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EBAP/84/276

December 13, 1984

To: Members of the Executive Board

From: The Secretary

Subject: Request for Additional Budget Appropriations for Mainframe
Computing Services

There is attached for consideration by the Executive Directors a paper requesting additional budget appropriations for mainframe computing services. A draft decision appears on pages 12 and 13. A paper providing background material on anticipated Fund-wide EDP requirements will be issued separately.

This subject will be brought to the agenda for discussion on a date to be announced.

If Executive Directors have technical or factual questions relating to this paper prior to the Board discussion, they should contact Mr. Minami (ext. (5)7500).

Att: (1)

Other Distribution:
Department Heads

INTERNATIONAL MONETARY FUND

Request for Additional Budget Appropriations
for Mainframe Computing Services

Prepared by the Administration Department and
the Bureau of Computing Services
in consultation with
the Executive Committee for Computing Services

Approved by R. Tenconi and W. N. Minami

December 12, 1984

I. Introduction

At an informal seminar on April 23, 1984, and in the course of the discussion of the administrative budget for FY 1985 (EBM/84/65 and EBM/84/66, 4/25/84), Executive Directors were informed about the evolution of computing services in the Fund and were given an overview of projected requirements through FY 1987. It was also noted at the time that a request for additional budget appropriations would be submitted in the course of FY 1985. The purpose of this paper is to document the need and seek approval for appropriations for purchasing an IBM-compatible mainframe computer 1/ as well as for taking the first steps toward relocating the Fund's mainframe computer operations 2/ to a lower-cost facility with adequate space. To place these requests in context, a paper will be issued separately, providing background material on anticipated Fund-wide requirements for computing services--including but not limited to mainframe services--for the three years through FY 1987, together with estimates of their respective costs and benefits. Recommendations and a proposed decision are contained on pages 12 and 13 of this paper.

II. Background

During the 1980-83 period, the computing services of the Fund, which began in the late 1960s, were reorganized. This process comprised the consolidation of all electronic data processing (EDP) services into the new Bureau of Computing Services (BCS), the establishment of the

1/ There are several U.S. and non-U.S. manufacturers of IBM-compatible equipment, i.e., equipment that can be interchanged with comparable IBM components and that will support all IBM products.

2/ Typically, this would comprise large computers (mainframes) and peripheral equipment, data communication equipment for linking these computers to Fund users, suppliers, operators, technicians and support staff.

Executive Committee for Computing Services (ECCS), and a substantial strengthening of planning and budgeting procedures for EDP outlays. Reflecting the growing work load and the fast-changing computational requirements in both institutions, the joint arrangement that has existed since 1968 between the World Bank and the Fund has evolved gradually to a point where each of the individual large computers of the joint center is dedicated to one organization or the other. Computer availability and computational needs could thus be managed more easily within each organization. The Bank relocated its Burroughs machines from the Fund premises to its new facility in the "H" building and, in 1982, acquired its own large IBM computer, also located on its premises. This development separated the systems and computers of the two institutions, leaving two Burroughs computers on the concourse level exclusively for Fund use. The Fund, however, has contracted with the Bank to provide staff for the day-to-day operation of these computers. Close cooperation continues to be maintained with the Bank to ensure mutual back-up facilities, provision of time-sharing services when needed, and compatibility of equipment to facilitate exchange of data (especially in the external debt area).

During the recent period of reorganization, a number of EDP projects, particularly the development of new systems, had to be held back. Hence, the budgets for FY 1984 and FY 1985 included budgetary appropriations for computing services that were significantly larger than in previous years. These increases reflected growing and changing requirements for mainframe computer services for the daily processing of the Fund's work in a number of production areas.

The main activities of the Fund requiring production systems that are dependent on large mainframe computers include: the retrieval, manipulation and analysis of data by economists, interdepartmental forecasting exercises (WEO), compilation of data on international banking and external debt, personnel applications, Data Fund System, and Treasurer's Department's accounting and reporting systems. Currently, these production systems use two mainframe Burroughs 7800 computers, located in the existing computer center.

Growth in the work load, more complex operations, and requests for additional and more detailed information have, over the years, increased the demand for mainframe computer capacity. The inadequacy of the mainframe hardware capacity became acute in late 1983 and has intensified further in 1984. Insufficient computer capacity has resulted in a marked lengthening of the World Economic Outlook production schedule which, in turn, has had a potentially detrimental effect on the quality of the forecasts and the associated analyses. At the same time, frequent nonavailability of mainframe machines and slow response time have hampered country and research work as well as the ability of the Treasurer's Department to close the Fund's accounts on a timely basis. There have also been serious bottlenecks in the production of the Fund's major statistical publications that have prevented, at times, the

inclusion of the latest updates. In short, service from the mainframe computers has deteriorated to the point where the functioning of the Fund's main production systems is in jeopardy.

In order to reverse the deterioration that has taken place and to meet the growing needs of Fund users for computer services requiring mainframe computers, a two-pronged strategy is being followed. First, replacement systems are being developed, since production systems have been modified so many times over the past years that they need to be completely redesigned to be efficient. Work on such replacement systems was started in 1983-84 and funds were appropriated for this purpose in the administrative budgets for FY 1984 and FY 1985. The key areas affected by these replacement systems are: statistical information (Data Fund System), the Treasurer's Department's accounting and reporting systems, and the Administration Department's budget and procurement system. For reasons described in the next section, these systems are being designed to operate on IBM-compatible mainframe computers rather than on Burroughs equipment.

Secondly, existing Burroughs equipment is being upgraded in order to meet the current needs of those users requiring continued access to the Burroughs computers. As authorized in the administrative budget for FY 1985, one of the two Burroughs 7800 computers will be replaced shortly by leasing a more powerful model, the 7900.

III. The Need for an IBM-Compatible Computer

There are a number of reasons why the Fund needs to change, over time, from Burroughs to IBM-compatible mainframe computer hardware. Some of these reasons have to do with the critical work requirements of the Fund that need to be addressed immediately; others have to do with superior features of IBM hardware and software that should yield benefits to the Fund over the medium and longer term.

As already indicated, there are three critical operational areas in the Fund in which present production systems are 10-15 years old and cannot be modified further to respond adequately to present and projected work needs; although these systems need to be replaced, they cannot be replaced effectively and economically on the existing Burroughs mainframe computers of the Fund for reasons explained later in this paper. The consequence of not replacing these aging systems includes escalating production and maintenance costs and growing potential for errors and extended breakdowns. The critical areas are the Fund's large statistical database (550,000 time series), its complex financial operations with member countries, and its internal budgeting and procurement transactions. Details on these key systems requiring replacement are provided below:

The Data Fund System has, during its 12 years of existence, undergone major and costly overhauls that did not keep up with all of the

growing needs of Fund users. This system was originally designed to support Fund publications. Over time, numerous changes were made to accommodate the needs of Fund economists for statistical time series data in their analytic work. Other attempts were also made to facilitate direct electronic exchange of information between the Fund and member countries as well as to meet the needs of Fund managerial staff for key country data. The Executive Board was informed in April 1983 that a major redesign of the system, based on different technology, was needed. The new system, renamed the Economic Information System (EIS), is based on IBM technology; this new system is now in the test phase and should shortly replace the Data Fund System. The programming and testing of this new system has been done using the World Bank IBM computer on a time-sharing basis, with current charges running at approximately \$70,000 per month.

The expansion and the growing complexity of the Fund's financial activities over the last ten years have required numerous modifications of the Treasurer's Department's accounting and reporting systems. As a result, a number of separate databases and ad hoc computerized reports have been developed; these have become costly to operate and maintain, very difficult to modify further, and require substantial additional manpower to prevent data inconsistency. Excessive work is required by the data processing staff to keep the old system in operation and the probabilities of failures in the present system have become very high. In 1983 it was decided to design a replacement system. The overall design of a new, integrated system has now been completed and small segments of the system, operating on microcomputers, are in operation. The next step, i.e., detailed design and programming, is under way, using commercial IBM time-sharing facilities. Presently, computer charges incurred for this project are moderate (about \$20,000 per month), but these charges will increase significantly once the system enters the test phase.

In the FY 1985 budget, authorization was obtained to begin work on the replacement of the Administration Department's existing budget and procurement system. Executive Directors have been requesting more frequent and broader budgetary analyses, and the external auditors have repeatedly emphasized the need to improve expenditure control and to move toward discretionary budgeting. In view of the size of the envisaged system, its communication requirements with all other departments in the Fund, and its close relationship with the administrative payments system of the Treasurer's Department, it was decided to design the system for operation on an IBM-compatible computer. The system is presently in the design phase and a small subsystem will be evaluated shortly. Time-sharing costs will be small at the beginning (about \$5,000-\$10,000 a month) but will build up gradually.

The replacement of the three large, old systems described above with new systems operating on IBM-compatible computers was indicated because this type of machine offers greater possibilities than Burroughs

for the integration of various other computer systems and a wider range of prepackaged software, increased compatibility with equipment of other organizations, and reduced operational risks.

For those Fund users who rely primarily on minicomputers and microcomputers, the integration of mainframe machines with minicomputers and microcomputers enhances operational scope, efficiency, and flexibility. Unfortunately, the desired degree of integration cannot be achieved with Burroughs, because that manufacturer does not offer a sufficiently wide range of smaller machines. In contrast, IBM and vendors of IBM-compatible equipment have developed a full range of machines and, in the United States, they now account for around three quarters of the mainframe market and one half of the corporate market for microcomputers.

The range and volume of prepackaged software available for use on IBM-compatible equipment are far greater than that available for Burroughs machines, and this gap continues to grow. Prepackaged software reduces the cost of development and maintenance, raises productivity of EDP development staff, and is generally more reliable than specially made "in-house" programs.

The shift to IBM technology is advantageous, as the Fund's computers will then become more compatible with those used by nearly all of the governments and central banks of member countries. This would allow more efficient and speedy exchange of data through tapes or by direct electronic transfers, a procedure which some member countries have been pressing the Fund to adopt.

Finally, operational risks are reduced with IBM-compatible equipment as compared with Burroughs. Because of the larger customer base, a wider range of support services is available and there are a greater number of machines available in the market that can be used for back-up purposes. Furthermore, the number of knowledgeable technicians, who can be hired at short notice, is larger than for any other hardware.

Even though a change to IBM-compatible equipment involves additional training and duplicate operational expenses during the transition period, such a move appears to be the most cost-effective solution. Computer equipment prices are similar for IBM and Burroughs, while associated software costs for IBM-compatible equipment are slightly higher than those for Burroughs. However, the cost of developing new systems in an IBM environment is considerably less because of the much greater availability of programming tools. As an example, it is estimated that the use of development tools and "canned" programs for the development of the Treasurer's Integrated Financial System on IBM-compatible equipment will reduce the time that would have been necessary on Burroughs by more than one third, resulting in a savings of \$1.3 million.

In the late 1960s, the Fund and the World Bank selected Burroughs as the computer equipment best suited for their needs at that time. In

the light of changing user requirements and the availability of new products, the Bank, in 1981, purchased an IBM mainframe computer and the Fund is now moving to IBM technology as well. However, each organization will continue to serve some applications with Burroughs equipment. In the Fund, for example, Burroughs equipment will continue to be used to support; among other systems, the Research Analysis Language (RAL), which is widely used by Fund economists. The economic merits of continuing such systems requiring Burroughs equipment versus replacing them with IBM-compatible systems will be evaluated over time.

The timing of the acquisition of a new IBM-compatible computer that is suggested below has substantial cost implications. As shown in Chart 1, the projected work schedule of the three main IBM-based replacement systems will soon include testing the Economic Information System and placing it into production, starting some production work on the Treasurer's Integrated Financial System and the Budget and Procurement System, and continued additional development of these two systems. A conservative estimate indicates that, if the present time-sharing arrangements were to be continued, charges would increase from about \$1 million in FY 1985 to \$4 million in FY 1986 and \$5.2 million in FY 1987, probably stabilizing at that level in the years thereafter.

In contrast, the purchase of an IBM-compatible computer, model 3081K or its equivalent, is estimated at \$6.1 million, including the main processors, memory and peripheral equipment required for communication and printing (\$5.6 million), system software (\$0.3 million), and start-up costs (\$0.2 million). If the costs of this investment were to be spread over the minimum expected useful life of five years for this equipment, the annualized cost would amount to \$1.2 million. Including staffing, utilities, supplies, and data communication recurring costs (about \$2 million per year), the annual cost would amount to \$3.2 million for each of the next five years, compared with about \$5 million for time-sharing. Rental of a machine would be far more expensive than purchase, because in less than three years rental fees would exceed purchase costs.

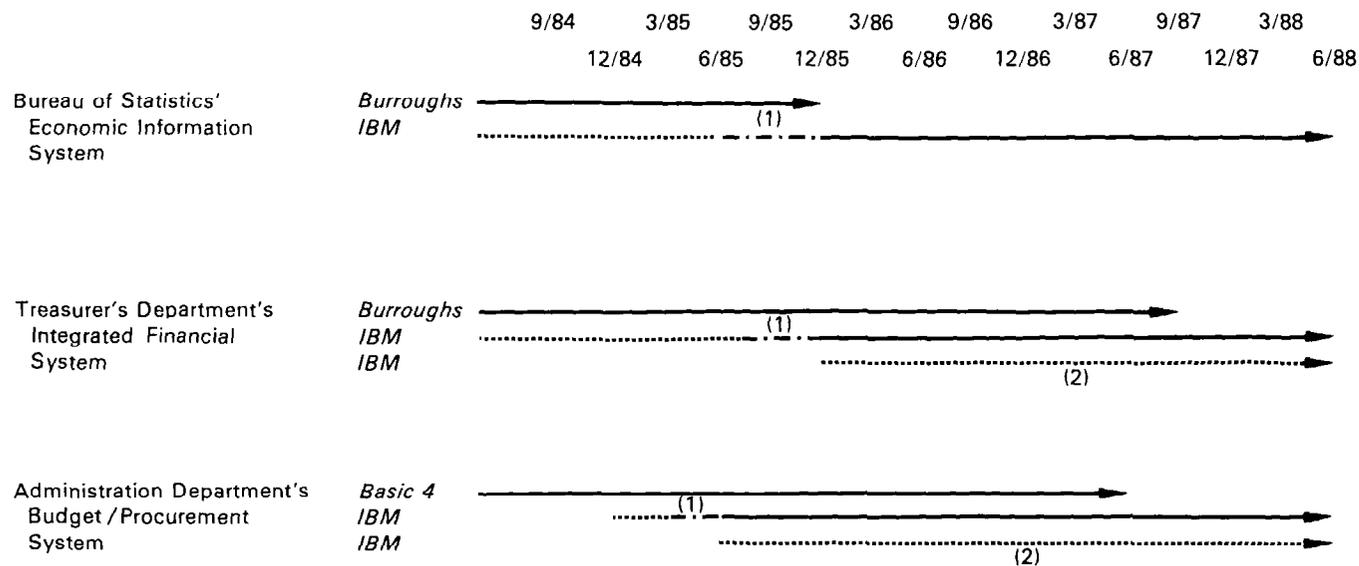
It is proposed, therefore, that the Fund purchase an IBM-compatible computer model 3081K or its equivalent. As explained in the following section, it is further proposed that this purchase take place in April 1985.

IV. Location and Staffing of Fund's Computer Facility

1. Location

When addressing the question of where the Fund's computer equipment should be located, the staff has evaluated various options, taking into account such factors as present and future space needs, costs, security, minimum acceptable environmental conditions for the facility, collaboration with the World Bank, etc. The staff estimates that space totaling

CHART 1
COMPUTER UTILIZATION SCHEDULE FOR IBM-COMPATIBLE SYSTEMS



LEGEND

- Production
- Development
- - - - - Test

NOTES

- (1) Parallel testing period of part or all of replacement system
- (2) Additional development of remainder of system



20,000 square feet will be required, including 15,000 contiguous square feet conditioned for computer equipment and 5,000 square feet for offices and storage. In the light of these considerations, four main options for the selection of a location were considered: (1) expansion and renovation of the present location in the Fund headquarters, (2) utilization of space in the World Bank, (3) leasing of outside space, and (4) construction or purchase of outside space. Arguments for and against these options, as well as their estimated costs, can be gleaned from Table 1.

a. Use of present location

The staff has known for some time that the existing computer room located on the concourse level of the Fund building has various deficiencies that have caused frequent disruptions of service and have required costly repairs. Consultants have confirmed the staff's findings that the existing center needs extensive reconditioning irrespective of whether or not the requested new computer would be housed there. 1/

Specifically, the consultants agreed that the present size of the computer room housing both hardware and staff (10,600 sq. ft.) is too small even for current needs. Its location makes it vulnerable to water damage; there have been two such incidents so far, one at a cost of over \$1 million in repairs. The consultants also pointed out serious shortcomings in the electrical (fluctuating power supply) and mechanical (insufficient cooling of equipment) systems that will continue to hamper the functioning of the center. Finally, the fire protection system does not meet the local regulations.

As the necessary renovation of the present computer room involves substantial cost and disruption of service, it should be done only if the space could be expanded sufficiently to accommodate the Fund's long-term mainframe computing needs; otherwise, it would be better to seek a solution that involves performing all mainframe computing functions outside the headquarters building. Doubling the size of the present facility would necessitate pre-empting a large amount of space presently occupied by other units adjacent to it; these units would have to be relocated outside the Fund headquarters in a premium downtown location. This raises the question whether it is advisable to move staff out of the headquarters building in order to make room for machines; in most organizations, the opposite situation usually prevails. It has been

1/ "IMF Feasibility Study--Modifications to Existing Data Center," the Kling Partnership, July 20, 1984; "IMF Data Center Planning Study," Arthur Andersen and Co., June 1983.

Table 1. Alternatives for Physical Location of Proposed Computer Facility

Options	Expenditure Streams Over 15 Years (In millions of U.S. dollars)		Nonfinancial Arguments	
	Nominal value	Present value ^{1/}	Pros	Cons
1. Renovation within Fund building				
Conditioning and moving costs	5.6	5.2	<ul style="list-style-type: none"> - Location in Fund building convenient to BCS staff - Eliminates need for data communications from outside building 	<ul style="list-style-type: none"> - Very difficult to accommodate any growth - Involves moving non-EDP staff out of building - Continued high risks to present present computer operations - Involves long period of instability to systems - Continued inferior layout and inadequate service standards
Relocation of non-EDP staff ^{2/}	5.2	3.1		
Space value within Fund building ^{3/}	3.9	2.3		
Maintenance costs	<u>0.5</u>	<u>0.3</u>		
Total	15.2	10.9		
2. Leasing of outside space				
Conditioning and moving costs	5.6	5.2	<ul style="list-style-type: none"> - Faster implementation time - Budget impact for first year lessened - Uncertainties reduced due to less construction 	<ul style="list-style-type: none"> - Faced with lease uncertainties - Lack of control over other tenants
Leasing costs ^{4/}	5.2	3.1		
Data communication costs	3.0	1.8		
Maintenance costs	<u>0.5</u>	<u>0.3</u>		
Total	14.3	10.4		
3. Construction of building				
Purchase of land	1.0	0.9	<ul style="list-style-type: none"> - Greater control over costs and facilities - Can meet specific needs 	<ul style="list-style-type: none"> - Longer implementation time - Involves uncertainty of construction - Highest immediate cash requirements
Construction and fit-out costs	8.0	7.2		
Miscellaneous expenses	0.5	0.5		
Data communication costs	3.0	1.8		
Maintenance costs	1.1	0.7		
Less value of equity ^{5/}	<u>(9.8)</u>	<u>(3.6)</u>		
Total	3.8	7.5		

^{1/} Using a discount rate of 7 percent.

^{2/} Based on 15-year lease costs of 9,400 sq.ft. at \$30 per sq.ft. with a 3 percent annual price increase.

^{3/} Based on 10,600 sq.ft at \$20 per sq.ft. with a 3 percent annual price increase.

^{4/} Based on 15-year lease costs of \$14 per sq.ft. with a 3 percent annual price increase.

^{5/} Assuming that the value of the land would appreciate at 3 percent per year and that the value of the building would not appreciate.

Note: The World Bank option is not presented for reasons stated in the text.

estimated that expanding the present location would be the most expensive of all of the options, costing \$15.2 million over a 15-year period. 1/

b. Use of space in the World Bank

This option is not viable as the World Bank does not have sufficient space available at present, nor does it foresee such space becoming available in the near future.

c. Lease of outside space

Researching the local market has indicated that chances of locating a 20,000 sq.ft. facility on a leasing arrangement that would meet the structural, environmental, and security requirements of a computer center are very small. The 15,000 sq. ft. space for machines must be equipped with special fire and water protection, adequate power supply with backup, air conditioning and water cooling systems, and greater than normal floor-to-ceiling heights and floor weight tolerances. It is most likely that any space that could be leased would have to be modified at considerable Fund expense (approximately \$5.6 million); at the end of the lease, the Fund would probably have to return the space to its original state, and most of the alteration costs would not be salvageable. Preliminary estimates indicate that leasing may cost \$14.3 million over a 15-year period.

d. Construction or purchase of outside space

A real estate firm was contracted to conduct a complete survey of available properties meeting the size and structural requirements. The conclusion was reached that finding a space to purchase would be highly improbable because of these special requirements. Therefore, a preliminary estimate has been made of the costs involved in constructing a facility.

The establishment of such a facility in a suburban location would cost \$13.6 million over 15 years. However, after allowing for the equity acquired, the net cost would amount to only \$3.8 million. The staff has learned that the Bank, too, may have to expand its computer facilities, using additional space in a remote location. The staff is in close contact with the World Bank to determine whether cost savings and efficiencies could be achieved through the sharing of a building. This could reduce the initial investment expenditure for the Fund, and some on-going costs such as security and transportation expenses. As

1/ For the three feasible options, the present values of the required expenditures, as well as the nominal costs, have been estimated; these are presented in Table 1.

the Fund's space needs are acute, the timetable of the Bank's plans would be crucial in determining whether some form of joint operation would be possible.

Before a final decision is made, however, a more extensive evaluation would be required. Thus, an additional budgetary appropriation of \$200,000 is requested for FY 1985 to carry out a site survey and to prepare a detailed design of a new facility. After these tasks and the necessary discussions with the World Bank have been completed, the staff will prepare a report to the Executive Board on the basis of which a decision on the location of the Fund's computer facility can be taken. At that time, an updated comparison will be provided of the leasing, purchasing, and construction options.

2. Staff

The overall management of the operations of the computer facility, added to the present work of the Facility Management and Computer Operations Section of BCS, represents a significant area of responsibility. As indicated in EBAP/84/64, Supplement 2, it will be necessary to add one Fund staff position at division chief level. Two additional positions will also be needed to provide in-house expertise in hardware, software, and data communications as related to the IBM-based facility. To ensure adequate planning for the new facility and facilitate activities relating to the provision of IBM resources in the interim, it is proposed that these three new positions be authorized effective February 1, 1985.

The day-to-day operational support for the new facility could be provided by either Fund staff, contractual staff, or a facilities management group (including the possible use of World Bank staff). The hiring of a facilities management group is considered preferable, because such groups manage computer centers as a business and can provide technical support specialists which a relatively small, individual center could not afford.

V. Period Prior to the Establishment of a New Computer Facility

As mentioned earlier, the work schedule of the three replacement systems operating on IBM-compatible equipment already involves significant time-sharing expenses which should be terminated at the earliest opportunity. The most economical solution would be purchasing an IBM-compatible computer immediately and locating it in a new computer facility. However, as the establishment of a new facility will take some time, an interim solution is needed.

The option of purchasing a computer and locating it temporarily in the Fund's existing computer room was discarded because the present facility is already overcrowded and the power and air-conditioning

services are inadequate. The following interim possibilities have been considered: (1) commercial time-sharing, (2) time-sharing with the World Bank; (3) shared facilities with companies having spare computer capacity; and (4) purchasing an IBM-compatible computer and locating it temporarily at a commercial establishment providing computer services. These options were evaluated on the basis of the following seven criteria: adequate capacity, cost, security, flexibility, ease of implementation, management control, and risks. Table 2 shows that, with a maximum of four points per criterion, these four options rated, on average, between 2.0 and 3.7 points and that option 4 is the most desirable. This table also indicates that the ranking of the four options by cost produces the same result. The cost estimates include start-up expenses but exclude both the cost of purchasing the computer, which will ultimately become necessary for all four options, 1/ and of the three new BCS positions, which are also common to all options.

Table 2. Comparison of Interim Options
For a Two-Year Period 1/

Interim Options	Rating (4 = Highest)	Cost Estimate (in millions of U.S. dollars)
1. Commercial time-sharing	2.0	16.9
2. World Bank time-sharing	2.7	9.2
3. Shared facility with commercial establishment	3.3	5.6
4. Fund computer located in commercial establishment	3.7	4.1

1/ This assumes the adoption of the construction alternative for the new computer facility.

Options 1 through 3 are more costly than option 4, as the Fund would in effect be renting a part of an outside computer for the two-year period, while under option 4, it would be using its own computer. Option 4 would allow the Fund to begin operating on, and stay with, the

1/ Since option 4 involves purchasing a computer two years before the other options, it could be argued that the obsolescence factor should be taken into account, even though the expected useful life of the computer is independent from its utilization. Based on an estimated 20 percent depreciation for obsolescence over two years, option 4 would still be the cheapest (\$5.2 million).

same machine, thus eliminating costs and potential problems when converting from a temporary machine to the final one. Accordingly, the option which is recommended for this interim period is the purchase of an IBM-compatible computer to be located at a temporary site with a facilities management contract covering all support, including space and staff, at a fixed price. It is proposed that the Fund enter into such a contract as of April 1, 1985, by which time the requested IBM-compatible computer will have been delivered.

VI. Recommendations and Proposed Decision

The preceding sections of this paper have attempted to explain why it is considered necessary to request appropriations at this time for purchasing an IBM-compatible mainframe computer and for initiating the process of establishing a new computer facility. In the light of these explanations, the following draft decisions are recommended for adoption by the Executive Board:

1. Management is authorized to increase the administrative budget for FY 1985 for data processing expenditures by \$6,072,000 to provide for the purchase cost of an IBM-compatible computer and its peripherals, systems software, and initial expenses.
2. Management is authorized to increase the administrative budget for FY 1985 for data processing expenditures by \$200,000 in order to proceed with preliminary research on a site selection and with a detailed cost estimate for the construction of a building designed to house the main computers of the Fund and, possibly, those of the World Bank. It is understood that the findings of the site survey, the preliminary architectural design, and the cost estimate will be submitted to the Executive Board for final approval.

3. Management is authorized to engage in a contract, to be effective not later than April 1, 1985, with a commercial establishment to provide a location and the operational support for Fund-owned computer equipment. It is understood that this would be a temporary arrangement pending completion of the new facility referred to in Decision 2 and that no additional budgetary appropriation would be required in FY 1985.

4. The total staff ceiling of 1,647 as approved in EBAP/84/64 (amended in EBAP/84/230, 10/29/84) is increased to 1,650, effective February 1, 1985, by the addition of three new positions in the Bureau of Computing Services, one at Division Chief level and two at F-I level.