Telephones and Computers

The Costs of Artificial Separation

William J. Baumol and Robert D. Willig

THE TECHNOLOGIES of computers and telecommunications have fused. Computers call each other over telephone channels to exchange information and coordinate their operations. Telephones have evolved into miniature computers, and telephone switchboards into bigger, more powerful ones. The telephone network is itself a giant computer, with its intelligence spread throughout its length and breadth instead of concentrated at one site.

Although the marketplace eagerly accepts this fusion of technologies, the Federal Communications Commission (FCC) has been standing athwart the tide of history crying "halt." The FCC's rules require the nation's largest phone company, AT&T, to keep its telecommunications operations entirely separate from its computer business. Thus, whenever AT&T offers telecommunications services that are "enhanced" to include a variety of data processing services, it must supply the latter through a separate part of the company, out of a separate location, and using a separate computer, instead of through the same computers and locations that comprise its telecommunications network.

The "separation" rules are responsible for a host of other inefficiencies as well. For example, many large Japanese companies maintain internal libraries of the computer software their divisions produce, so that expensive programming need not be done twice. But the FCC rules hamper AT&T's efforts to do the same thing. AT&T's incomparable research arm, Bell Laboratories, invests millions every year to design software for the company's long-distance network—software that it is not allowed to share with the company's commercial computer activities.

The rules in question—issued in 1980, three years before the court-ordered breakup of AT&T—force the firm to separate its operations into two compartments. Under those rules, one compartment provides basic telecommunications services and is regulated; the other sup-

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plies computer and telecommunications equipment and computer-enhanced services and is not regulated. What this has meant for AT&T's own competitive position is clear enough. The

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rules put the company at a significant disadvantage in the exploding new market for customer services that integrate computers and telecommunications. But the consequences of the FCC's separation rules stretch further than simply the bottom line of AT&T alone. Because the rules impede the use of AT&T's valuable resources—including billions of dollars in plant and equipment, an illustrious research organization studded with Nobel awards, nationwide marketing forces, and long experience—U.S. technology as a whole may be the loser. That is why the FCC proposed in January of this year to eliminate a substantial portion of the 1980 separation rules, and why even that reform may not go far enough.

How the Separation Rules Came About

In the 1970s, computers and telecommunications were becoming ever more interdependent, and by the end of the decade the boundary between them had all but vanished. The technologies, as we have said, had fused. Computers had learned to "talk to each other" by telephone. And the telephone system had come to rely heavily on computer technology for switching, routing, storing, and other activities. A modern telecommunications switch no longer makes mechanical electric connections—it is instead a highly sophisticated computer. If a call from New York to San Francisco encounters a sudden surge of traffic that clogs the Chicago portion of the route, the call may automatically be rerouted via St. Louis by an intelligent switch. Computers also permit sophisticated and valuable new services such as call forwarding, call recording and data storage, on-line translation between computer languages, and automatic conferencing.

As this convergence proceeded, companies like IBM acquired immense expertise in telephone matters, while companies like AT&T acquired immense expertise in computer matters. The inevitable result was that both kinds of companies found themselves with valuable services and products which they were forbidden by regulation to sell to customers. In the 1970s, one of these two barriers fell: competitors won the right to enter AT&T's market for long-distance telecommunications. At about the

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same time, the FCC began to inquire whether AT&T should be allowed, in turn, to enter the computer field. The FCC reasoned that this convergence could not be held off forever; nor was it defensible to allow others to come onto AT&T's turf but not vice versa. But, at the same time, the commission feared that freedom for AT&T to enter computer-related markets, unless accompanied by safeguarding regulations, would enable the company to exercise and extend monopoly power.* After all, this was before the 1984 divestiture, so AT&T still owned its twenty-one local telephone companies, the Bell operating companies (BOCs). These companies, with their bottleneck facilities, possessed unique, monopoly access to household and business telephone customers. AT&T's competition, moreover, was still new and confined mostly to providing equipment and long-distance service for large businesses.

In particular, the FCC feared that a new regime would invite "cross-subsidy." If the

*The FCC was also concerned that a freer arrangement might run afoul of the 1956 consent decree that had concluded an earlier Department of Justice antitrust case. That decree largely prohibited AT&T from engaging in businesses other than telecommunications.

THE STRUCTURE OF AT&T

Now (and before 1984)

COMMUNICATIONS SECTOR

AT&T Communications supplies domestic and international long-distance communications services. It is permitted to sell only "basic" services, which are regulated. (Before divestiture, this sector was called AT&T Long Lines, and provided all international and most interstate long-distance communications services. The twenty-one Bell Operating Companies, now divested, provided all intrastate and the rest of the interstate long-distance services.)

TECHNOLOGIES SECTOR

AT&T Bell Laboratories is the R&D arm of AT&T. (Formerly it was Bell Telephone Laboratories, a subsidiary of AT&T.)

AT&T Technologies produces electronic equipment, components, and software. (Formerly it was Western Electric Co., a subsidiary of AT&T.)

AT&T Information Systems markets electronic equipment and "enhanced" and other unregulated services to businesses and consumers, and does some development and software design. (Its predecessor, American Bell, was created in response to Computer II [see text]; before then AT&T was not allowed in such unregulated businesses.)

AT&T International markets AT&T products and services abroad. (Its status was unaffected by divestiture.)

Note: The FCC regulates AT&T in two different ways. First, it regulates the prices and characteristics of the interstate and international services of AT&T Communications under the direct authority of the Communications Act of 1934. Second, since 1980 (Computer II), it has maintained restrictions that separate the activities of AT&T Information Systems from those of Bell Labs, AT&T Technologies, and AT&T Communications.

activities of the different parts of AT&T were intermixed and certain kinds of direct transactions among the parts were permitted, the earnings from the basic, regulated telephone monopoly might provide a hidden source of funds that the company could channel to its unregulated enterprises operating in the competitive market for new services. If the regulated part of AT&T were to sell services to the unregulated parts at prices below the pertinent costs, or if costs were assigned without economic justification to the regulated services, then the latter would appear to receive lower earnings. Federal and state regulations might then permit basic transmission rates to rise, thereby allowing the regulated services to recoup the profits passed along as a cross-subsidy to the unregulated entity. As a result, the entire firm could enjoy higher earnings. Or it would be able to compete unfairly in its competitive markets, using the cross-subsidy to finance uneconomically low prices for its products, in the hope of higher future earnings.

Equally important to the FCC was concern about what the Bell operating companies themselves might do—concern that they might be inclined to deny to AT&T's competitors the access to local networks that is essential to many new computer-based services and products. It was feared that, in the highly complex world of electronic interfaces, there might be temptingly subtle ways by which one of AT&T's local phone companies could make life easier for its parent and harder for its parent's rivals.

To prevent these problems, the FCC's Second Computer Inquiry decision (Computer II, 1980) imposed a series of restrictions on the new subsidiary AT&T was creating to supply computerized and other unregulated products and services to the public. That firm, American Bell, became AT&T Information Systems (AT&T-IS, see box) at the time of the 1984 di-

vestiture. Under the separation rules, AT&T-IS is required:

- To keep its accounts and records completely separate from those of the rest of AT&T;
- To share no facilities and practically no staff with other parts of the company, even in marketing;
- To sell no basic services (telecommunications transmission), even if consumers are eager to buy those services "bundled" with their purchases of customer premises equipment (telephones, switchboards, answering devices, and so on);**
- To acquire no software from AT&T Technologies (formerly Western Electric) or Bell Laboratories unless the software is simultaneously made available on the same terms to outside buyers, even if those buyers are AT&T's direct competitors and hope to imitate its products.

Corresponding restraints were placed on the rest of AT&T. For example, AT&T Communications Inc., the regulated long-distance carrier of basic transmission services (formerly AT&T Long Lines) is prohibited from supplying "enhanced" (that is, computerized) telecommunications services to itself and to the outside market. It also cannot sell consumer premises equipment (CPE), which must be distinguished from AT&T telephone network equipment by an arbitrary boundary.

These rules were not imposed on rival long-distance carriers, such as MCI and GTE Sprint, or on competing foreign and domestic suppliers of telecommunications equipment to U.S. markets, among them Rolm Corporation, Mitel, ITT, Northern Telecom, and NEC. It is true that AT&T is a huge firm, but it is also true that some very powerful firms—both bigger and smaller than AT&T—are legally allowed to bridge the computer/telephone gap. Earlier this year, for instance, IBM took over Rolm, a Silicon Valley firm that is America's second largest seller of PBX's (private office "switchboards"—today computerized and "smart"). IBM is also a major owner of Satellite Business Systems, which sells long-distance data and voice telecommunications services. The giant firm is expected to combine these operations in order to develop and market integrated systems that make possible coordinated and interactive data processing and communications over a network of locations. A host of other major international corporations are pursuing a similar strategy, including Wang and NCR Corporation at home, and Japanese and British firms undergoing denationalization and deregulation.

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The FCC's Proposed Reform

In April 1984 AT&T asked the FCC to drop the Computer II restrictions, and nine months later, in January 1985, the commission replied with a proposal that went part of the way. In particular, it proposed to "remove the structural separations conditions from AT&T's provision of CPE," to waive the rules so as to allow AT&T-IS to make "unrestricted use of proprietary software on a fully compensatory basis," and to permit AT&T Technologies to provide personnel as well as recruiting services to AT&T-IS.

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If these proposals survive the public comment period, they will lessen some of the worst inefficiencies caused by the Computer II rules. Unfortunately, however, they leave on the books the FCC's crucial restrictions on enhanced services. That is, the FCC will continue to prohibit the different AT&T subsidiaries from jointly developing, producing, and marketing services and products that lie on different sides of the arbitrary boundary between basic (regulated) and enhanced (unregulated) telecommunica-

**In 1984 the FCC decided to allow AT&T-IS to *resell* widely used, tariffed services of AT&T Communications, but to continue to prevent it from owning facilities for providing basic services.

tions. Moreover, it appears that the FCC intends to continue to subject AT&T to information disclosure requirements that do not apply to its domestic and foreign competitors.

Thus, the regulatory separation of computers and telecommunications remains a pressing issue today. It requires careful description and analysis, and these are the tasks to which we now turn.

Revolution in the Telephone Industry

While there may have been some logic to the FCC's separation rules in 1980, the subsequent upheaval in the industry has rendered them obsolete, removing the promised benefits of the restrictions and multiplying the social costs. Three of these developments are worth special attention: the explosive growth of competition, the divestiture by AT&T of its local operating companies, and technological changes that have destroyed the boundaries between basic service and enhanced service and between telecommunications equipment and computer products. But before dealing with these developments individually, let us comment on their general relevance.

Recall that the chief danger of allowing a firm to operate in both the regulated and unregulated sphere is that of "cross-subsidy": either the regulated part of the firm will underprice the products it sells to its unregulated affiliate, or the parent firm will overassign joint costs to the regulated entity. In either case, the regulated entity may be able to recoup its earnings "loss" (that is, the loss that appears in its own books) via the regulatory process, while the unregulated entity comes out ahead. Neither of these strategies can work, however, when the regulated entity faces substantial competition and thus does not possess significant monopoly power.

Suppose the regulated entity tries the strategy of underpricing the products that it sells to its unregulated affiliate. If there are competing suppliers of the products in question, the market will provide clearly visible benchmark prices that regulators can use to check the legitimacy of transfer prices. Furthermore, if the regulated entity sells the same items to all others who want them, its underpricing will provide a subsidy to rivals as well as to friends. Finally, if the other services that the regulated entity provides are subject to competition, it may be unable to raise the prices of those services as an offset—which would make the whole venture of underpricing a pure drain on profits. Nor will the other strategy, misassignment of common costs, be effective in an environment in which competition puts an effective ceiling on prices. Even if the regulators did allow the regulated entity to raise its rates to cover the fictitious costs, the effect would just be to drive its customers into the arms of its competitors. (This is the very reason why the prices of most of the services offered by AT&T Communications no longer need to be regulated. Any attempt to raise prices significantly above costs would prove to be unprofitable because of the resulting loss of business to the rivals of AT&T Communications. See Michael Katz and Robert Willig, "The Case for Freeing AT&T," *Regulation*, July/August 1983.)

The Growth of Competition

Since the FCC's 1980 decision, competition has accelerated spectacularly throughout the industry—with the obvious exception of local exchange service. The market for traditional long-distance service, the only AT&T service whose prices and rate of return are still regulated directly, has seen an extraordinary rise in competition. Back in 1980 AT&T Long Lines invested nearly $1 billion in plant and equipment, while its rivals invested only about $0.3 billion. But by 1983 Long Lines had fallen behind, putting about $1.1 billion into investment compared to some $1.6 billion by its rivals. It is now widely projected that, by 1986, the total long-distance transmission capacity of the competitors will be several times larger than AT&T's (*Fortune*, January 7, 1985).

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In equipment sales, the story is much the same. Many observers think that a Canadian

firm, Northern Telecom, now sells the best small and medium-scale electronic switching machines, and that the Japanese may soon become the world's best suppliers of fiber optic transmission systems, in terms of both quality and price. The number of competing producers of microwave transmission systems is growing. AT&T's small share of telecommunications satellite capacity continues to shrink, and many new firms are actively innovating in earth station facilities for satellite transmission. In long-distance equipment, the market share held by AT&T Technologies has declined along with AT&T's share of investment. Even AT&T Technologies' sales of exchange switching equipment to the divested BOCs, sales that might have been expected to suffer hardly at all from the incursions of competitors, have fallen from the predominant share of the market in 1980 to less than half the market currently ("Central Office Equipment Markets," Northern Business Information Inc., March 1984). The enormous and continuing growth of competitors in number, size, and capability means that AT&T no longer possesses significant monopoly power in most of the long-distance and equipment markets. There is little reason to fear that in today's competitive environment either arm of AT&T can manipulate its prices to provide significant cross-subsidies to the other.

The Role of Divestiture

Aside from competition, the most dramatic development in the recent history of telecommunications has undoubtedly been the antitrust settlement that led to AT&T's January 1984 divestiture of its local operating companies. The implications of this action are profound.

First, at one chop, it cut AT&T off from its remaining genuine monopolies—the twenty-one local telephone companies. Second, because these companies are now independent, they no longer have any incentive to spend money or incur costs in ways intended to benefit AT&T. Indeed, the antitrust settlement explicitly enjoins them from giving AT&T preferential treatment, and they are watched very closely in this regard, both by the local regulatory agencies and by AT&T's competitors. Moreover, the BOCs are not only independent but are already very much acting as such. They are competing with their former parent in the provision of computer and telephone premises equipment and in the supply of some interexchange network services. A number of spirited contests between the BOCs and AT&T are underway in these markets.

Obviously, the fear that a regulated division of AT&T might find a way to cross-subsidize AT&T-IS cannot sensibly be extended to relationships between AT&T and the [now very independent] local telephone companies. . . .

These developments have largely eliminated the rationale for the FCC's 1980 Computer II decision. Obviously, the fear that a regulated division of AT&T might find a way to cross-subsidize AT&T-IS cannot sensibly be extended to relationships between AT&T and the local telephone companies. For the latter have no reason to sell anything to AT&T at an uneconomically low price.

The divestiture of the BOCs also guarantees that AT&T will not manipulate its equipment prices. It cannot overprice equipment because the BOCs, its main customers, can and do shop elsewhere. Nor can it afford to supply such equipment at prices that are too low and, hence, uncompensatory, since that would simply constitute a gift to the BOCs (and to other ouside buyers) in which AT&T no longer retains any financial interest. Since nearly 90 percent of AT&T's equipment production is now sold to outsiders who have access to many alternative sources of supply, AT&T is hardly in a position to misprice the equipment it sells to its own subsidiaries.

Drawing an Arbitrary Line

A major source of the social costs of FCC's separation decision is the practical difficulty of drawing a clean line between telecommunications and computers, between basic services and enhanced services. The distinction between these categories, not very clear even in 1980, is now so blurred and unrecognizable that the separation rules would be practically unworkable even if their purpose were still pertinent.

Two illustrations will suffice to demonstrate the point.

The first is the case of "private networks" put together for a single organization. A private network carries voice and data between and among people and computers within a firm and to the outside world. These networks are run by "intelligent PBXs" whose central computers direct the internal distribution of messages. Because a private network can take advantage of scale economies in handling congestion, it reduces the number of phone lines needed. In addition, it can process and translate information flows between computers, interconnect with satellite and terrestrial long-distance facilities, and record and forward calls on command while it receives and answers them.

The second example is the development of the "smart building." The smart building offers the services of a private network to all the tenants of a single edifice or an industrial park (and also runs the heating plant and the elevators!). Because of the diverse demands of the various users of such a system, integration of basic and enhanced services is even more essential here than for the private network serving only one firm. Although these buildings may seem futuristic, several of them are already in existence, and surveys of real estate developers indicate that a good many more are under way.

Under the separation rules, AT&T is prevented from efficiently organizing its efforts to bring these innovative services to the marketplace. Private networks and smart buildings require careful matching of the customer's needs with the most advanced telecommunications and computer technology. But in many situations the separation rules prohibit AT&T from

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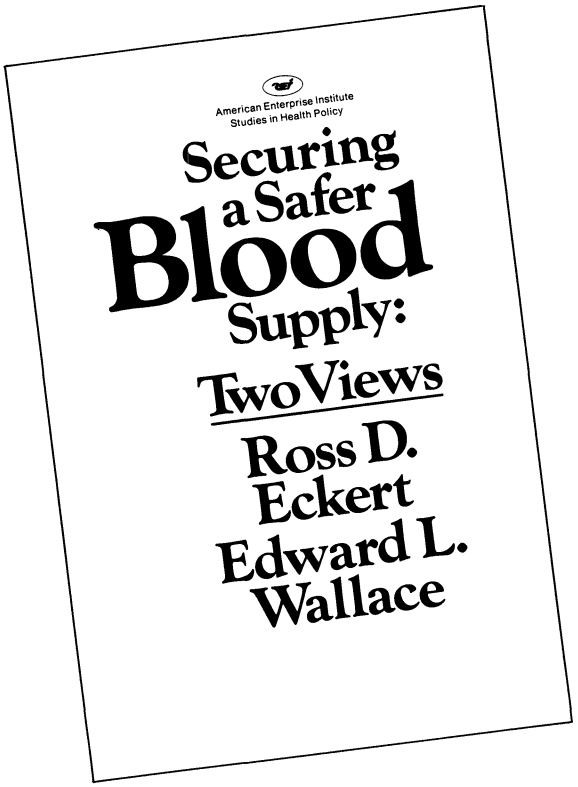

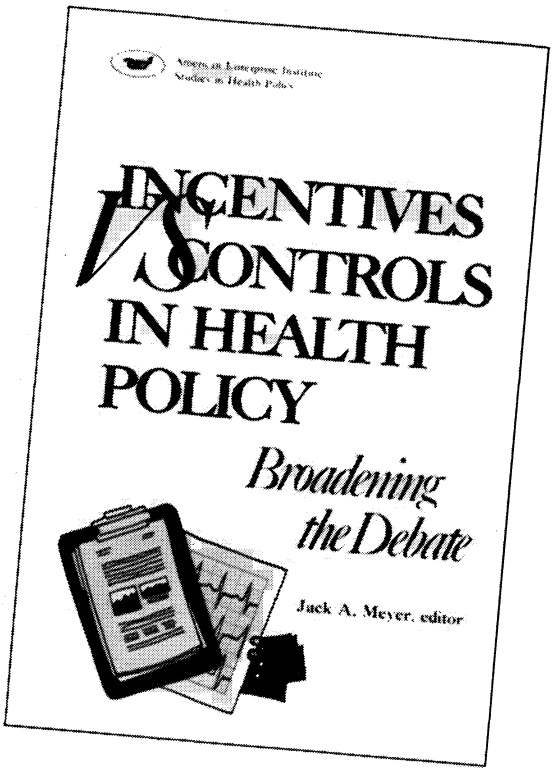

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speaking directly to its customers. For example, AT&T Technologies, the company's equipment manufacturer, may not sell directly to end-users, which means that it can offer its software to the user only by working through AT&T-IS or some non-AT&T distributor. But if it does work through AT&T-IS its proprietary software must be made generally available to outsiders, including AT&T's competitors, on an equal basis. Thus, the separation rules deprive AT&T of the full benefits of its own innovations, and dull the incentives to generate them. AT&T is the only firm in the industry that is hampered by such regulatory controls.

The artificial separation in this area gives rise to five principal social costs:

(1) *Unmet consumer needs.* Consumers want services tailored to their particular needs; and they neither notice nor care that some of the inputs they require are classified as "basic" and others are classified as "enhanced" or "CPE." The separation rules prevent AT&T from meeting its customers' demands for integrated services through the coordinated efforts of several subsidiaries. Thus the major competitor in the market is hobbled.

(2) *Costly duplication.* Some enhanced services offer substantial economies of scope and scale when sold in combination with basic services. The separation rules make necessary a duplication of capital, labor, and other facilities. Much money could be saved, for example, if AT&T could unify its sales forces and billing operations, particularly in marketing to customers who want to buy packages of basic and enhanced services and equipment. As we have already noted, much of the software developed by Bell Labs or AT&T Technologies would be used elsewhere in the firm were it not for the separation rules. In addition, without the rules AT&T would be able to use the same computers that are integral to its long-distance network to provide enhanced communications services as well.

(3) *Distorted incentives.* The separations boundaries also distort underlying profit incentives. The problem arises when an end product (or end service) requires the coordination of inputs from the different, separated parts of the company established by the FCC. Under the rules, AT&T Communications often will find it unattractive to invest in facilities for transmitting a new enhanced service whose market is still uncertain. For if the new product turns out to be a great success, the regulated subsidiary's profits are held to the fixed regulated rate, and if the product fails, the loss may be absorbed by the parent.

There are well-known efficiencies in allowing firms to coordinate the design, production, and marketing of services or products that are complementary. To illustrate, consider a superior new type of razor that is produced by two firms, one of which has developed the blade and the other the handle. If the two firms are forced to operate independently, each may try to raise the price of its own component in an attempt to capture for itself most of the razor's potential profits. And the result would be a total price too high to maximize *both* firms' profits (and to optimize both consumer welfare and the incentive to invent useful shaving products). Unregulated markets take care of this sort of distortion of incentives by integration (both vertical and among complementary lines of business), joint ventures, equity holdings among firms, or agreements for joint product development and marketing. But such arrangements are explicitly denied to AT&T by the FCC's separation rules.

(4) *Disincentives for R&D.* Research and development are particularly hard hit by the separation rules. The rules require that R&D projects be assigned to one side of the line or the other, but there is no way to predict whether a research success will yield a product on side A, or side B, or both. The more basic a research activity is, the less predictable and more broadly applicable its results are likely to be. Since it is difficult to obtain suitable compensation for new ideas from unaffiliated beneficiaries, the efficient use of R&D in electronics today requires the sharing of information among integrated entities. But once again, this is forbidden at AT&T.

(5) *Cost of uncertainty and litigation.* Regulatory restrictions also invite deliberate distortions of the marketplace, distortions that rival firms create to protect themselves from competition by the regulated firm. Where the rapidity of technological change ensures that the rules will be hazy, which is the case with the FCC's Computer II decision, there will always be something to litigate about. Litigation slows a firm's competitive response to market conditions and adds to the high risk burden that is

already posed by most high-technology investments.

Conclusion

The FCC's 1980 decision was based on cost-benefit grounds. That was then, and continues to be, the right criterion. But the balance of costs and benefits has changed. What might have seemed a tenable boundary in 1980 has now become an arbitrary wall that prevents effective efforts to meet consumers' needs and the challenges of competition. The obsolescence of the line can only mount as the technologies involved become increasingly complex and convergent.

It is ironic that among the main beneficiaries of continuation of the FCC's rules are AT&T's integrated foreign competitors, which are not subject to similar restrictions and which market combined computer and communications services on a global scale. Our leading supplier of telecommunications services and products is bound up in a net of regulatory restrictions at the same time that its foreign rivals, far from being handicapped by their governments, receive from them systematic aid and encouragement. This is not meant as an argument for trade restrictions of any sort—only for the elimination of the senseless restraints that this country imposes on the conduct of its own, leading firm in the world telecommunications market. If the public is to gain the full benefit of the revolution in computer and telecommunications technology, an equally dramatic revolution will have to take place in the world of regulation. ■

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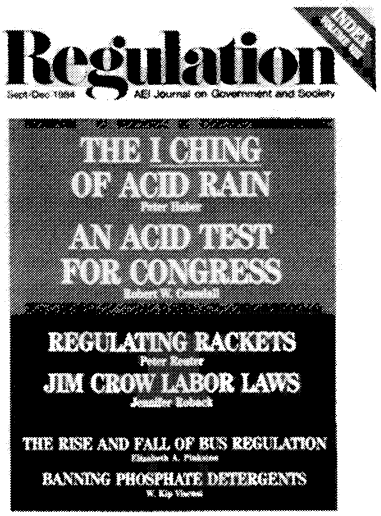
Letters to the Editor
(Continued from page 3)

The market for the Mirabel plant's output is uncertain. The plant is to produce light bi-turbo helicopters. The government stipulated in 1982 that Canada's defense forces would not be purchasing any of the 'copters, and light bi-turbos account for only 0.6 percent of the Canadian civilian helicopter market. Indeed, only six helicopters of *any* type were sold in Canada in 1984, and the total number of 'copters in circulation has actually declined by one (to 956) since 1980.

Bell Helicopters, however, assures the government that its production (to commence in January 1987) will be ten 'copters a month, presumably for export. But the export market seems equally uncertain, for several reasons. First, a 1982 study by the consulting firm Aviation Planning Services (recently leaked to the press) claims that, as far ahead as 1990, light bi-turbo 'copters will hold only 16 percent of the world market, and that their share is not growing. Second, the world supply of light bi-turbo 'copters is more than adequate now. Only about ten such helicopters (of any make) were sold in the world last year, according to Mr. Phillippe Orsetti, vice-president in charge of American operations for the French firm Aérospatiale.

Bell has made it exceptionally painless for potential buyers to place orders for these helicopters (a mere $10,000 deposit, interest-bearing *and refundable*, is all that it requires). Still, it would be interesting to know how many such "firm" orders it has in hand. It is a field where the French Aérospatiale seems to have the technological lead. Bell initially claimed that the Mirabel 'copters would have revolutionary new turbines, but it turns out that these are not available, so Bell will be going with the same motors used by all its competitors.



In its 1983 announcement, the federal cabinet proudly proclaimed that the plant would directly create 2,773 jobs. On March 4, 1985, Bell president Jim Schwalbe said the plant will employ 835 persons, *if* the ten-helicopter per month schedule can be maintained. This works out to a cost to taxpayers of $330,000 for each permanent job created (assuming they are permanent).

In part to calm the howls of Ontario residents after this plum was granted to Quebec, the federal government announced, also in 1983, that a similar (but smaller) and equally subsidized helicopter plant would be built by the German firm Messerschmitt - Bolkow - Blohm in Fort Erie, Ontario.

How will these firms sell more than 120 noninnovative 'copters per year? Will the federal government agree to buy dozens of unsold helicopters that taxpayers will already have paid for? Only time can tell whether the new Progressive Conservative government will decide to follow its predecessors up the well-worn path of "industrial policy."

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