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EQUINE ENTHUSIASTS RIDING HIGH

WORLD TRADE INDEX

Volume I Number 2 1992

COMMUNICATION LINKAGES

Medicine and education: space age travelers on electronic highways

By Christina Dyar

Once, only in the mind of the science fiction writer, was a digitized world with interactive video business telephones, students linked to regional classrooms and physical examinations with doctors miles or hemispheres away. No longer. A technological revolution — changing the way people learn, think and do business — is here now and growing rapidly.

How the South exploits this revolution and the subsequent shift to a technology-based society will determine a standard of living for generations to come. The good news: one U.S. state in particular, Georgia, is strongly positioned to take a lead in telecommunications technology, providing solid economic development and improved quality of life, due to recent advances in fiber optics and compression technology.

Optic fiber, roughly the diameter of a human hair, has the bandwidth to transmit as many as two billion bits of information per second, two million times faster than most modems on the market today. It has the capacity to send an entire Encyclopedia Britannica in two seconds, compared with the sluggish 17 minutes over standard phone lines. Fiber can carry 300 or more channels of data, voice communication and video (250 more channels than coaxial cable) and offers superior fidelity, protection from electrical disturbances and fewer repairs and security breaches.

Data super highways or networks, using the speed and capacity of fiber, will foster standardized communication protocols such as Integrated Systems Digital Network (ISDN). Combining the latest in digital compression algorithms with increased bandwidth of fiber multiplies the capacity of the medium and paves the way for interactive video applications such as distance learning and telemedicine.

ONE U.S. STATE TAKES A STAND

Georgia's political structure is highly supportive of telecommunications technology. Governor Zell Miller calls it the future success of Georgia: "It is very clear that the economy of the 21st century is in technology ... the state of Georgia depends upon our ability to develop technology ... and the charge is to work together."

The governor's Advisory Council on Science and Technology Development assists Miller and the state legislature in developing policies and infrastructures to promote environments conducive to technology-based businesses. Dennis Hayes, president of Hayes Microcomputer Products and a council member, says, "Not only will traditional high tech business prosper in such an environment, but also those not traditionally thought of as high tech but which use technology in their operations and processes. Development of this environment will attract the human, technical and financial resources to Georgia to support these businesses and enable them to compete in the global market."

Georgia's technology infrastructure lures business and major corporations who need higher and higher communication capacity. There are 29 major fiber optic bundles emanating from Atlanta, compared with New York City's eight. Southern Bell has laid 184,815 miles of fiber cable, connecting 91 percent of the BellSouth offices and 82 percent of Georgia's independent telephone companies. An extensive infrastructure also provides a jump-start for new telecommunication applications.

Senate Bill 144, The Distance Learning and Telemedicine Act, was passed March 20, 1992, granting $50 million. No other state, including Iowa, Oklahoma and Kentucky, who also are leaders in distance learning, committed money before detailed plans were developed.

"We had a different approach from any other state," Tom Bostick with the Department of Administrative Services explains. "Most have programs without funding. I don't know of any that funded as much as $50 million within 48 hours of it being reserved. Governor Miller looked at several distance learning and telemedicine initiatives across the state and immediately saw the potential. He sees distance learning as a way to improve state education, get the whole state on an equal level and have a better trained workforce. The Governor believes those in Jesup, Georgia should have the same advantages as those in Atlanta."

MERGING RESOURCES

A synergism of merging resources supports Georgia's technology initiatives. Formed two years ago to promote and draw research to the area, the Georgia Research Alliance (GRA) is a consortium of six research universities: Clark Atlanta University, Emory University, Georgia State University, the Georgia Institute of Technology (Georgia Tech), the Medical College of Georgia and the University of Georgia.

The GRA commissioned a McKinsey study to determine how to take advantage of Georgia's pool of knowledge and how to leverage leading edge collaborative research.

The report confirmed GRA's suspicions — focusing on intellectual development and research attracts and creates jobs, improving the quality of life. Although major industries and large business are well-known to stimulate the economy, "job growth comes from the small entrepreneurial companies," explains GRA President Bill Todd. "Research, in turn, spawns the small start-ups."

The GRA is developing initiatives in environmental technology and genetics, but because a massive telecommunications structure was already in existence, "the telecommunication initiative developed the fastest and furthest," says Todd.

The Georgia Center for Advanced Telecommunications Technology (GCATT) reports directly to the GRA with a diverse board of directors pulled from academia, industry and government. The goal is "collaborative competition." GCATT acts as a catalyst to facilitate merging of related technological interests. "If you do research only in a given industry, you get results optimized for that industry or even suboptimized for that industry. But if you look at it on a holistic or integrated basis, you get a different end product," explains Dick Snelling, GCATT director and CEO.

"GCATT looks at industries with common customers and common technology to see what they can achieve together that otherwise couldn't be achieved. For instance, GCATT may take projects to appropriate corporations. Corporation X is working on digital signal processing — here is Y's algorithm software that is extraordinary. The will and the effort are there. We hope to put it together."

Six areas of research — advanced technology, enhanced learning, telemedicine, public policy and intellectual properties, medical imaging and technology transfer — are slated to be functional in 1993, funded 50 percent by the state and 50 percent by private industry, sponsoring members, GCATT members or federal grants. Additional projects will be added later.

GCATT also encourages academic freedom for intellectual development of ideas. The bottom line: shrinking the research time for a product from 10 years to four or three or even less. "If we can do that, we can create many thousands of jobs all over the state," Snelling says.

CRITICAL MASS

Georgia's influential higher education community fuels a critical mass of advanced technology industries. For example, Georgia Tech Research Institute's $95 million annual funding makes it one of the largest private research organizations in the world.

"... strong universities and colleges have helped the community discover more effective ways to capitalize on technological vehicles," says Tom Smith, IBM vice president and southern area manager. "They also benefit Georgia with a highly skilled workforce."

Says Bill Bobst in the Broadband Communication Group of Scientific

World Trade Increases

Exports to Japan Up Over 57% Top $280 Million, Mexico up 89%, Canada Now At $359 Million

According to the Wachovia World Trade Index, Georgia's international trade – exports plus imports – through the 3rd quarter of 1992 rose 6.8 percent over the comparable 1991 period and totaled $10.8 billion. Third quarter trade activity was up 7.3 percent from the previous year.

"Foreign trade has become increasingly important for Georgia industries," said G. Joseph Prendergast, president and chief executive officer of Wachovia Bank of Georgia. "With this index, we hope to make it easier for companies to monitor world trade activity and for Georgia residents to learn more about the state's involvement in the global economy."

Comparing third quarter 1992 and 1991, exports increased 17.2 percent in 1992 and were $1.89 billion. Manufactured exports, at 1.72 billion, showed a 17.0 improvement; non-manufactured exports were up 19.0 percent at $168 million.

Exports through Georgia airports and ports totaled $2.27 billion, up 14.7 percent from the same period a year ago and the value increased

Atlanta, "Mental and physical infrastructure are more than bonuses; they are instrumental to our success. We rely on Georgia's universities and colleges for employees, not to mention our far-sighted founders came from Georgia Tech ..."

A large number of advanced technology companies, divisions and projects base product and/or research activities in the state. In telecommunications, Siemens, Fujitsu, Hayes Microcomputer Products, BellSouth, GTE, Northern TeleCom — including the Fiber World Research Center, and Syncordia (British Telecom) have major presence. AT&T designs and develops fiber optic cable and cable joining equipment at the AT&T Bell Laboratories Transmission Media Laboratory. AT&T's Atlanta Works is the world's largest manufacturer of communications cable, making Georgia a major producer of fiber optic cable, demand for which is expected to grow 13.7 percent in the next three years to an estimated $371 million.

The cable communication industry is well represented through Cox Cable Communications, Scripps Howard Cable and many others. Scientific Atlanta, market leader in fiber electronics distribution equipment for cable TV systems, devotes millions of dollars to research and is the principle research organization for CATV — two current projects are digital video compression and advanced set top terminals ("smart boxes"). Zenith, Scientific Atlanta and AT&T are working together on an advanced project in high definition television (HDTV).

Computing giants such as IBM, NCR, UNISYS and DEC base activity in Georgia, as well as high tech consumer electronics leaders Fujitsu, NEC and General Electric. Many of these industries fuel content origination goals of Turner Enterprises, Georgia Public Television, ABC, NBC, CBS and Cox Newspapers.

Georgia research, products and technology cultivate new applications.

APPLIED DISTANCE LEARNING

Throughout the U.S., local education officials have found it more and more difficult to provide effective on-site teacher training programs, as well as delivery of high quality student instruction to districts with wide variations in economic conditions and diverse pupil populations.

According to a U.S. Office of Technology Assessment (OTA) report, long-distance teachers can help enormously to overcome shortages of qualified teachers and provide continuing education. The workplace of the future can be reproduced in schools today; teachers and students can learn to interpret the new complex information environment, providing a better skilled workforce in the future. Linking students, classrooms, teachers, libraries, and other resources that are physically far apart can alleviate problems and optimize opportunity.

"Distance learning lets you spread out expertise," explains Tom Bostick. "It's amazing what can be done with existing cable television networks alone broadcasting into schools over public access at very little cost." Several pilot projects in distance learning are currently in place throughout the state of Georgia utilizing computers,

26.6 percent to $774 million.

A trade surplus of $143 million for the third quarter was estimated, with imports calculated at $1.75 billion.

Highlights of 3rd quarter trade includes:

- The largest export category was industrial machinery and equipment, including computers, which increased 22.1 percent to $248 million.
- The second largest classification was chemicals and allied products, including pharmaceuticals, which increased 97.8 percent to $244 million.
- Paper and allied products rose 31.6 percent to $230 million.
- The fifth major category, transportation equipment, showed a decline of 19.7 percent to $192 million.
- Canada export revenues were greater than Japan's; exports to Canada totaled $359 million and grew by 9.6 percent while those to Japan were $282 million, up 57.3 percent.
- Exports to Mexico showed strong growth, increasing 89.3 percent to $128 million.

Charts with detailed breakdowns of the trade index data appear on page 23 of this journal. The index uses U.S. Commerce Department data on Georgia exports and an estimation of imports to gauge Georgia's international trade and its trade balance. The Wachovia Georgia World Trade Index will be published quarterly as a regular feature of the ECONOMOS Journal.

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interactive video, satellites and high performance, high capacity cable.

Using the state's existing telecommunication network, Georgia Tech, Morris Brown College, the University of Georgia and Columbus College reconnected to high schools in Atlanta and Columbus. Supported by BellSouth, NEC America, Bidicom and KA Teletech, "ClassConnect" provides college level courses to high schools, permitting advanced students exposure to enrichment learning. "In keeping with the ongoing work of professionals in education, technology can play a key role in helping students, teachers and faculty strive for cost effective advances in education," comments Carl Swearingen, president of BellSouth Telecommunications Georgia.

In Douglasville, the Georgia Cable Association sponsors a program allowing schools to share resources and students; one teacher can instruct Spanish to six classes in various elementary and middle schools throughout the system.

A grant from IBM and support from Southwire, BellSouth and TeleCommunication Inc. (TCI) provide an enhanced learning environment in Carrollton through cable delivery. Each school is part of an extensive token ring network with up to seven computers in each room. The high school boasts three computers with seven integrated compact disc drives daisychained for a capacity of 21 CDs networked to each classroom. According to Jackie Filligen with the Carrollton City School System, four billion pages of information are at each student's fingertips, including 7200 laser disks with every video clip ever produced.

Carrollton businesses also are conducting independent community projects to enhance the school system's reach. TCI is wiring into homes without current cable access to allow viewing of Carrollton school system's programs and classes on parenting skills, child care and parent-child activities. The neighborhood CB&T bank contributes its 12 phone lines during downtime for a school system messaging center — parents can call for messages from their children's teacher and for lunch menus, school closings due to weather or upcoming school functions.

A project at Georgia Southern University reaches the nontraditional student limited to educational access by job or dependents. "Everyone benefits, but it's really targeted at those who wouldn't be enrolled otherwise," explains Pam Ramsey, Georgia Southern University coordinator for Distance Education. "Better yet, we can do the continuing education so needed across rural southeast Georgia and help those interested in a CPA or real estate license, for example. We can even hook up rural development services so they can share advice, problems or find how another area handled a state or federal mandate." The project, using compressed video over telephone lines, began as a trial in the fall of 1991 and has now expanded to five courses. Remote sites, like Altamaha Technical Institute in Jesup, are linked to Georgia Southern, eliminating the student's hour and a half drive to the university.

A video link between Georgia Tech and its research office in Warner Robbins offers courses, consulting and engineering assistance to employees in the aerospace industry.

Scripps Howard in Rome, Georgia is currently reviewing proposals to link a 16 county-wide area in northwest Georgia into a distance learning hub. They already have put together a system which enhances existing coaxial cable. Says Neil Fondren of Scripps Howard, "We can process 10 million bits of information a second over existing cable — that's far ahead of the million bits T1 lines can process. By first quarter 1993, we should have the capacity to move 30 frames a second, which is as smooth as watching a VCR tape."

APPLIED TELEMEDICINE

A cancer patient in a rural community hospital frequently endures two surgeries and anesthesia risks because few such hospitals can afford pathologists on staff. The tissue removed through the biopsy is frozen and sent to an urban medical center; if cancer is confirmed, the patient faces a second operation. Rural patients recovering from open heart surgery often must drive hundreds of miles to urban hospitals for subsequent check-ups, sometimes being driven by a family member who must take time off from work and sometimes having to stay overnight.

With less patient anxiety and less cost, telemedicine enables doctors to see and examine patients who are hundreds of miles away. Now the heart patient need only go as far as his regional hospital where the urban specialist, 150 miles away, examines him through a two-way interactive voice and video system. Through telemedicine, the cancer biopsy patient endures only one surgery. While under anesthesia, a pathologist far away adds an adapter on a microscope and is able to see the biopsy tissue. The biopsy, as well as any additional surgery, is done in one step.

The Medical College of Georgia, with support from BellSouth which donated $500,000 worth of equipment, Georgia Power and the Georgia State Assembly, has operated a pilot telemedicine project for almost a year between a base in Augusta and a remote location at Dodge County Hospital in Eastman.

Similar to business teleconferencing, telemedicine combines video, television screens, telephones and fax machines with added diagnostic tools such as stethoscopes, microscopes, endoscopes, electro- and echo-cardiograms, sonograms and other devices. "We can do eyes, ears, heart, motor skills, x-rays, ultrasound studies, everything except palpate the patient's abdomen," says Dr. Francis Tedesco, president of the Medical College of Georgia. "And we're working on that with Georgia Tech."

Georgia Tech is developing a device using virtual reality that transmits and receives tactile sensations. The doctor at the remote location will don a glove and palpate the patient; the base doctor in the urban center will put on a sensory apparatus and feel the same texture, force and temperature that the remote glove is feeling.

More than 100 patients already have benefited from the pilot program. Eighty percent of the patients were treated in Eastman without having to commute to the Augusta hospital.

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Therefore, most of the medical fees stayed in Eastman. Since rural hospital fees are usually lower (averaging $850 a day) than large urban centers (averaging $1,350 a day), savings were realized for both patients and insurance companies.

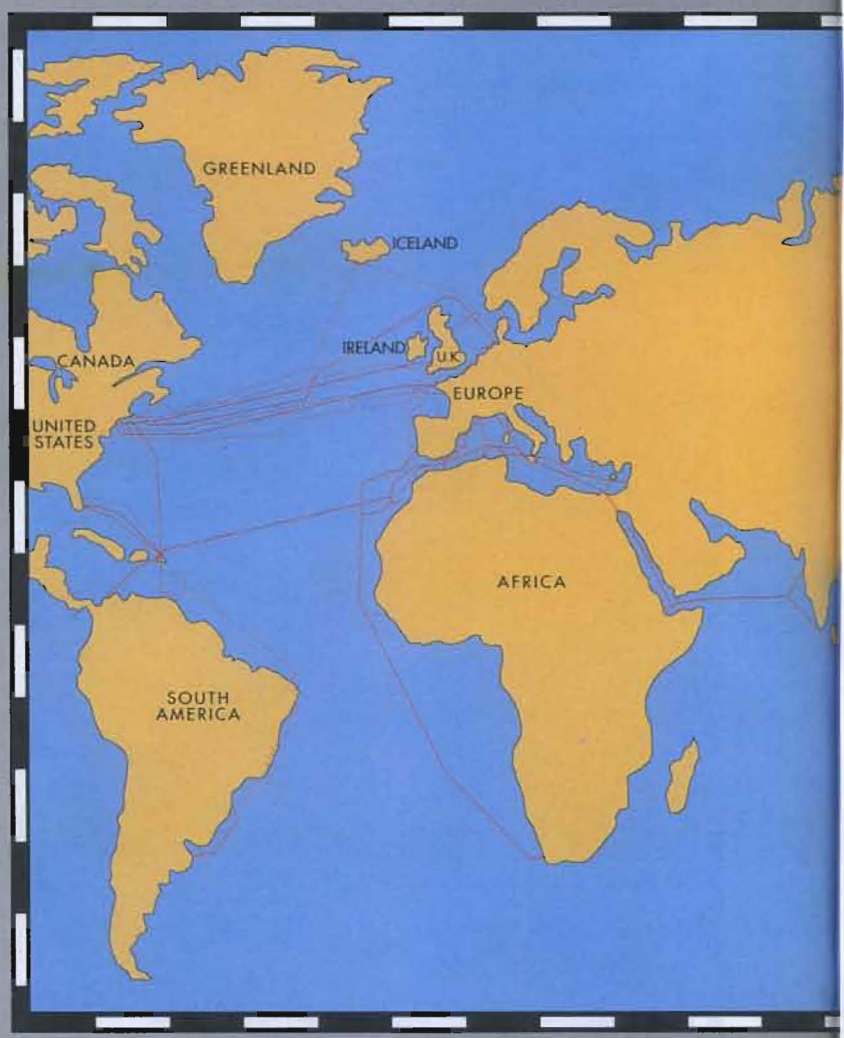
Over 600 small rural hospitals closed during the past 15 years in the U.S. And, health care experts estimate a $1.5 million community penalty when the last doctor leaves a rural area and the closest physician is more than 30 miles away. Shifting costs back to rural hospitals greatly increases the survival rate of those facilities left. "The biggest reason rural physicians leave is the sense of isolation," says Tedesco. "Telemedicine solves that. Real-time continuing education as well as talking and working with colleagues erases the isolation and improves the level of health care."

Six or seven regional telemedicine centers with substations around Georgia are planned, each interacting with the other. A portable system is also in the works, enabling those rural hospitals who otherwise couldn't afford the technology a chance to participate by sharing a system among several hospitals. The statewide telemedicine system would link urban and rural hospitals, nursing homes, military bases, retirement communities and prisons. Currently, doctors interact with doctors, but it's only a matter of time before remote nurses interact with base doctors, reducing costs in the nurse-driven public health care system.

POTENTIAL GROWTH CENTERS

In addition to distance learning and telemedicine, Georgia has the potential to become the leader in a number of other fields. If GCATT, GRA and other state initiatives reach their goals, Georgia could become a global center for collaborative research.

Less obvious but very significant is Georgia's position as a center for computer network value added companies in the computer industry. Syncordia chose Atlanta because of its access to high capacity, high performance networks on a global basis. AT&T located their eastern United States Network Control Center in Georgia, as well as their Network Systems Regional Center which supports and develops advanced personal video. National Data Corporation has 108 T1 lines hooked into their major network management center.



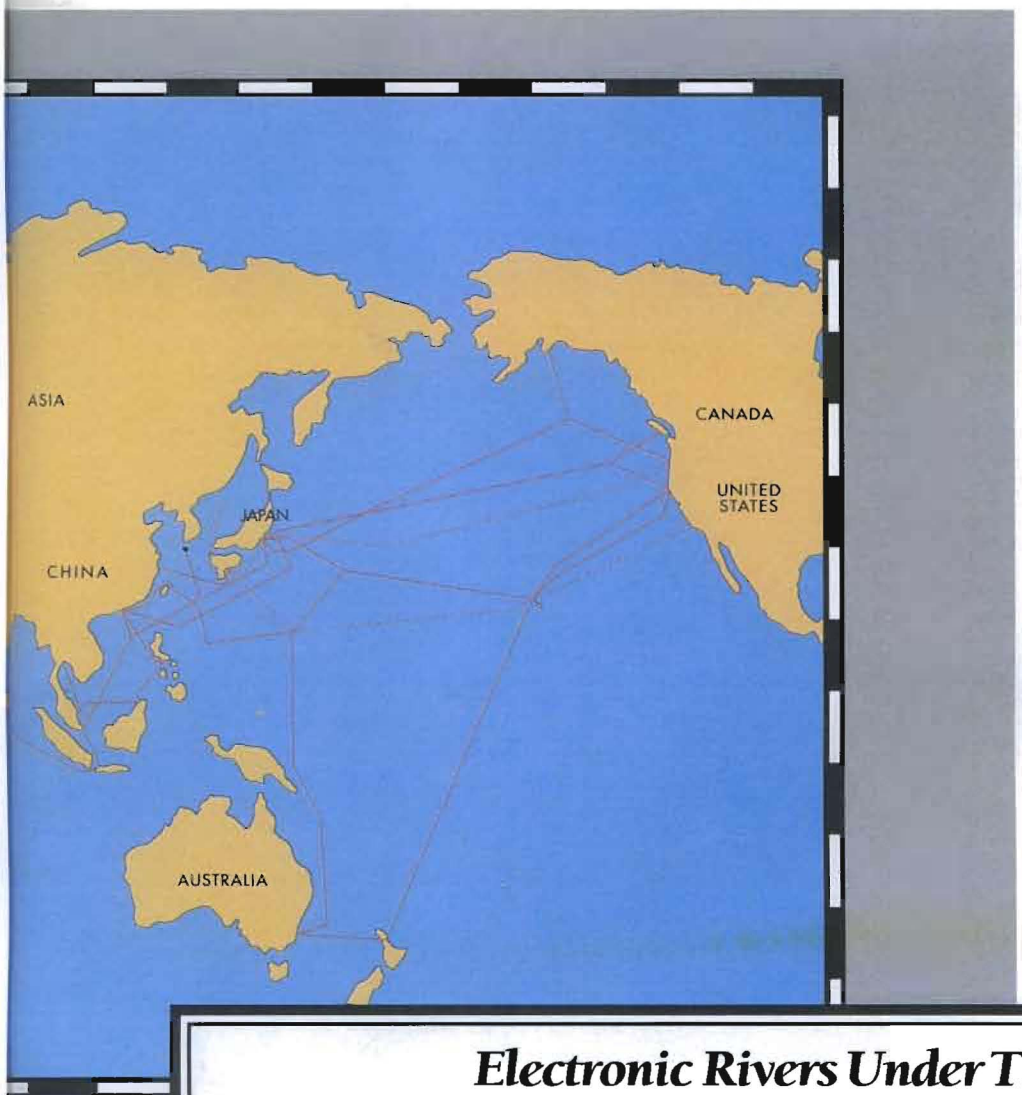
Cables Under The Sea

Technical advances have vastly increased the capacity of telephone cable links between North America and Asia across the Pacific, and between North America and Europe across the Atlantic. Here are the cables that have been put into service since 1970 and the number of simultaneous calls each can handle.

Georgia is already a frontrunner in content origination, largely through the activities of Ted Turner. CNN pulls information to Atlanta from around the world, edits it, layers it, maneuvers it, and distributes it back to the world — all in real-time on a mass basis. Content origination can be disseminated on either a mass basis — newspaper, television, radio — or on an individual basis — digital character and computer generation. IBM's Multimedia Lab is a global participant in content origination, producing some 60 interactive titles to date. Many smaller, entrepreneurial multimedia companies have sprung up across Georgia, in part to be close to the IBM lab but also because of the state's technical infrastructure; multimedia requires very broad bandwidth to handle the combination of voice, data and video.

Georgia's existing technology infrastructure was a major advantage in the 1996 Olympic decision. As a technological trigger event, Olympic research and development will be focused on multimedia; broadband; ISDN; HDTV; global bundled and unbundled voice, data and video; artificial intelligence; digital high capacity, high reliability networks and virtual reality — leaving a legacy of expanded infrastructure, continued research opportunities, collaborative organizations and constituents in its wake. The three billion people who watch the 1996 Olympics will see the results.

Global undersea cable information provided by France Telecom.



Electronic Rivers Under The Sea

TRANSPACIFIC

In Service	Cable	Type	Capacity	Status
1974	TPC-2	Analog	845	Active
1969	TPC-3	Digital	40,000	Active
Nov 1992	TPC-4	Digital	80,000	Under Construction
1996	TPC-5	Digital	320,000	Planned
Not Yet Set	APCN	Digital	160,000	Planned

TRANSATLANTIC

In Service	Cable	Type	Capacity	Status
1970	TAT-5	Analog	1,690	Due to be retired
1976	TAT-6	Analog	8,400	Active
1983	TAT-7	Analog	8,400	Active
1988	TAT-8	Digital	40,000	Active
1992	TAT-9	Digital	80,000	Active
1992	TAT-10	Digital	80,000	Active
Aug 1993	TAT-22	Digital	80,000	Under Construction
Late 1994	Columbus 2	Digital	80,000	Planned
1996	TAT-12,13	Digital	700,000	Planned

Source: American Telephone & Telegraph and The New York Times