Case 10B

EMI AND THE CT SCANNER (B)

The year 1977 looked like it would be a very good one for EMI medical inc., a North American subsidiary of EMI Ltd. EMI's CT scanner had met with enormous success in the American market. (Exhibit 1 shows a photograph of an early EMI scanner.) In the three years since the scanner's introduction, EMI medical electronics sales had grown to £42 million. Although this represented only 6% of total sales, this new business contributed pretax profits of £12.5 million, almost 20% of the corporate total (Exhibit 2). EMI Medical Inc. was thought to be responsible for about 80% of total scanner volume. And with an order backlog of more than 300 units, the future seemed rosy.

Despite this formidable success, senior management in both the subsidiary and the parent company were concerned about several developments. First, this fast-growth field had attracted more than a dozen new entrants in the past two years, and technological advances were occurring rapidly. At the same time, the growing political debate over hospital cost containment often focused on \$500,000 CT scanners as an example of questionable hospital spending. Finally, EMI was beginning to feel some internal organizaional strains.

ENTRY DECISION

Product Launch

Following months of debate among EMI's top management, the decision to go ahead with the EMI Scanner project was assured when John Read, the company CEO, gave his support to Dr. Powell's proposal. In April 1972 a formal press announcement was greeted by a response that could only be described as overwhelming. EMI was flooded with inquiries from the medical and financial communities, and from most of the large diagnostic imaging companies wanting to license the technology, enter into joint ventures, or at least distribute the product. The response was that the company had decided to enter the business directly itself.

Immediately action was implemented to put Dr. Powell's manufacturing strategy into operation. Manufacturing facilities were developed and supply contracts drawn up with the objective of beginning shipments within 12 months.

In May, Godfrey Hounsfield, the brilliant EMI scientist who had developed the scanner, was dispatched to the U.S. accompanied by a leading English neurologist. The American specialists with

whom they spoke confirmed that the scanner had great medical importance. Interest was running high in the medical community.

In December, EMI mounted a display at the annual meeting of the Radiological Society of North America (RSNA). The exhibit was the highlight of the show, and boosted management's confidence to establish a U.S. sales company to penetrate the American medical market.

U.S. Market Entry

In June 1973, with an impressive pile of sales leads and inquiries, a small sales office was established in Reston, Virginia, home of the newly appointed U.S. sales branch manager, Mr. Gus Pyber. Earlier that month the first North American head scanner had been installed at the prestigious Mayo Clinic, with a second machine promised to the Massachusetts General Hospital for trials. Interest was high, and the new sales force had little difficulty getting into the offices of leading radiologists and neurologists.

By the end of the year, however, Mr. Pyber had been fired in a dispute over appropriate expense levels, and James Gallagher, a former marketing manager with a major drug company, was hired to replace him. One of Gallagher's first steps was to convince the company that the Chicago area was a far better location for the U.S. office. It allowed better servicing of a national market, was a major center for medical electronics companies, and had more convenient linkages with London. This last point was important since all major strategic and policy decisions were being made directly by Dr. Powell in London.

During 1974, Gallagher concentrated on recruiting and developing his three-man sales force and two-man service organization. The cost of maintaining each salesman on the road was estimated at \$50,000, while a serviceman's salary and expenses at that time were around \$35,000 annually. The production rate for the scanner was running at a rate of only three or four machines a month, and Gallagher saw little point in developing a huge sales force to sell a product for which supply was limited, and interest seemingly boundless.

In this seller's market the company developed some policies that were new to the industry. Most notably, they required that the customer deposit one-third of the purchase price with the order to guarantee a place in the production schedule. Sales leads and enquiries were followed up when the sales force could get to them, and the general attitude of the company seemed to have somewhat of a "take it or leave it" tone. It was in this period that EMI developed a reputation for arrogance in some parts of the medical profession.

Nonetheless, by June 1974 the company had delivered 35 scanners at \$390,000 each, had another 60 orders in hand.

DEVELOPING CHALLENGES

Competitive Challenge

Toward the end of 1974, the first competitive scanners were announced. Unlike the EMI scanner, the new machines were designed to scan the body rather than the head. The Acta-Scanner had been developed at Georgetown University's Medical Center and was manufactured by a small Maryland company called Digital Information Sciences Corporation (DISCO). Technologically, it offered little advance over the EMI scanner except for one important feature. Its gantry design would accommodate a body rather than a head. While specifications on scan time and image composition were identical to those of the EMI scanner, the \$298,000 price tag gave the Acta-Scanner a big advantage, particularly with smaller hospitals and private practitioners.

The DeltaScan offered by Ohio Nuclear (ON) represented an even more formidable challenge. This head and body scanner had 256 X 256 pixels compared with EMI's 160 X 160, and promised a 2 1/2-minute scan rather than the 4 1/2 minute scan time offered by EMI. ON offered these superior features on a unit priced \$5,000 below the EMI scanner at \$385,000.

Many managers at EMI were surprised by the speed with which these products had appeared, barely two years after the EMI scanner was exhibited at the RSNA meeting in Chicago, and 18 months after the first machine was installed in the Mayo Clinic. The source of the challenge was also interesting. DISCO was a tiny private company, and ON contributed about 20% of its parent Technicare's 1974 sales of \$50 million.

To some, the biggest surprise was how closely these competitive machines resembled EMI's own scanner. The complex wall of patents had not provided a very enduring defense. ON tackled the issue directly in its 1975 annual report. After announcing that \$882,200 had been spent in Technicare's R&D Center to develop DeltaScan, the report stated:

Patents have not played a significant role in the development of Ohio Nuclear's product line, and it is not believed that the validity or invalidity of any patents known to exist is material to its current market position. However, the technologies on which its products are based are sufficiently complex and application of patent law sufficiently indefinite that this belief is not free from all doubt.

The challenge represented by these new competitive products caused EMI to speed up the announcement of the body scanner Dr. Hounsfield had been working on. The new CT 5000 model incorporated a second-generation technology in which multiple beams of radiation were shot at multiple detectors, rather than the single pencil beam and the single detector of the original scanner (see Exhibit 3). This technique allowed the gantry to rotate 10° rather than 1° after each translation, cutting scan time from 4 1/2 minutes to 20 seconds. In addition, the multiple-beam emission also permitted a finer

image resolution by increasing the number of pixels from 160 X 160 to 320 X 320. Priced over \$500,000, the CT 5000 received a standing ovation when Hounsfield demonstrated it at the radiological meetings held in Bermuda in May 1975.

Despite EMI's reassertion of its leadership position, aggressive competitive activity continued. In March 1975, Pfizer Inc., the \$1.5 billion drug giant, announced it had acquired the manufacturing and marketing rights for the Acta-Scanner.

By June 1975, managers at EMI estimated competitors' cumulative orders as follows:

	Total Shipped	On Order
EMI	122	110
Ohio Nuclear	2	50 (est.)
Pfizer	0	20 (est.)

EMI was then operating at an annual production rate of 150 units, and ON had announced plans to double capacity to 12 units per month by early 1976. Pfizer's capacity plans were unknown.

The most dramatic competitive revelation came at the annual RSNA meeting in December 1975, when six new competitors displayed CT scanners. Although none of the newcomers offered immediate delivery, all were booking orders with delivery dates up to twelve months out on the basis of their spec sheets and prototype or mock-up equipment exhibits.

Some of the new entrants (Syntex, Artronix, and Neuroscan) were smaller companies, but others (General Electric, Picker, and Varian) were major medical electronics competitors. Perhaps most impressive was the General Electric CT/T scanner, which took the infant technology into its third generation (see Exhibit 3). By using a 30°-wide pulsed fan x-ray beam, the GE scanner could avoid the time-consuming "translate-rotate" sequence of the first- and second-generation scanners. A single continuous 360° sweep could be completed in 4.8 seconds, and the resulting image was reconstructed by the computer in a 320 X 320 pixel matrix on a cathode ray tube. The unit was priced at \$615,000. Clinical trials were scheduled for January, and shipment of production units was being quoted for mid-1976.

The arrival of GE on the horizon signalled the beginning of a new competitive game. With a 300-person sales force and a service network of 1200, GE clearly had marketing muscle. They had reputedly spent \$15 million developing their third-generation scanner, and were continuing to spend at a rate of \$5 million annually to keep ahead technologically.

During 1975, one industry source estimated, about 150 new scanners were installed in the U.S., and more than twice as many, orders entered. (Orders were firm, since most were secured with hefty

front-end deposits.) Overall, orders were split fairly evenly between brain and body scanners. EMI was thought to have accounted for more than 50% of orders taken in 1975, ON for almost 30%.

Market Size and Growth

Accurate assessments of market size, growth rate, and competitors' shares were difficult to obtain. The following represents a sample of the widely varying forecasts made in late 1975:

- Wall Street was clearly enamored with the industry prospects (Technicare's stock price rose from 5 to 22 in six months) and analysts were predicting an annual market potential of \$500 million to \$1 billion by 1980.
- Frost and Sullivan, however, saw a U.S. market of only \$120 million by 1980, with ten years of cumulative sales only reaching \$1 billion by 1984 (2,500 units at \$400,000).
- Some leading radiologists suggested that CT scanners could be standard equipment in all short-term hospitals with 200 beds or more by 1985.
- Technicare's president, Mr. R.T. Grimm, forecast a worldwide market of over \$700 million by 1980, of which \$400 million would be in the U.S.
- Despite the technical limitations of its first-generation product, Pfizer said it expected to sell more than 1,500 units of its Acta-Scanner over the next five years.

Within EMI, market forecasts had changed considerably. By late 1975, the estimate of the U.S. market had been boosted to 350 units a year, of which EMI hoped to retain a 50% share. Management was acutely aware of the difficulty of forecasting in such a turbulent environment, however.

International Expansion

New competitors also challenged EMI's positions in markets outside the U.S. Siemens, the \$7 billion West German company, became ON's international distributor. The distribution agreement appeared to be one of short-term convenience for both parties, since Siemens acknowledged that it was developing its own CT scanner. Philips, too, had announced its intention to enter the field.

Internationally, EMI had maintained its basic strategy of going direct to the national market rather than working through local partners or distributors. Although all European sales had originally been handled out of the U.K. office it quickly became evident that local servicing staffs were required in most countries. Soon separate subsidiaries were established in most continental European countries, typically with a couple of salesmen, and three or four servicemen. Elsewhere in the world, salesmen were often attached to EMI's existing music organization in that country (e.g., in South Africa, Australia and Latin America). In Japan, however, EMI signed a distribution agreement with Toshiba which, in October 1975, submitted the largest single order to date: a request for 33 scanners.

EMI IN 1976: STRATEGY AND CHALLENGES

EMI's Situation in 1976

By 1976 the CT scanner business was evolving rapidly, but, as the results indicated, EMI had done extremely well financially (Exhibit 2). In reviewing developments since the U.S. market entry, the following was clear:

- While smaller competitors had challenged EMI somewhat earlier than might have been expected, none of the big diagnostic imaging companies had brought its scanner to market, even four years after the original EMI scanner announcement.
- While technology was evolving rapidly, the expertise of Hounsfield and his CRL group, and the aggressive reinvestment of much of the early profits in R&D gave EMI a strong technological position.
- While market size and growth were highly uncertain, the potential was unquestionably much larger than EMI had forecast in their early plans.
- In all, EMI was well established with a strong and growing sales volume and a good technical reputation. The company was unquestionably the industry leader.

Nonetheless, in the light of all the developments, the strategic tasks facing EMI in 1976 differed considerably from those of earlier years. The following paragraphs outline the most important challenges and problems facing the company in this period.

Strategic Priorities

EMI's first sales priority was to protect its existing highly visible and prestigious customer base from competitors. When its second-generation scanner was introduced in mid-1975, EMI promised to upgrade without charge the first-generation equipment already purchased by its established customers. Although each of these 120 upgrades was estimated to cost EMI \$60,000 in components and installation costs, the U.S. sales organization felt that the expense was essential to maintain the confidence and good faith of this important core group of customers.

To maintain its leadership image, the U.S. company also expanded its service organization substantially. Beginning in early 1976 new regional and district sales and service offices were opened with the objective of providing customers with the best service in the industry. A typical annual service contract cost the hospital \$40,000 per scanner. By year's end, the company boasted 20 service centers

with 150 service engineers - a ratio that represented one serviceman for every two or three machines installed. The sales force by this time had grown to 20, and was much more customer oriented.

Another important task was to improve delivery performance. The interval between order and promised delivery had been lengthening; at the same time, promised delivery dates were often missed. By late 1975, it was not unusual for a 6-month promise to convert into a 12- or 15-month actual delivery time. Fortunately for EMI, all CT manufacturers were in backorder and were offering extended delivery dates. However, EMI's poor performance in meeting promised dates was hurting its reputation. The company responded by substantially expanding its production facilities. By mid-1976 there were six manufacturing locations in the U.K., yet because of continuing problems with component suppliers, combined capacity for head and body scanners was estimated at less than 20 units a month.

Organizational and Personnel Issues

As the U.S. sales organization became increasingly frustrated, they began urging top management to manufacture scanners in North America. Believing that the product had reached the necessary level of maturity, Dr. Powell judged that the time was ripe to establish a U.S. plant to handle at least final assembly and test operations. A Northbrook, Illinois site was chosen.

Powell had become EMI's managing director and was more determined than ever to make the new medical electronics business a success. A capable manager was desperately needed to head the business, particularly in view of the rapid developments in the critical North American market. Consequently, Powell was delighted when Normand Provost, who had been his boss at Texas Instruments, contacted him at the Bermuda radiological meeting in March 1975. He was hired with the hope that he could build a stronger, more integrated U.S. company.

With the Northbrook plant scheduled to begin operations by mid-1976, Normand Provost began hiring skilled production personnel. A Northbrook product development center was also a vision of Provost's to allow EMI to draw on U.S. technical expertise and experience in solid state electronics and data processing, and the company began seeking people with strong technological and scientific backgrounds.

Having hired Provost, Dr. Powell made several important organizational changes aimed at facilitating the medical electronics business's growth and development. In the U.K., he announced the creation of a separate medical electronics group. This allowed the separate operating companies, EMI Medical Ltd. (previously known as the X-Ray Systems Division), Pantak (EMI) Ltd., SE Labs (EMI) Ltd., and EMI Meterflow Ltd., to be grouped together under a single group executive, John Willsher. (See Exhibit 4.) At last, a more integrated scanner business seemed to be emerging organizationally.

The U.S. sales subsidiary was folded into a new company, EMI Medical Inc., but continued to operate as a separate entity. The intention was to develop this company as an integrated diversified

medical electronics operation. Jim Gallagher, the general manager of the U.S. operations, was fired and Bob Hagglund became president of EMI Medical Inc. While Gallagher had been an effective salesman, Powell thought the company needed a more rounded general manager in its next phase of expansion. Hagglund, previously executive vice president of G.D. Searle's diagnostic business, seemed to have the broader background and outlook required to manage a larger integrated operation. He reported through Provost back to Dr. Powell in the U.K.

While Provost's initial assignment was to establish the new manufacturing and research facilities in the U.S., it was widely assumed within EMI that he was being groomed to take responsibility for the company's medical electronics businesses worldwide. However, in April 1976, while visiting London to discuss progress, Provost died of a heart attack. As a result, the U.S. and U.K. organizations reported separately to Dr. Powell.

Product Diversification

Since EMI wished to use the scanner as a means to become a-major force in medical electronics, Powell argued that some bold external moves were needed to protect the company's leadership position. In March 1976, EMI acquired for \$2 million (£1.1 million) SHM Nuclear Corporation, a Californiabased company that had developed linear accelerators for cancer therapy and computerized radiotherapy planning systems. Although the SHM product line needed substantial further development, the hope was that linking such systems to the CT scanner would permit a synchronized location and treatment of cancer.

Six months later EMI paid £6.5 million to acquire an additional 60% of Nuclear Enterprises Ltd., an Edinburgh-based supplier of ultrasound equipment. In the 1976 annual report, Sir John Read, now EMI's chairman, reaffirmed his support for Dr. Powell's strategy:

We have every reason to believe that this new grouping of scientific and technological resources will prove of national benefit in securing a growing share of worldwide markets for high-technology products

FUTURE PROSPECTS

At the close of 1976, EMI's medical electronics business was exceeding all expectations. In just three years, sales of electronics products had risen from £84 million to £207 million; a large part of this increase was due to the scanner. Even more impressive, profits of the electronics line had risen from £5.2 million in 1972/73 to £26.4 million in 1975/76, jumping from 16% to 40% of the corporate total.

Rather than dwindling, interest in scanners seemed to be increasing. Although the company had sold around 450 scanners over the past three years (over 300 in the U.S. alone) its order backlog was

estimated to be 300 units. At the December 1976 RSNA meeting, 120 of the 280 papers presented were related to CT scanning.

As he reviewed the medical electronics business he had built, Dr. Powell was generally pleased with the way in which the company had met the challenges of being a pioneer in a new industry segment. However, there were several developments that he felt would need considerable attention over the next few years. First, Powell felt that competitive activity would continue to present a challenge; second, some changes in the U.S. regulatory environment concerned him; and finally, he was aware that the recent organization changes had created some strains.

Competitive Problems

By the end of 1976, EMI had delivered 450 of the 650-odd scanners installed worldwide, yet its market share had dropped to 56% in 1975/76 (198 of 352 scanners sold that June-to-June period were EMI's). The company gained some consolation from the fact that despite their premium pricing strategy and their delivery problems, they had conceded less than half the total market to the combined competitive field. They also felt some sense of security in the 300 orders they held awaiting delivery. Nonetheless, Sir John Read was clearly concerned:

We are well aware of the developing competition. Our research program is being fully sustained to ensure our continued leadership

In mid-1976, the company announced its intention "to protect its inventions and assert its patent strength," and subsequently filed suit against Ohio Nuclear claiming patent infringement. However, at the same time, EMI issued a statement proclaiming that "it was the company's wish to make its pioneering scanner patents available to all under suitable licensing arrangements."

At the annual RSNA meeting in December 1976, sixteen competitors exhibited scanners. The year's new entrants (including CGR, the French x-ray giant; Hitachi from Japan; and G.D. Searle, the U.S. drug and hospital equipment company) were not yet making deliveries, however. The industry's potential production capacity was now estimated to be over 900 units annually.

GE's much public ized entry was already six months behind their announced delivery date, but it was strongly rumored that production shipments of GE's third-generation scanner were about to begin. EMI Medical Inc. awaited that event with some trepidation. (A summary of major competitors and their situations as of 1976 is presented in Exhibit 5.)

Regulatory Problems

By mid-1976 there were indications that government might try to exert a tighter control over hospital spending in general, and purchase of CT scanners in particular.

The rapidly escalating cost of health care had been a political issue for years, and the National Health Planning and Resources Development Act of 1974 required states to control the development of costly or unnecessary health services through a mechanism known as the Certificate of Need (CON) procedure. If they wished to qualify for Medicare or Medicaid reimbursements, health care facilities were required to submit documentation to their state's department of health to justify major capital expenditures (typically in excess of \$100,000).

Before 1976, the CON procedures had generally been merely an administrative impediment to the process of selling a scanner, delaying but not preventing the authorization of funds. However, by 1976, the cost of medical care represented 8% of the gross national product and Jimmy Carter made control of the "skyrocketing costs of health care" a major campaign issue. One of the most frequently cited examples of waste was the proliferation of CT scanners. It was argued that this \$500,000 device had become a symbol of prestige and sophistication in the medical community, so that every institution wanted its own scanner, even if a neighboring facility had one that was grossly underutilized.

In response to heightened public awareness of the issue, five states declared a moratorium on the purchase of new scanners, including California, which had accounted for over 20% of total U.S. scanner placements to date. In November, Jimmy Carter was elected president.

Organizational Problems

Perhaps most troublesome to Dr. Powell were the organizational problems. Tensions within the EMI organization had been developing for some time, centering on the issues of manufacturing and product design. Managers in the U.S. company felt that they had little control over manufacturing schedules and little input into product design, despite the fact that they were responsible for 80% of corporate scanner sales. In their view, the company's current market position was being eroded by the worsening manufacturing delivery performance from the U.K., while its longer term prospects were threatened by the competitive challenges to EMI's technological leadership.

Although the Northbrook plant had been completed in late 1976, U.S. managers were still not satisfied they had the necessary control over production. Arguing that the quality of subassemblies and components shipped from the U.K. was deteriorating and delivery promises were becoming even more unreliable, they began investigating alternate supply sources in the U.S.

U.K.-based manufacturing managers felt that much of the responsibility for backlogs lay with the product engineers and the sales organizations. Their unreliable sales forecasts and constantly changing design specifications had severely disrupted production schedules. The worst bottlenecks involved outside suppliers and subcontractors that were unable to gear up and down overnight. Complete systems could be held up for weeks or months awaiting a single simple component. As the Northbrook plant became increasingly independent, U.S. managers sensed that in the U.K. plants felt less responsibility for them. In tight supply situations they felt there was a tendency to ship to European or other export customers first. Some U.S. managers also believed that components were increasingly shipped from U.K. plants without the same rigid final checks they normally received. The assumption was that the U.S. could do their own QC checking, it was asserted. Both these assertions were strongly denied by the English group.

Nonetheless, Bob Hagglund soon began urging Dr. Powell to let EMI Medical Inc. become a more independent manufacturing operation rather than simply a final assembly plant for U.K. components. This prospect disturbed John Willsher, managing director of EMI Medical Ltd., who argued that dividing manufacturing operations could mean duplicating overhead and spreading existing expertise too thin. Others felt that the "bootleg development" of alternate supply sources showed a disrespect for the "center of excellence" concept, and could easily compromise the ability of Pantak (x-ray technology) and SE Labs (displays) to remain at the forefront of technology.

Product development issues also created some organizational tension. The U.S. sales organization knew that GE's impressive new third- generation "fan beam" scanner would soon be ready for delivery, and found customers hesitant to commit to EMI's new CT 5005 until the GE product came out. For months telexes had been flowing from Northbrook to EMI's Central Research Laboratories asking if drastic reductions in scan time might be possible to meet the GE threat.

Meanwhile, scientists at CRL felt that U.S. CT competition was developing into a specifications war based on the wrong issue, scan time. Shorter elapsed times meant less image blurring, but in the trade-off between scan time and picture resolution, EMI engineers had preferred to concentrate on better-quality images. They felt that the 20-second scan offered by EMI scanners made practical sense since a patient could typically hold his breath that long while being diagnosed.

CRL staff were exploring some entirely new imaging concepts and hoped to have a completely new scanning technology ready to market in three or four years. Dr. Hounsfield had conducted experiments with the fan beam concept in the early 1970s and was skeptical of its ability to produce good-quality images. To use sodium iodide detectors similar to those in existing scanners would be cost prohibitive in the large numbers necessary to pick up a broad scan; to use other materials such as xenon gas would lead to quality and stability problems in Hounsfield's view. Since GE and others offering third-generation equipment had not yet delivered commercial machines, he felt little incentive to redirect his staff to these areas already researched and rejected.

There were many other demands on the time and attention of Hounsfield and his staff, all of which seemed important for the company. They were in constant demand by technicians to deal with major problems that arose that nobody else could solve. Salesmen wanted him to talk to their largest and most prestigious customers, since a visit by Dr. Hounsfield could often swing an important sale. They were also involved in internal training on all new products. The scientific community wanted them

to present papers and give lectures. And increasingly, Dr. Hounsfield found himself in a public relations role as he accepted honors from all over the globe. The impact was to greatly enhance EMI's reputation and to reinforce its image as the leader in the field.

When it appeared that CRL was unwilling or unable to make the product changes the U.9. organization felt it needed, Hagglund made the bold proposal that the newly established research laboratories in Northbrook take responsibility for developing a three- to five-second-scan "fan beam"-type scanner. Dr. Powell agreed to study the suggestion, but was finding it difficult to evaluate the relative merits of the U.S. subsidiary's views and the CRL scientists's opinions.

By year's end, Dr. Powell had still been unable to find anybody to take charge of the worldwide medical electronics business. By default, the main decision-making forum became the Medical Group Review -Committee (MGRC), a group of key line and staff managers which met, monthly at first, to help establish and review strategic decisions.

Among the issues discussed by this committee were the manufacturing and product development decisions that had produced tensions between the U.S. and U.K. managers. Powell had hoped that the MGRC would help build communications and consensus among his managers, but it soon became evident that this goal was unrealistic. In the words of one manager close to the events:

The problem was there was no mutual respect between managers with similar responsibilities. Medical Ltd. was resentful of Medical Inc's push for greater independence, and were not going to go out of their way to help the Americans succeed.

As the business grew larger and more complex, Dr. Powell's ability to act both as corporate CEO and head of the worldwide medical business diminished. Increasingly, he was forced to rely on the MGRC to address operating problems as well as strategic issues. The coordination problem became so complex, that by early 1977, there were four subcommittees of the MGRC, each with representatives of the U.S. and U.K. organizations, and each meeting monthly on one side of the Atlantic or the other. Committees included Manufacturing and Operations, Product Planning and Resources, Marketing and Sales Programs, and Service and Spares.

Powell's Problems

As the new year opened, Dr. Powell reviewed EMI's medical electronics business. How well was it positioned? Where were the major threats and opportunities? What were the key issues he should deal with in 1977? Which should he tackle first, and how?

These were the issues he turned over in his mind as he prepared to note down his plans for 1977.



- Selectable matrix size—high accuracy 160 x 160; high definition 320 x 320
- Fast image reconstruction—24 seconds
 (dual slice)
- Floppy disc standard
- Simultaneous view/scan capability
- System disk stores up to 100 160 x 160 images
- Minimum dose to orbits—X-ray source travels posteriorly





Exhibit 2

EMI AND THE CT SCANNER (B)

EMI Limited: P&L Statement, 1969-76

Years ended 30 June 1969 £'000 1970 £'000 1971 £'000 1972 £'000 1973 £'000 1974 £'000 1975 £'000 Music 110,554 129,439 128,359 137,755 169,898 213,569 258,343 Leisure 20,960 32,651 35,798 37,917 45,226 53,591 66,566 Television 4,640 10,625 13,593 17,165 22,011 22,814 29,107 Electronics - Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics - - - 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066	1976 £'000 344,743 81,428 38,224 164,943 42,104 671,442
Sales 100,554 129,439 128,359 137,755 169,898 213,569 258,343 Leisure 20,960 32,651 35,798 37,917 45,226 53,591 66,566 Television 4,640 10,625 13,593 17,165 22,011 22,814 29,107 Electronics- Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics - - 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066	344,743 81,428 38,224 164,943 42,104 671,442
Music 110,554 129,439 128,359 137,755 169,898 213,569 258,343 Leisure 20,960 32,651 35,798 37,917 45,226 53,591 66,566 Television 4,640 10,625 13,593 17,165 22,011 22,814 29,107 Electronics – Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics - - - 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066	344,743 81,428 38,224 164,943 42,104 671,442
Leisure 20,960 32,651 35,798 37,917 45,226 53,591 66,566 Television 4,640 10,625 13,593 17,165 22,011 22,814 29,107 Electronics – Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066	81,428 38,224 164,943 42,104 671,442
Television 4,640 10,625 13,593 17,165 22,011 22,814 29,107 Electronics – Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066 Profit (loss) before interest and taxation	38,224 164,943 42,104 671,442
Electronics - 40,170 42.571 52,819 58,215 83,516 104,811 128,644 Medical Electronics 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066 Profit (loss) before interest and taxation	164,943 42,104 671,442
Other than Medical 40,170 42,571 52,819 58,215 83,516 104,811 128,644 Medical Electronics 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066 Profit (loss) before interest and taxation	164,943 42,104 671,442
Medical Electronics 321 5,076 20,406 176,324 215,286 230,569 251,052 320,972 399,861 503,066 Profit (loss) before interest and taxation	42,104 671,442
176,324 215,288. 230,569 251,052 320,972 399,861 503,066 Profit (loss) before interest and taxation	671,442
Profit (loss) before interest and taxation	
Profit (loss) before interest and taxation	
Music 13,293 16,427 1,970 9,333 16,606 26,199 19,762	27,251
Leisure 1,691 3.875 4,146 4,983 4,255 2,639 5,981	5,619
Television 733 992 3,833 5,001 6,104 4,465 2,982	5,646
Electronics –	
Other than Medical 3,741 3,283 3,090 1,353 5,264 5,835 5,378	13,937
Medical Electronics — — — (67) 1,242 9,230	12,502
19,458 24,577 13,039 20,670 32,162 40,380 43,333	64.955
Property (20) 939 2.118 1,842 402 (103)	
19,458 24,557 13,978 22,788 34,004 40,782 43,230	64,95 5
Sales	
United Kingdom 63,144 89,069 103,824 113,925 142,945 165,641 198,153	241.972
Europe 25.987 27.017 39.673 52.541 82.405 105.251 134.450	170.385
North America 65.528 74.622 58.989 53.151 55.143 67.141 78.154	128.798
Other countries 21,665 24,578 28,083 31,435 40,479 61,828 92,309	130,287
176,324 215,286 230,569 251,052 320,972 399,861 503,066	671,442
Profit (loss) before interest and taxation	
United Kingdom 8,301 10,465 13,113 15,447 19,287 16,784 16,494	21,802
Europe 3,176 3,230 3,113 3,133 6,133 9,043 9,679	14,521
North America 5,525 7,627 (5,754) 1,091 3,555 6,412 7,065	13,067
Other countries 2.456 3,235 3,506 3,117 5,029 8,543 9,992	15,565
19.458 24.557 13.978 22.788 34.004 40.782 43.230	64.955
Net interest payable 1,857 3,599 5,010 4,452 6,386 5,690 8,258	5,604
Profit before taxation 17.601 20,958 8,968 18.336 27,618 35,092 34,972	59,351
As a percentage of net assets 15.8 17.3 7.4 14.4 18.9 22.8 21.2	31.2
Taxation 8,407 10,443 3,541 8,575 13,227 18,666 19,549	31,224
As a percentage of profit 47.8 49.8 39.5 46.8 47.9 53.2 55.9	52.6
Profit after taxation 9,194 10,515 5,427 9,761 14.391 16.426 15.423	28,127
As a percentage of net assets 8.3 8.7 4.5 7.7 9.8 10.7 9.3	14.8
Extraordinary items — — — 843 264 (14,472)	(146)
Profit attributable to ordinary stockholders 7,259 8,736 4.562 7.297 10.864 13.327 13.124	24,399





*Only the medical business responsibilities reporting to Dr. Powell are shown. In addition, he had overall responsibility for EMI's other business (music, industrial electronics, etc.).

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