACSIMILE	1.1000	1.7000	7.9000	37.6000	130.8000	440.8000
COMMUNICATING WORD PROCESSOR	1.3000	2.3000	9.3000	30.4000	71.2000	151.9000
CONVENIENCE FACSIMILE						
NON-GOVERNMENT	0.7000	1.1000	3.3000	7.4000	13.3000	21.8000
GOVERNMENT	0.1000	0.2000	0.6000	1.3000	2.3000	3.0000
MAILBOX SERVICES	2.2000	3.4000	10.4000	25.5000	54.2000	114.9000
TOTAL RESTRICTED ACCESS	30.3000	42.7000	109.0000	267.5000	669.6000	1633.0000
OPEN ACCESS NETWORKS						
TWX AND TELEX	0.5000	0.5000	0.6000	0.8000	1.1000	1.5000
MAILGRAM AND TELEGRAM	0.1000	0.1000	0.1000	0.3000	0.6000	1.0000
USPS EMSS						
NON-GOVERNMENT			495.7000	866.6000	965.1000	1046.7000
GOVERNMENT			39.7000	75.4000	84.0000	92.9000
TOTAL OPEN ACCESS	0.6000	0.6000	496.1000	943.1000	1050.8000	1162.1000
TOTAL ELECTRONIC MAIL	30.9000	43.3000	605.1000	1210.6000	1720.4000	2795.1000
FETS, FCS/APPLICATIONS						
INQUIRY/RESPONSE	1.3000	2.2000	8.4000	22.7000	64.4000	179.5000
DATA ENTRY/DATA TRANSFER						
NON-GOVERNMENT	2.6000	4.1000	13.2000	30.1000	85.3000	228.8000
GOVERNMENT	0.5000	0.7000	2.3000	5.2000	14.7000	39.4000
TOTAL FETS/FCS	4.4000	7.0000	23.9000	58.0000	164.4000	447.7000
MISCELLANEOUS APPLICATIONS						
SPECIAL PURPOSE FACSIMILE						
NON-GOVERNMENT	10.9000	12.2000	20.3000	37.0000	63.8000	117.4000
GOVERNMENT	3.7000	4.1000	6.8000	9.3000	15.9000	16.0000
SECURE VOICE			33.1000	87.6000	224.6000	524.8000
MONITORING SERVICES					0.1000	0.4000
TOTAL MISCELLANEOUS	14.6000	16.3000	60.2000	133.9000	304.4000	658.6000
TOTAL ALL APPLICATIONS	291.1000	387.6000	1442.9000	3208.8000	6435.9000	13708.8000