

FROM ELECTRICAL
DISTRIBUTION ROOM

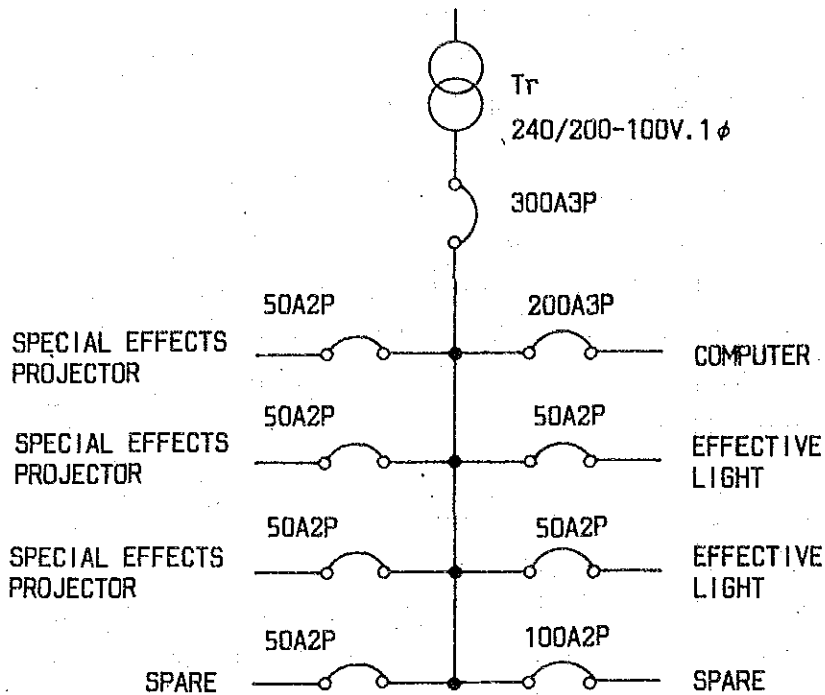


FIG. 5 SINGLE LINE DIAGRAM

4.2.5 Drawings of Facilities Plan

It is not possible to determine the installation area of the equipment at this stage until tendering has been completed, at which time the details of the equipment to be supplied will be decided. However, since the manufacturer of the equipment and the equipment type will be limited to two companies in Japan, a standard installation plan with maximum uniformity to allow the products of both companies to be installed, regardless of which product is selected, has been drawn up based on the products of both manufacturers.

- 1) Layout plan of equipment
- 2) Cross section of equipment installation
- 3) Electrical wiring
- 4) Structure of the system
- 5) Standard installation plan

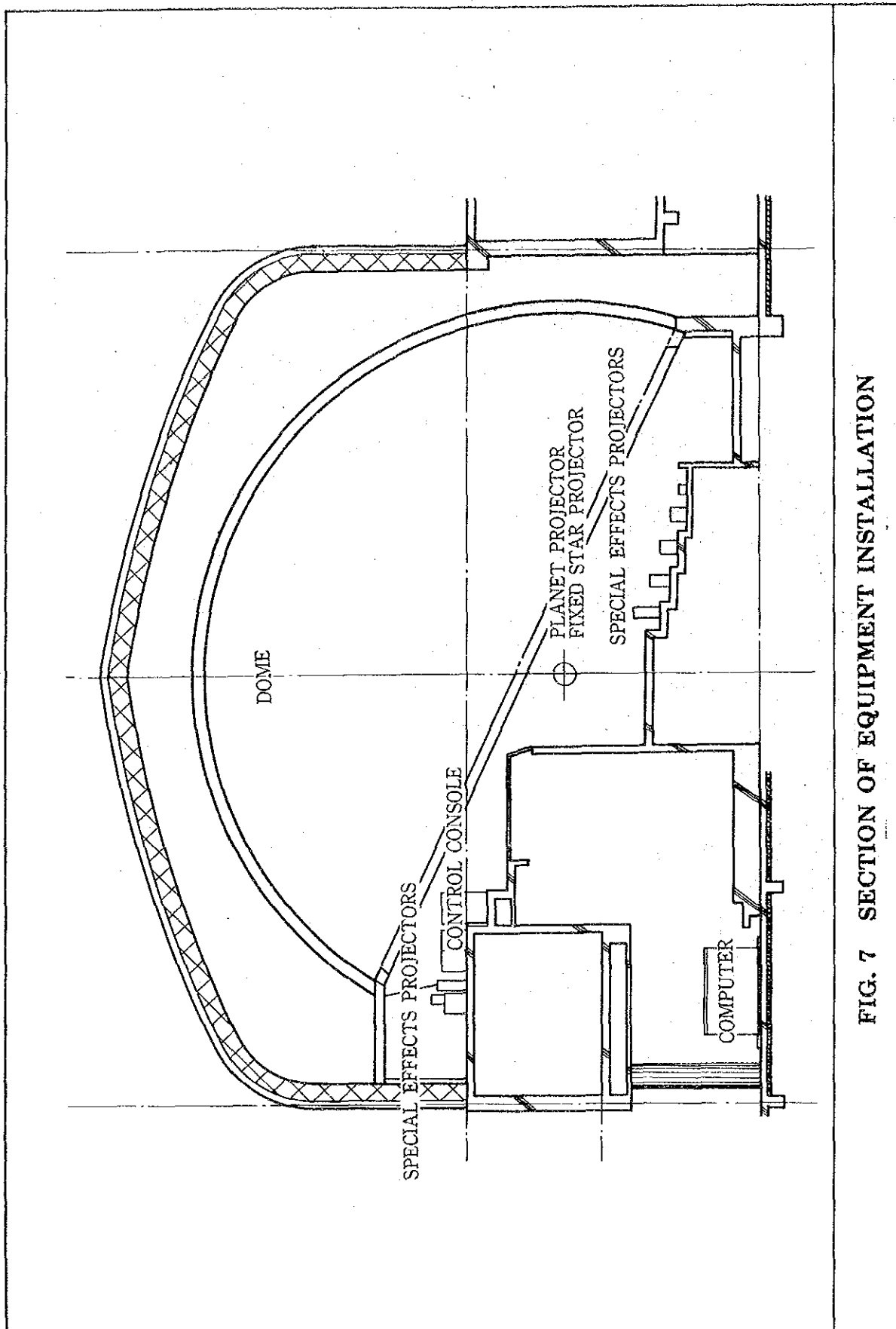


FIG. 7 SECTION OF EQUIPMENT INSTALLATION

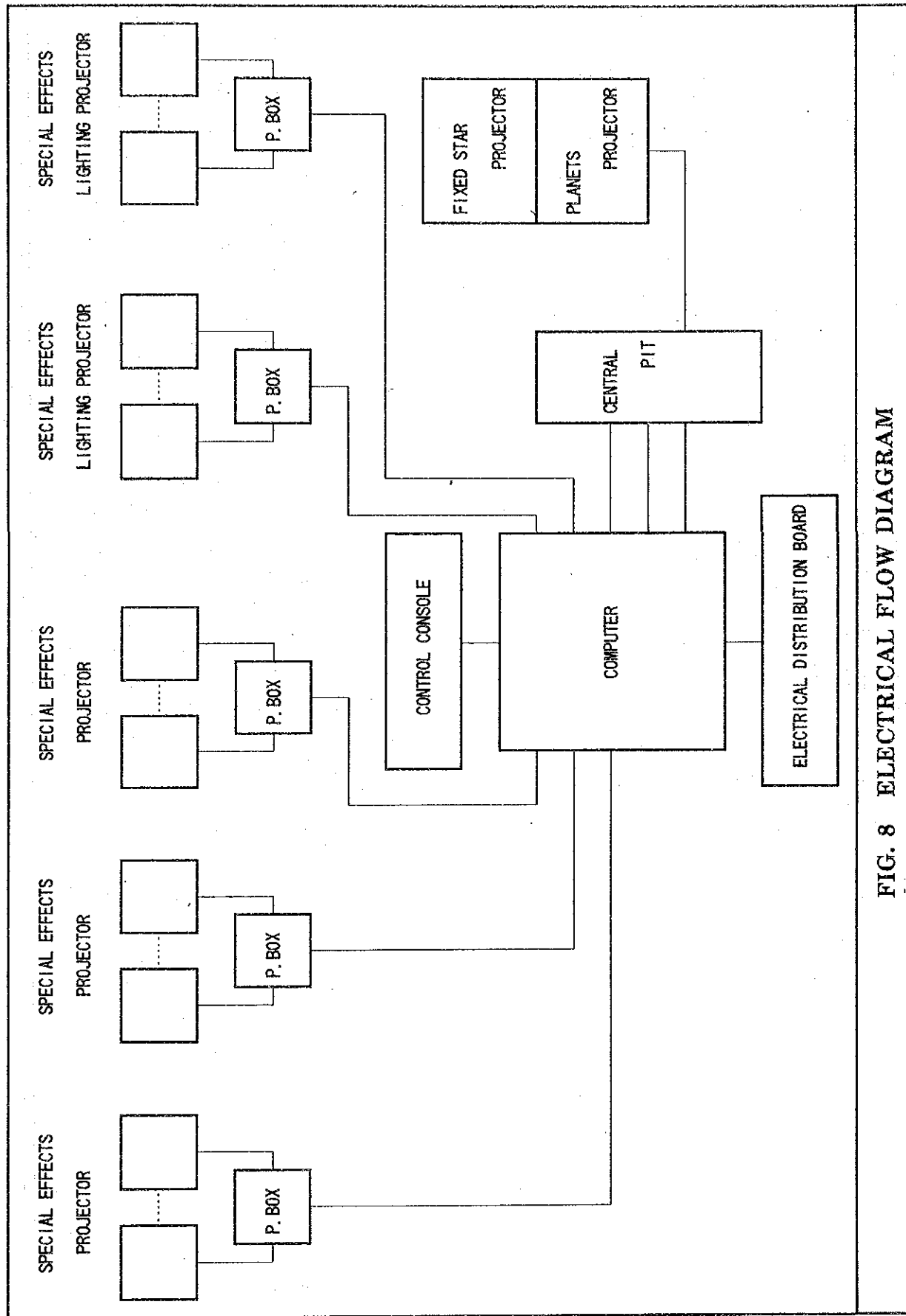


FIG. 8 ELECTRICAL FLOW DIAGRAM

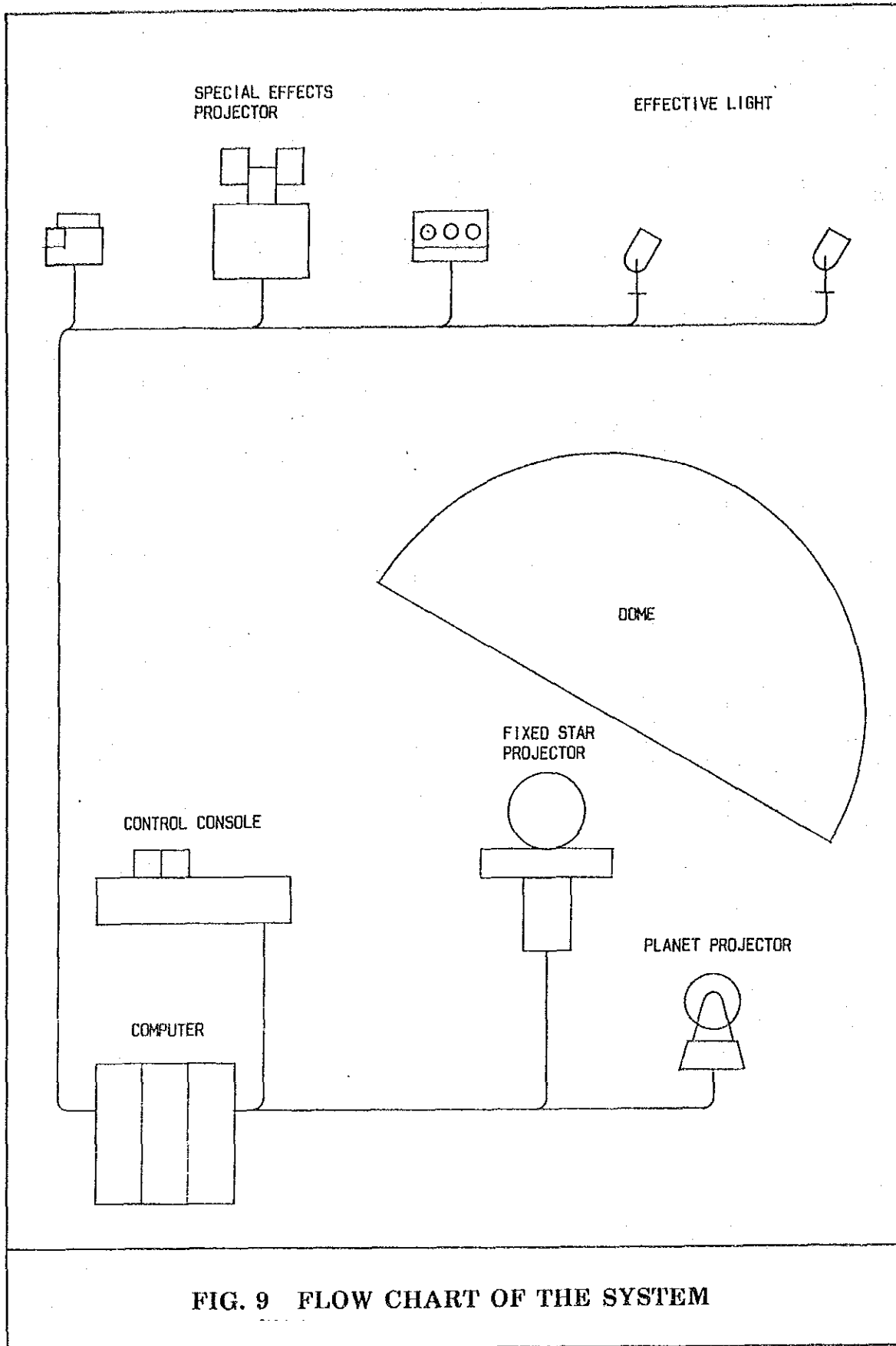


FIG. 9 FLOW CHART OF THE SYSTEM

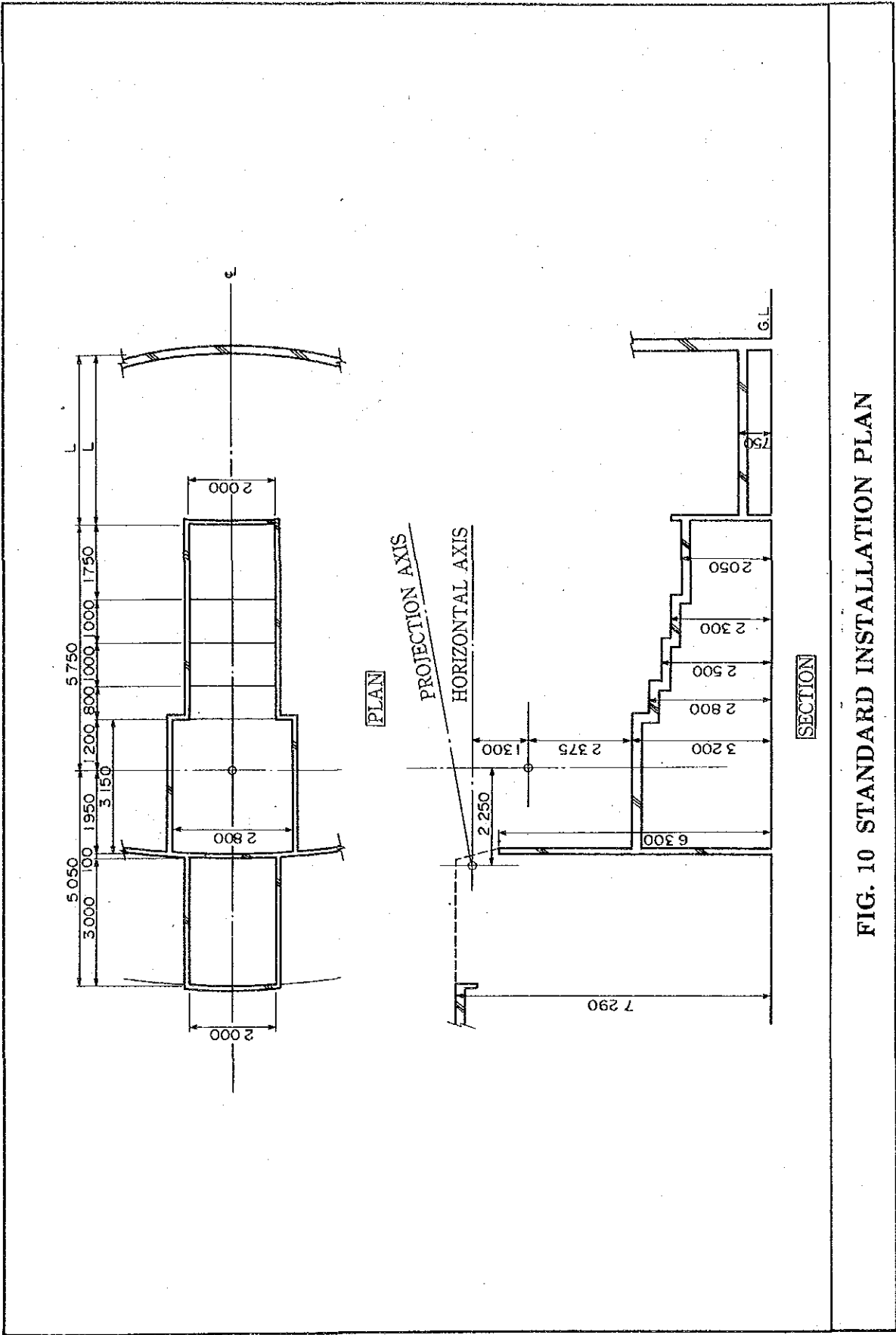


FIG. 10 STANDARD INSTALLATION PLAN

5. IMPLEMENTATION PLAN OF THE PROJECT

5. IMPLEMENTATION PLAN OF THE PROJECT

5.1 Implementing Organization

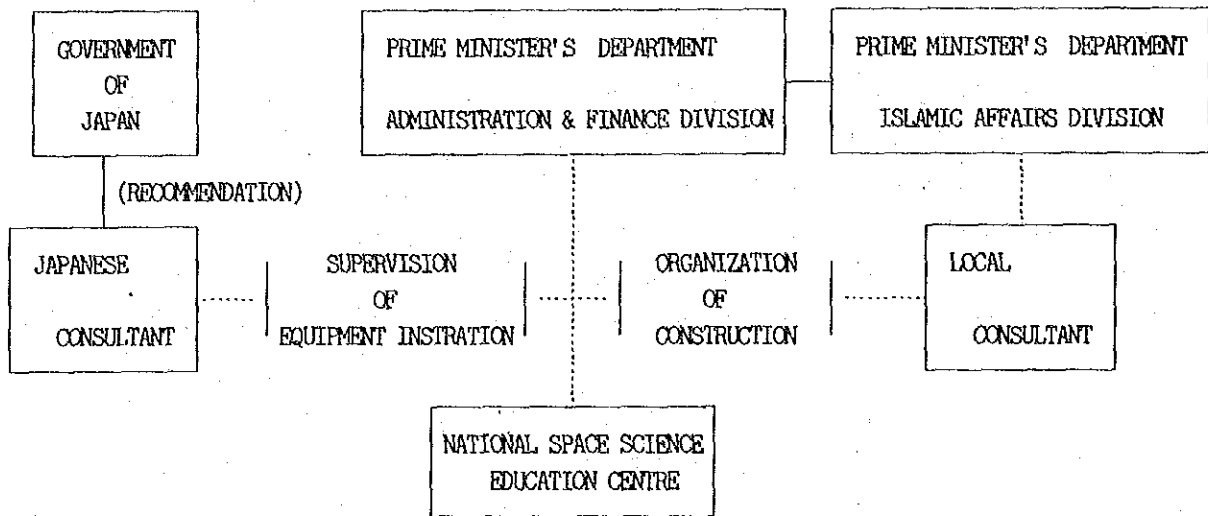
The implementing agency for construction is the Administration and Finance Division of the Prime Minister's Department. Currently the management organization of the Space Science Education Centre under the jurisdiction of the implementing agency is being created to manage and operate the Centre after its completion as well as to carry out the preparatory work during the construction period. The newly created management organization of the Centre will work closely with the implementing agency during the construction period and to advise the agency on the effective use of the Centre after its completion. It will be an independent organization within the Prime Minister's Department under the jurisdiction of the Administration and Finance Division and will oversee the Centre's operations. However, due to the cooperation of the Islamic Affairs Division for technicians and other personnel, the project will be implemented with their cooperation for the duration of the construction period. After construction has been completed, the Islamic Affairs Division will completely withdraw from the project and the management organization of the Centre together with the Administration and Finance Division will manage the Centre.

Construction work and equipment installation will be supervised by a local consultant company employed by the Administration & Finance Division and a Japanese consultant company recommended by JICA and employed by the Malaysian government. Presently the local consultant company, Kumpulan Senireka Sdn., has already begun implementation of the basic construction plan and is making preparations such as detailed design, tendering, etc. in order to begin work as soon as the work on the Japanese side has progressed.

After the Exchange of Notes, the Japanese consultant company will receive the recommendation of JICA, sign a contract with the pertinent department of the Malaysian government, and carry out its responsibilities to prepare the detailed design, to conduct the tendering, and to supervise the installation and commissioning of the equipment under Japanese grant aid.

The organizational structure of project implementation during

construction and installation of equipment is outlined below.



ORGANIZATION OF CONSTRUCTION IMPLEMENTATION FOR THE PROJECT

5.2 Undertakings of Both Governments

The work for the project has been divided between workload which will be undertaken by the Japanese and Malaysian governments and has been outlined below.

Content of Work	Japan	Malaysia
(1) Equipment		
1) Provision of equipment	0	
2) Installation of instruments	0	
3) Testing and adjusting instruments	0	
4) Training of local personnel	0	
(2) Installation of electrical facilities		
1) All electrical wiring up to the power points		0
2) All step down transformers for power supply for equipment supplied under Japanese grant aid	0	

Content of Work	Japan	Malaysia
(3) Mutual wiring installation between each equipment supplied under Japanese grant aid		
1) Wiring plan for installation of equipment	0	
2) Provision of all wiring cables and connectors	0	
3) Provision and installation of cable ducts and conduits according to the wiring plan		0
4) Mutual wiring for each equipment	0	
(4) To secure storage for equipment		0
(5) Import/arrangements to clear customs		
1) Transport to Malaysia	0	
2) Tax exemption, arrangements to clear customs		0
3) Transport within Malaysia (from port to site)	0	
(6) Payment of B/A charges to Japanese foreign exchange bank		0
(7) To expedite immigration procedures for Japanese personnel working on the project and arrangements for their stay in Malaysia		0
(8) Appropriate, efficient use and management of equipment furnished by grant aid		0
(9) To undertake the total costs of equipment transportation, installation and construction of facilities not included in the grant aid		0
(10) To arrange the permits, etc. necessary to carry out construction work		0

5.3 Installation Plan

5.3.1 Installation Principle

The work which will be the responsibility of the Japanese side in the project which is primarily concerned with providing the main planetarium projector, can be divided into three main categories: (1) transport and installation of the equipment to be supplied, (2) installation of secondary side electrical facilities for each item of equipment, and (3) testing and adjusting the equipment and the training and instruction of local personnel.

The basic principle will be as follows based on the work which will be carried out.

- (1) Careful attention will be given to coordinate the construction work by the Malaysian side and installation by the Japanese side.
- (2) The division of responsibilities for the installation of electrical facilities will be clearly made; and efforts will be made to carry out the work efficiently and harmoniously.
- (3) An ample exchange of ideas will be carried out between the Malaysian side (Administration and Finance Division, the Islamic Affairs Division and consultant company) and the Japanese consultant company and technicians (from the manufacturing company of the equipment) to maintain a good working relationship.

5.3.2 Factors to be Considered in Equipment Installation

Factors which must be taken into consideration during installation of the precision instruments for the planetarium, due to their special properties, are given below.

- (1) Care must be taken to ensure that the equipment is protected from dust and dampness during its temporary storage, transport, and installation.
- (2) It is important to check that the air conditioning of the dome, the computer room, and the room for the special effects projectors is operational before installation work begins, in order to preserve the

precision and accuracy of the instruments.

- (3) In order to prevent unexpected accidents, installation of the equipment will be undertaken in the final stages of the construction work which will be carried out by the Malaysian side.
- (4) Installation work will be carried out under the direction and supervision of the technicians sent by the equipment manufacturers to guarantee efficient and good quality workmanship.

5.3.3 Installation and Supervision Plan

The consultant company in charge of the project for equipment will hold consultations with the Malaysian side and formulate a meticulous plan of supervision. Members of this consultant company will be sent to the construction site and will carry out effective and appropriate supervision of the installation work based on this plan. The main points in this plan on supervision are given as follows:

- (1) The equipment will be inspected by the Japanese consultant in Japan before shipping to ensure that design specifications, quantity, function, etc. offered by the contractor conform to the tender documents.
- (2) The Japanese side will be present during the testing and adjusting of equipment in Malaysia and will turn over the equipment to the Malaysian side after confirming the equipment is functioning according to the requested plan.
- (3) The Japanese side will always be aware of the progress and amount of construction work being carried out by the Malaysian side and will endeavor to accomplish superior work without any delays.
- (4) The Japanese side will ensure that placement and installation of the equipment during local supervision will be appropriately executed as intended in the implementation plan, and will further ensure that proper instruction on equipment operation and maintenance is carried out.

- (5) In order to guarantee that installation progresses smoothly, the relevant parties on the Malaysian side, the Japanese consultants, and the equipment manufacturers will keep in constant and close contact with each other and will conduct ample consultations.
- (6) During construction and installation, all contractors working at site will be under designated representative of the implementing agency

The organization chart for supervision is shown in Fig. 11.

5.3.4 Procurement of Equipment

There are only five manufacturers of planetarium projectors throughout the world, of which two are in Japan. The Malaysian side is formulating related design plans on the premise that one of the two manufacturers will be selected. The planetarium equipment is desirably Japanese as the project shall be implemented under tight implementation schedule because these special optical equipment requires more than 12 months and careful manufacturing, and will be with the assistance of grant aid from the Government of Japan; these Japanese equipment are comparatively advanced from the other foreign products on the performance and price-wise, and no such kind of products in Malaysia. The equipment in this project are interrelated, so it is necessary for the supplier to deliver all the equipment as one package. Furthermore, the supplier of the planetarium projector must take full responsibility for all the equipment or complete success cannot be guaranteed. Therefore, it has been decided that bidding will be in one package.

5.3.5 Malaysian Government's Construction Workload

Plan for the Provision of Equipment

The construction work schedule and the plan for the provision of equipment on the Malaysian side of the project is shown in Table 1.

5.4 Implementation Schedule

According to the schedule, after the official Exchange of Notes has been made, the consultant contract, detailed design, approval for detailed design, tender announcement, tender closing, tender evaluation, contract negotiation and supply contract must all be undertaken and completed within two months. As this schedule is exceedingly tight, it is desirable

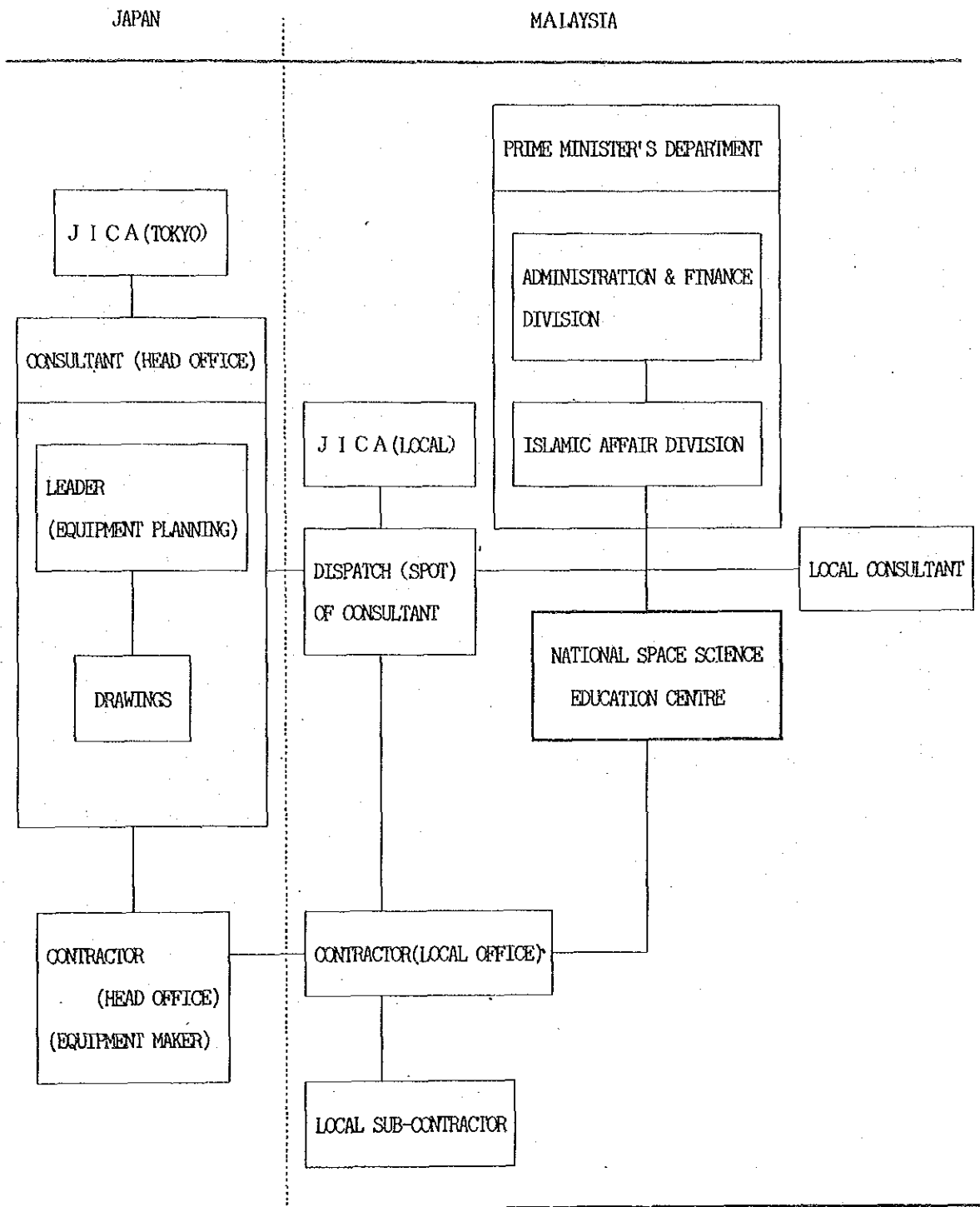


FIG. 11 ORGANIZATION CHART FOR SUPERVISION

TABLE 1 CONSTRUCTION PROCUREMENT SCHEDULE (MALAYSIAN SIDE)

MONTH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
PLANETARIUM EQUIPMENT IDENTIFIED																							
ARCHITECTURE WORKING DRAWINGS/DETAILS																							
STRUCTURE WORKING DRAWINGS/DETAILS																							
BUILDING APPROVAL																							
MECHANICAL & ELECTRICAL DRAWINGS																							
BILL OF QUANTITY																							
ANNOUNCEMENT OF TENDER																							
TENDERING																							
EVALUATION & AWARD																							
COTRACT																							
CONSTRUCTION WORK																							
PROCUREMENT OF EQUIPMENT BY MALAYSIA																							
EQUIPMENT INSTALLATION (BY JAPAN)																							
TEST AND COMMISSIONING (BY JAPAN)																							

TABLE 2 PROJECT IMPLEMENTATION SCHEDULE

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Master Schedule	E/N	Tender				Preparation, Manufacturing & inspection								Transportation	Installation, Training & Test		
	(1.0 m)	(1.0 m)				(1.0 m)								(1.0 m)	(2.5 m)		
Action by Japan Government	E/N			① Recommendation of Consultant ② Consultant Contract & A/P for Consultant ③ Verification ④ Approval ⑤ Review													
Action by Malaysia Government	E/N & B/A			⑥ Tender Announcement ⑦ Tender Closing ⑧ Tender Evaluation & Recommendation ⑨ Negotiation & Awarding ⑩ Supply Contract													▲ Handing Over
Action by Consultant Service				⑪ A/P for Supplier						Intermediate Inspection				Inspection before Shipment	Confirmation of Electrical Works	Test & Commissioning	
Action by Supplier				Confirmation of Construction Changes							Confirmation Building Construction			Inspection	Installation & Adjustment		▲ Handing Over
				Preparation of Manufacturing				Manufacturing (10.0 m)						Transport			Training

that the daily necessary procedures on both the Malaysian and Japanese side be managed harmoniously. Generally, it takes about 12 months to manufacture the equipment after the order has been received by the manufacturer. However in this project, it is necessary for the equipment to be manufactured and given final inspection within 11 months. The equipment can be installed within approximately three weeks, but because they are special optical equipment, a period of two months is necessary for minute adjustments. Consequently, a duration of about 2.5 months, after the equipment has been transported, is necessary before the installation can be said to be completed. The entire process will take a total of approximately 16.5 months. The details of this schedule are outlined in Table 2.

5.5 Estimate of Project Cost

5.5.1 Entire Project Cost

The entire project cost is M\$ 20,369,230. This amount has already been approved by the Malaysian government. The Malaysian economy at present is in excellent condition and it is not necessary to consider the element of inflation during the period of project implementation.

5.5.2 Project Cost by the Government of Malaysia

The project cost for the Malaysian government has been outlined below in accordance with the request. There are a few costs which must be borne by the Malaysian side in conjunction with the Japanese grant aid. These are shown in (5).

(1) Infrastructure Cost	M\$ 1,000,000
(2) Construction Cost	M\$ 4,000,000
(3) Planetarium related equipment costs	M\$ 9,259,230
(4) Other equipment costs	M\$ 1,110,000
(5) Costs incurred under Japanese grant aid	M\$ 10,000
<hr/>	
Total	M\$ 15,379,230

The taxes which will be levied in the project for ordinary business transactions are:

- | | |
|---------------|-----|
| 1. Import tax | 25% |
| 2. Sales tax | 10% |

However, the Malaysian government is required to arrange tax exemption for the project and therefore tax will not be included in the calculations.

The following costs must be covered by the Malaysian government in conjunction with the Japanese grant aid.

1. Port charges of Port Klang
2. Customs preparation fee
3. Bonded warehouse charges (inside customs)
4. Storage charges (outside customs)
5. Preparation charges for B/A

5.6 Operation and Maintenance Plan

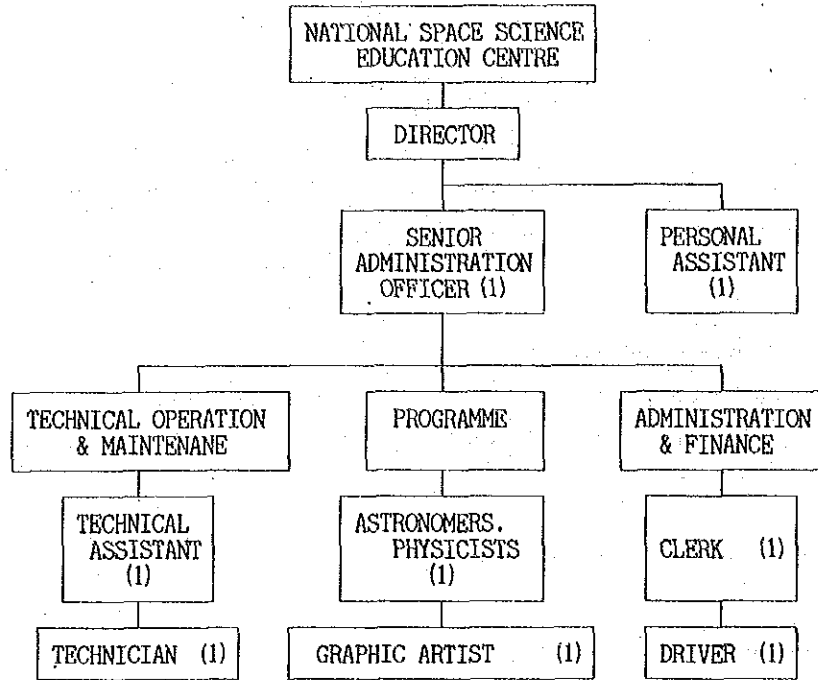
5.6.1 Operation and Maintenance Organization

This centre will be established by the Administration and Finance Division of the Prime Minister's Department of the Malaysian government, and the Project is being implemented under the jurisdiction of the Division. Therefore, the Centre's management organization will also be under the jurisdiction of the Administration and Finance Division. The Centre's budgetary measures will be directly requested to this division.

The management and operations organization of the Centre will be divided into two stages. The personnel involved during the construction period and the period after construction completion will differ. The Centre's management and operations personnel employed during the construction period will be making preparations for the time when the Centre is completed and begins its formal operations. Therefore the number of personnel will be limited to nine members, approximately half of the required number of staff. After the Centre has been completed the staff will be comprised of the 17 members given in the original plan, in order to carry out practical management and operation activities. An outline of the staff members during the two stages has been given in Fig. 12.

The qualifications of the personnel shown above will be recruited and placed according to the following.

DURING CONSTRUCTION



AFTER CONSTRUCTION

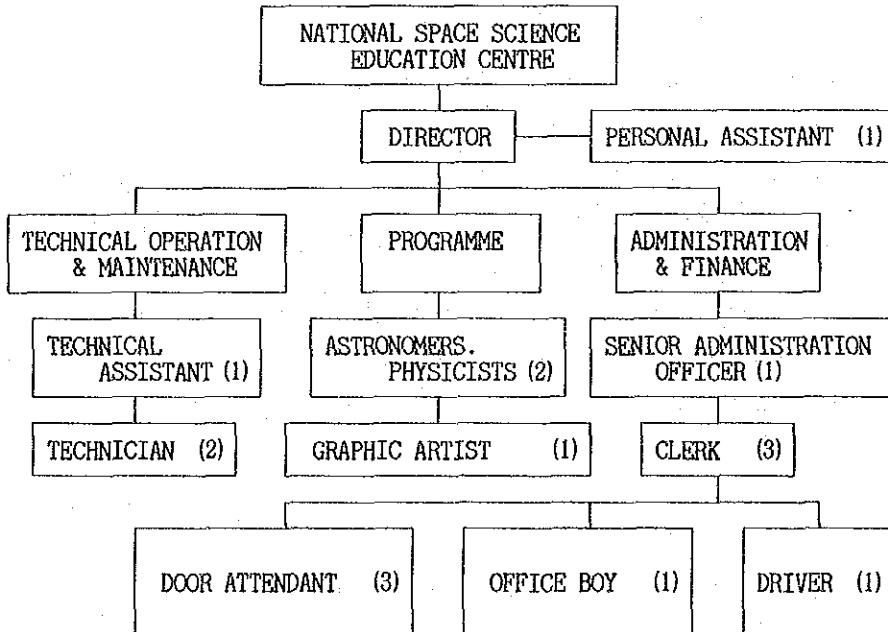


FIG. 12 ORGANIZATION OF NATIONAL SPACE SCIENCE EDUCATION CENTRE

1. The Director

The director must have the minimum of a master's degree in either astronomy or physics, with teaching experience in astronomy and with a background in research. It is desirable that the director have experience in or knowledge about managing a planetarium. It will not be difficult to recruit a person with such qualifications as there are three universities in Malaysia with physics departments and courses in astronomy as described earlier in the section on Background of the Project of this report. However, recruitment will be difficult if the qualification on experience in planetarium management is stressed.

2. The Administration Officer

The Administration Officer should have an university degree in management and a minimum of 10 years experience in accounting and in personnel management. It is expected that there should be no difficulties in recruiting a person with such qualifications.

3. Astronomy Expert/Physicist

The Astronomy Expert/Physicist should be an university graduate with an appropriate degree in an accredited course of study, with ample educational experience in astronomy. The qualification requiring the candidate to have ample educational experience in astronomy, is judged to be a difficult qualification to satisfy and should be reconsidered.

4. Graphics Assistant

The qualifications for this position call for a person with a diploma in art or design. A recruit with a certificate of completion from a polytechnic art school is preferable.

The aforementioned is a brief description of the qualifications of the personnel who will fill the main positions, and does not include positions concerned with the management and operation of the planetarium programmes. These positions are outlined in the following section.

5.6.2 Operation and Maintenance Plan

The operation and maintenance of the entire equipment of the centre, including the equipment which will be furnished by Japan, will be the responsibility of the screening Maintenance and Management Department shown on the organizational chart (Fig. 10). This department will be composed of one screening engineer and two maintenance technicians. The screening engineer must be a graduate of an electronics course from an engineering college with experience in maintenance, management, and operation of computers. The maintenance technicians must be graduates of a technical school with qualifications as an electrician, an electronics technician or a mechanic.

The equipment which will be furnished by the Japanese side consists almost entirely of optical equipment or equipment that is computer driven. Therefore the placement of such personnel in the screening maintenance and management of the equipment is considered as appropriate. Moreover, the planetarium in Singapore which has a seating capacity of 250, has a staff of 15 members to manage the entire planetarium. In view of this fact, the plan to post a staff of 17 members for this centre's planetarium is considered to be sufficient.

5.6.3 Operation and Maintenance Cost and Budget Measures

The budget of the Space Science Education Centre and the budget for the facilities of the centre are described below.

(1) Operation and maintenance budget for the Space Science Education Centre

1) Costs

The costs of the centre are delineated as follows:

The Management, Maintenance, and Operation Costs for the Space Science Education Centre

1. Salaries (including overtime pay)	M\$	166,440
2. Business trips	M\$	50,400
3. General maintenance costs	M\$	2,556,000
4. Spare parts for maintenance	M\$	50,000
5. Telephone	M\$	3,000
6. Rental of sky movies	M\$	640,000
7. Planning cost of sky movies	M\$	3,840,000
8. Seminars, lectures, training	M\$	50,000
9. Publications	M\$	50,000
10. Purchase of book case.	M\$	150,000
11. Rental fee of telex	M\$	6,000
12. Consumer goods, imports for store	M\$	150,000
13. Purchase of exhibit supplies	M\$	200,000
Total	M\$	7,911,840

A break down of the cost in salaries given in item 1 is shown below.

Break Down of the Salaries

Position	No.	Pay Standard	Monthly Salary	Total Annual Salary
1. The Director	1	A.08-00	(M\$ 3,300)	M\$ 39,600
2. Administrative Officer	1	A.12-00	(M\$ 2,205)	M\$ 26,460
3. Astronomy Expert/ Physicist	1	A.18-00	(M\$ 1,230)	M\$ 29,520
4. Technician	1	B.08-00	(M\$ 870)	M\$ 10,440
5. Graphic Specialist	1	B.08-00	(M\$ 870)	M\$ 10,440
6. Maintenance Technician	2	C.10-00	(M\$ 435)	M\$ 10,440
7. Secretary	1	C.12-00	(M\$ 460)	M\$ 5,520
8. Office Clerk	3	C.11-00	(M\$ 435)	M\$ 15,660
9. Doorman	3	D.28-00	(M\$ 300)	M\$ 10,800
10. Janitor	1	D.28-00	(M\$ 300)	M\$ 3,600
11. Driver	1	D.43-1	(M\$ 330)	M\$ 3,960
TOTAL			M\$	166,440

2) Income

Income which will be generated by the centre is expected to be as follows:

Income Generated by the Space Science Education Centre

1. Admissions	M\$ 1,856,320
2. Seminars, lectures, training	M\$ 50,000
3. Sale of publications	M\$ 55,000
4. Rent from restaurants and shops	M\$ 8,400
5. Sale of souvenirs	M\$ 500,000
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TOTAL	M\$ 2,469,720

A breakdown of the income generated from admissions in terms of the number of visitors and admission charges is given below.

Estimated Income From Admissions

i) Admission charges to the planetarium

1) Adults	M\$ 3.00
2) Children	M\$ 2.00
3) Groups of 30 people or more	M\$ 1.00

ii) Admission charges to the sky movies

1) Adults	M\$ 6.00
2) Children	M\$ 4.00
3) Groups of 30 people or more	M\$ 3.00

iii) Estimated number of visitors (visitors to the planetarium show and the sky movies are estimated to be about the same)

The estimated number of visitors is slightly lower in comparison to the estimation earlier on the basis of demand. The daily number of visitors is estimated at 200 people, about 20% less than the original estimation. The Malaysian government is taking conservative budget measures. These measures are appropriate in terms of the centre's operations.

Days	Admission	Adult	Children	Student Groups	Total
Tue - Fri	Each show	70	30	100	200
	Daily	560	240	800	1,600
	Annual	89,600	38,400	128,000	256,000
Sat - Sun Public Holidays	Each show	100	50	80	230
	Daily	800	400	640	1,840
	Annual	84,000	42,400	67,200	193,200
Long School Holidays	Each show	100	50	120	270
	Daily	800	400	960	2,160
	Annual	52,800	26,400	63,360	142,560
	Total	226,400	106,800	258,560	591,760

iv) An estimated breakdown of income generated from admissions

Class	Estimated Audience (Persons)	Income from Planetarium (M\$)	Income from All sky Movie (M\$)	Total Income (M\$)
Adults	226,400	339,600	679,200	1,018,800
Children	106,800	106,800	213,600	320,400
Student groups	258,560	129,280	387,840	517,120
Total	591,760	575,680	1,280,640	1,856,320

3) Financial assistance required from the government

There is a shortage of M\$ 5,442,120 when generated income and costs are compared. The shortage will be appropriated as financial assistance from the Government of Malaysia.

(2) Administration and Finance Division of the Prime Minister's Department, and the Economic Planning Unit

1) The budget for the Prime Minister's Department

Unit: M\$

Annual	1987	1988	1989
1. Ordinary Expenditures	316,084,900	328,225,410	341,160,610
2. Development Costs	33,941,120	500,152,410	412,055,200
TOTAL	350,026,020	828,377,790	753,215,810

2) Administration and Finance Department, and the Economic Planning Agency

Unit: M\$

Annual	1987	1988	1989
1. Administration and Finance Division	43,484,800	43,757,400	46,793,200
2. Economic Planning Unit	15,780,000	16,002,000	17,859,000
TOTAL	59,264,800	59,759,400	64,652,200

(3) Operation and Maintenance Cost of the Equipment Provided under the Japanese Grant Aid

1) Operational costs (electricity consumption)

i) Electricity consumption

The operational costs of the equipment provided are basically electricity consumption costs. They will be approximately M\$4,920 annually.

ii) Spare parts

Spare parts for two years will be provided together with the equipment supplied under Japanese grant aid.

The operation and maintenance costs mentioned above are approximately half of the "Maintenance Spare Parts Outlay" appropriated by the Malaysian government. As the equipment to be provided by Japanese grant aid is the main equipment in this project, much of the operation and maintenance outlay can be utilized for it. Therefore it can be concluded that the maintenance and operation of the equipment to be provided will be appropriate.

6. EVALUATION OF THE PROJECT

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6.1 Benefits of the Project

6.1.1 Direct Benefits

This project is to install the main projector for the planetarium of the National Space Science Education Center, which is to be implemented as an educational facility to promote space science education in Malaysia. Its objective is not only to develop specialized space science education, but to strive to promote the enlightenment and understanding of Malaysian citizens regarding space science to promote progress in science.

The benefits of this project will be seen when the aforementioned objective is achieved. Knowledge will be retained among the general populace as well as the space science specialists. Though it may be impossible to grasp quantitatively, the direct results of this endeavor have been compiled in the following sections.

(1) Benefits in primary and secondary level education

Astronomy and space science are fields of study which have been the foundation in the development of natural science from ancient times and is also the key to unraveling the various phenomena which are close to the source of humanity.

The attendance ratio in primary school education in Malaysia is 97% which is high. Likewise, the attendance ratio in the lower secondary level is estimated to be more than 80%. Stimulating the intellectual curiosity and introducing the mysteries of space science through the planetarium to a majority of the populace during their primary and secondary education, will introduce the younger generation to the beginning of science research. Thus it is expected to greatly contribute to the development of talent and ability in science and technology for the modernization and development of the Malaysian economy. According to this study, an average of 190,000 students and pupils are expected to utilize the planetarium annually. This is expected to have a great effect on space science education in the compulsory school curriculum.

(2) The benefit on specialized space science education

Presently, there are three universities in Malaysia which offer astronomy courses in the physics department. However, there is no specialized equipment. Though there are many students who select courses in astronomy, astronomy is not offered as a major.

The lack of equipment in the universities will be compensated by the National Space Science Education Centre with its planetarium facility, which will henceforth maintain close ties with each university, thereby making it possible to cultivate the abilities of future specialists by raising the quality of specialized space science education. Furthermore, the next generation of specialists will be fostered utilizing the Space Science Education Center as a base, as well as teachers in the primary, secondary, and higher form levels who will in turn, nurture future specialists in the field of space science to complete and begin a cycle. The path to space science research, a leading field of study, will unfold and will contribute to progress in the field of science in Malaysia.

6.1.2 Indirect Benefits

The benefits of the planetarium will not be limited to students alone, but as a facility open to the general public, will gratify their demand for knowledge as well.

The Malaysian people are active in the pursuit of leisure activities. During school holidays, the number of visitors to the zoo and the museum average one million to three million people a year. If the number of visitors to the two facilities are combined, one out of every five people in the nation has visited these facilities. The degree of frequency with which the citizens visit facilities that satisfy their intellectual interests, as part of their leisure activities, is high. Therefore, the planetarium will be welcomed as a new source of intellectual interest and is planned as an addition to the leisure activities of the people.

6.2 Justification of the Project

Malaysia has not been able to effectively promote space science education for many years due to the lack of equipment necessary in space science education. Efforts by Malaysian space science specialists to appeal to the government have continued, but due to the irregular domestic

economy, it was not possible to secure the budget for the construction of a planetarium.

As explained earlier, the field of space science is the origin of natural science and space science education is the foundation for all other fields of science education. Therefore, the planetarium equipment in this project is a necessary and basic facility for space science education and it is expected to widely contribute to many different fields of science education. It is a facility which will become the foundation of education in science and technology essential in the development of the Malaysian economy and the country in general.

The implementing agency of the project is the Administration and Finance Division of the Prime Minister's Department. The centre's operations will be run by the organization of the Space Science Education Centre under the jurisdiction of this department, and its provision is being studied at present. Annual operation and maintenance costs have been estimated at M\$5.44 million. The Malaysian government has decided to allocate these costs to ensure and smooth operation of the Centre.

As can be deduced from the above, the planetarium is essential not only for space science, but plays a crucial role in the promotion of science in general. The government has approved the planetarium in the project which will be the first of its kind on the Malaysian peninsula. Upon its completion, appropriate operations and maintenance will be carried out and the planetarium will have an effect on general science education as well as space science in Malaysia. Therefore the implementation of the project has been evaluated as appropriate.

7. CONCLUSIONS AND RECOMMENDATIONS

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7.1 Conclusions

The project has been formulated in conjunction with the institution of a National Space Science Education Centre for the purpose of promoting space science in Malaysia. It is a project whose aim is to equip the centre with "space science educational equipment" for the purpose of promoting knowledge of space science by means of sky movies and the planetarium programmes. Space science is the gateway to all other fields of science and it is an area where the results are put to practical application. Therefore, promoting space science is in effect, promoting all other fields of science. As an advanced nation in the field of space science and as a leader in Asia, it is firmly believed that Japan's cooperation through this project to promote space science in Malaysia, will not only elevate space science, but will greatly contribute to Malaysia's industry, economic development, and friendship between the two countries.

7.2 Recommendations

The Malaysian government is recommended to carry out the following measures in order to ensure smooth and effective progress in construction, equipment installation, and operation of the centre.

- (1) It is necessary to draw up immediately, by referring to the "Standard Installation Plan", a detailed construction design which is adaptable to whatever equipment that will be finally decided on. Efforts must be made to ensure that construction bidding and construction will not delay the equipment installation schedule.
- (2) The use of the planetarium as a part of the compulsory educational curriculum must be systematized. Therefore negotiations between the Centre and the Ministry of Education are desirable.

- (3) The provision and installation of the inner dome and sound system which will be undertaken by the Malaysian side, greatly affects the progress of the work to be carried out by the Japanese side. It is necessary that the work mentioned above commences according to the project implementation schedule given in this report. Efforts on the part of the Malaysian side regarding this matter will be greatly appreciated.
- (4) There are a few formalities which must be taken care of by the Malaysian side in relation to the Japanese part of the operation. As the entire installation schedule is exceedingly tight, a smooth and prompt response to the formalities by the Malaysian side is requested.
- (5) The Malaysian plan has stipulated the qualifications of the director and other personnel of the centre in detail. These qualifications are judged to be appropriate and it is desirable that the Malaysian side endeavor to employ personnel based on these standards.
- (6) In order to ensure the planetarium's full contribution to the promotion of space science over a wide range, it is desirable for the astronomical organizations to be involved in the activities of the Centre when it is in operation.
- (7) The participation of the Ministry of Education and other related educational institutions (universities, the boards of education, etc.) in the advisory board of the Centre is necessary in view of its educational objectives.

APPENDIX 1

Appendix 1

1.1 Members of the Basic Design Study Team

1) Basic Design Study

Name	Speciality (Present Department)
1) Shoichi ITOH	Team Leader (Director, Suginami Science Education Centre)
2) Akira OUCHI	Grant Aid Cooperation (Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs)
3) Masatoshi KITAMURA	Astronomical Education Specialist (System Science Consultants Inc.)
4) Yoshihisa ONISHI	Equipment Planner (System Science Consultants Inc.)
5) Hiroshi KISHIMOTO	Facility Planner (System Science Consultants Inc.)

2) Draft Report Explanation

Name	Speciality (Present Department)
1) Koichi MORITA	Team Leader (Director, First Project Management Division, Grant Aid Project Management Department, JICA)
2) Yoshihisa ONISHI	Equipment Planner (System Science Consultants Inc.)

1.2 Study Team Survey Itinerary

1) Basic Design Study

(1/2)

DATE	ITINERARY	DESCRIPTION
1. July 23 (Sun)	Narita - Kuala Lumpur	Departed Narita and arrived in Kuala Lumpur
2. July 24 (Mon)	Kuala Lumpur	Courtesy call to Japanese Embassy; Courtesy call and meeting at JICA office in Malaysia; Courtesy call to Economic Planning Unit (EPU) and meeting
3. July 25 (Tue)	Kuala Lumpur	Courtesy call to Islamic Affairs Division; Explanation of inception report and meeting and inspection and observation of the National Museum; the planned National Space Science Education Center
4. July 26 (Wed)	Kuala Lumpur	Meeting at Islamic Affairs Division; Discussion at JICA Office; Preparation of Minutes of Discussion
5. July 27 (Thu)	Kuala Lumpur	Meeting at EPU; Luncheon meeting at EPU; In the afternoon meeting of study team members and arrangement of the data and information
6. July 28 (Fri)	Kuala Lumpur	Meeting at EPU regarding the Minutes and signing of of the Minutes
7. July 29 (Sat)	Kuala Lumpur	Collection and arrangement of data and information; Luncheon meeting of study team members
8. July 30 (Sun)	Kuala Lumpur	Departure of Team Leader, Shoichi Itoh to Japan and Team member, Akira Ouchi left for Bangkok; Arrangement of data and information by consultant members
9. July 31 (Mon)	Kuala Lumpur	Meeting at Islamic Affairs Division and EPU

DATE	ITINERARY	DESCRIPTION
10. Aug. 1 (Tue)	Kuala Lumpur	Visit to National University of Malaysia (KITAMURA and ONISHI); Collection of data and information of prices of materials (KISHIMOTO)
11. Aug. 2 (Wed)	Kuala Lumpur	Meeting with Kumpulan Senireka Sdn. (Malaysian consultant); Collection of data
12. Aug. 3 (Thu)	Kuala Lumpur	Survey of the proposed construction site and its neighboring facilities; Collection of data
13. Aug. 4 (Fri)	Kuala Lumpur	Meeting at Islamic Affairs Division; Explanation of results of the survey to Japanese Embassy and JICA office
14. Aug. 5 (Sat)	Kuala Lumpur - Narita	Meeting at EPU and departed Malaysia
15. Aug. 6 (Sun)	Narita	Arrival in Japan

2) Draft Report Explanation

DATE	ITINERARY	DESCRIPTION
1. Sept. 25 (Mon)	Narita - Kuala Lumpur	Departed Narita and arrived in Kuala Lumpur
2. Sept. 26 (Tue)	Kuala Lumpur	Courtesy call to Japanese Embassy; Courtesy call to JICA office in Kuala Lumpur; Courtesy call to Economic Planning Unit (EPU) and explanation of draft report despatched earlier
3. Sept. 27 (Wed)	Kuala Lumpur	First meeting at EPU
4. Sept. 28 (Thu)	Kuala Lumpur	Second meeting at EPU and signing of minutes of discussions
5. Sept. 29 (Fri)	Kuala Lumpur - Narita	Meeting with Malaysian consultant, EPU and Islamic Affairs Division; and departed Kuala Lumpur for Narita
6. Sept. 30 (Sat)	Narita	Arrived in Japan

1.3 Name of Members Contacted

1) Basic Design Study

ORGANIZATION	POSITION	NAME
- Related Japanese Personnel		
1. Embassy of Japan	First Secretary	Yoichi Suzuki
2. Embassy of Japan	Second Secretary	Toshiyuki Akagi
3. JICA Malaysia Office	Resident Representative	Kazuo Okabe
4. JICA Malaysia Office	Asst. Res. Representative	Keizo Kagawa
5. JICA Malaysia Office	Asst. Res. Representative	Yoshino Minato
- Authorities concerned in Malaysia		
Prime Minister's Department	Director of Budget	Subkey Abdul Wahab
Prime Minister's Department	Director General, Islamic Affairs Division	Yaakob bin Lazim Ali
Prime Minister's Department	Director of Administration, Islamic Affairs Division	Khairuddin Ibrahim Ali
Prime Minister's Department	Asst. Director (Finance), Islamic Affairs Division	Hasan Saad
Prime Minister's Department	Asst. Director (Budget), Economic Planning Unit	Mohd. Sha'arany Mohd. Jan.
Prime Minister's Department	Asst. Director, External Assistance Section, Economic Planning Unit	Wan Norma Wan Daud
Prime Minister's Department	Deputy Director, Technical Services Section, Economic Planning Unit	Lim Sek Ming
National University of Malaysia	Associate Professor	Mazlan Othman
University of Malaya	Professor of Fundamental Physics	Beng-Cheok Tan
Kumpula Senireka Sdn.	Architect	Dato. Nik Mohamed Mahmood
Kontena National Sdn.	Marketing Executive	R. Venugopal
Peruding Ajz Sdn.	Managing Director	Mohd. Zain Yusoff

2) Draft Report Explanation

ORGANIZATION	POSITION	NAME
- Related Japanese Personnel		
1. Embassy of Japan	Minister	Kanji Koike
2. Embassy of Japan	First Secretary	Yoichi Suzuki
3. Embassy of Japan	Second Secretary	Toshiyuki Akagi
4. JICA Malaysia Office	Resident Representative	Kazuo Okabe
5. JICA Malaysia Office	Asst. Res. Representative	Kuniaki Nagata
- Authorities concerned in Malaysia		
Prime Minister's Department	Director of Budget	Subkey Abdul Wahab
Prime Minister's Department	Director General, Islamic Affairs Division	Yaakob bin Lazim Ali
Prime Minister's Department	Director of Administration, Islamic Affairs Division	Khairuddin Ibrahim Ali
Prime Minister's Department	Asst. Director (Finance), Islamic Affairs Division	Hasan Saad
Prime Minister's Department	Asst. Director (Budget), Economic Planning Unit	Mohd. Sha'arany Mohd. Jan.
Prime Minister's Department	Asst. Director, External Assistance Section, Economic Planning Unit	Wan Norma Wan Daud
Prime Minister's Department	Deputy Director, Technical Services Section, Economic Planning Unit	Lim Sek Ming
National University of Malaysia	Associate Professor	Mazlan Othman
Kumpula Senireka Sdn.	Architect	Anhar Ahmad
Peruding Ajz Sdn.	Managing Director	Mohd. Zain Yusoff

1.4 Minutes of Discussions

1) Basic Design Study

MINUTES OF DISCUSSIONS
ON
THE PROJECT FOR THE PROVISION OF PLANETARIUM PROJECTOR
FOR THE NATIONAL SPACE SCIENCE EDUCATION CENTRE
IN MALAYSIA

In response to the request made by the Government of Malaysia, the Government of Japan decided to conduct a basic design study of the Project for the Provision of Planetarium Projector for the National Space Science Education Centre (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Malaysia the study team headed by Mr. Shoichi ITOH, Planetarium Director, Suginami Science Education Centre, from July 23 to August 6, 1989.

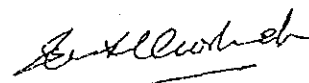
The Team had a series of discussions on the Project with the officials concerned of the Government of Malaysia and conducted a field survey in Kuala Lumpur.

As a result of the study and discussions, both parties agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Kuala Lumpur, July 28, 1989

伊東昌市

Mr. Shoichi ITOH
Team Leader,
Basic Design Study Team,
JICA



(HJ. SUBKEY B. HJ. ABDUL WAHAB)
For The Chief Secretary
to the Government,
Prime Minister's Department.

1. TITLE OF THE PROJECT

The title of the Project is "The Project for the Provision of Planetarium Projector for the National Space Science Education Centre in Malaysia."

2. OBJECTIVE OF THE PROJECT

The objective of the Project is to provide the necessary equipment of Planetarium for the National Space Science Education Centre in order:

- 1) To enhance the scientific literacy of the public in the field of space science.
- 2) To promote the school and public education in various facets of astronomy and space science.

3. IMPLEMENTING AGENCY AND ORGANIZATION OF THE CENTRE

The Implementing Agency for the Project is the Prime Minister's Department. The organization of the National Space Science Education Centre is shown in Annex-1.

4. PROJECT SITE AND INSTALLATION PLAN

The National Space Science Education Centre will be built at Jalan Perdana, Kuala Lumpur. The installation plan of the equipment provided under the Grant Aid is shown in Annex-2.

5. REQUEST BY THE GOVERNMENT OF MALAYSIA

The request made by the Government of Malaysia is shown in Annex-3 according to priority order within the budget availability.

The Japanese Study Team will convey to the Government of Japan the intention of the Government of Malaysia that the Government of Japan will take the necessary measures to cooperate in implementing the Project within the scope of Japanese Economic Cooperation in Grant Aid.

S. I.

6. JAPANESE GRANT AID SYSTEM

The Malaysian side understood the Japanese Grant Aid System explained by the Team which includes the use of a Japanese consultant firm and a Japanese contractor for the implementation of the Project.

7. CONSTRUCTION OF THE CENTRE

The Malaysian side will take the necessary measures to ensure that the installation of equipment (sound system, etc.) and the construction of Planetarium Theatre (inner dome, electricity supply, etc.), related to the Project, would be completed by the end of December 1990, prior to the installation of equipment provided under the Grant Aid. The proposed Schedule is shown in Annex-4.

8. NECESSARY MEASURES TO BE UNDERTAKEN BY THE GOVERNMENT OF MALAYSIA

The Government of Malaysia will take the necessary measures listed in Annex-5 on condition that the Grant Aid by the Government of Japan is extended to the Project.

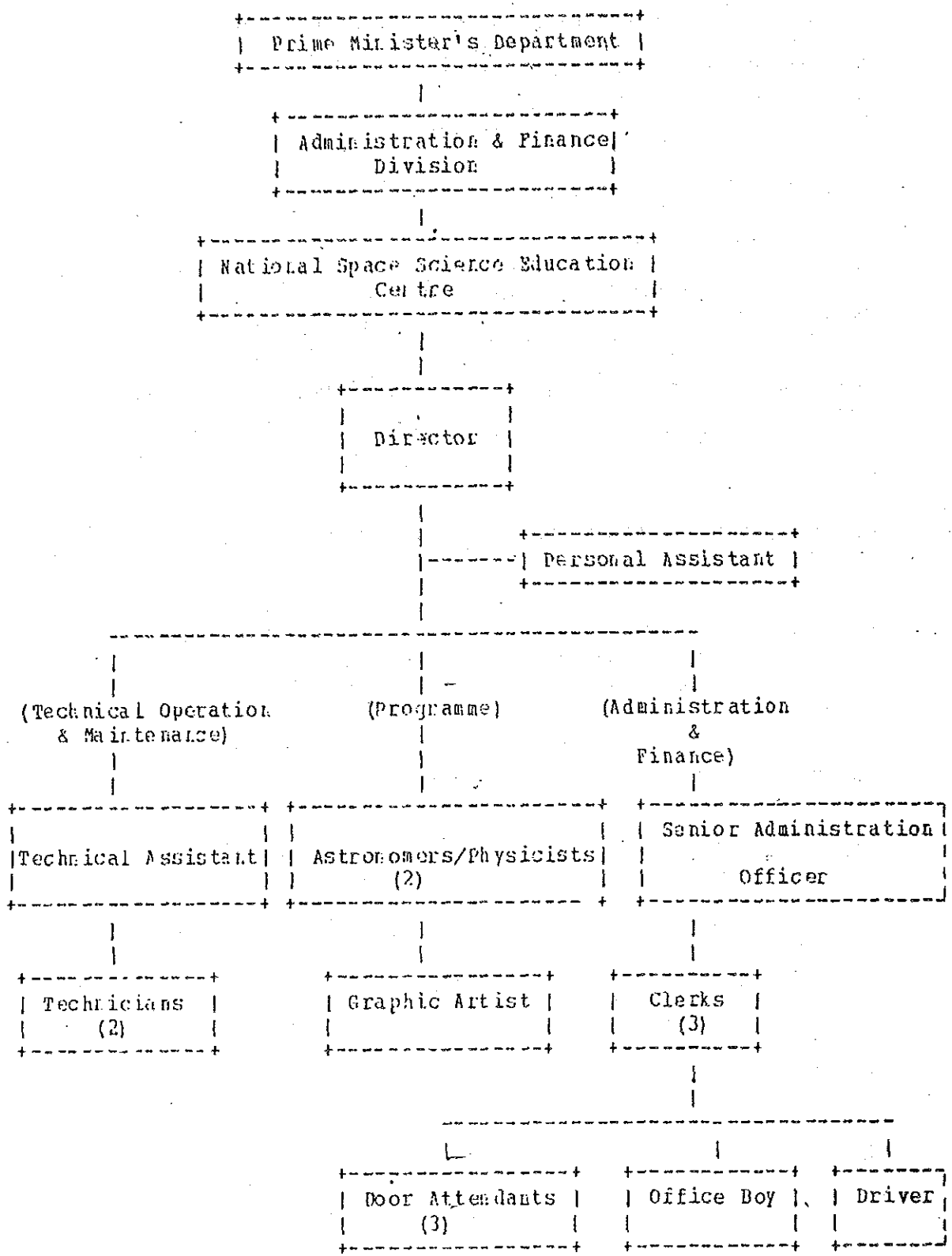
9. OTHER MATTERS

The Malaysian side requested that the Japanese side should as far as possible speed up the processing of the Grant Aid in order for the Malaysian side to complete necessary works for the completion of the facilities for the installation of the equipment as mentioned in paragraph 7.

The Malaysian side requested that due consideration should be given by the Japanese side on the requirements of the Malaysian side on the equipment to be provided under the Grant Aid.

S.1.

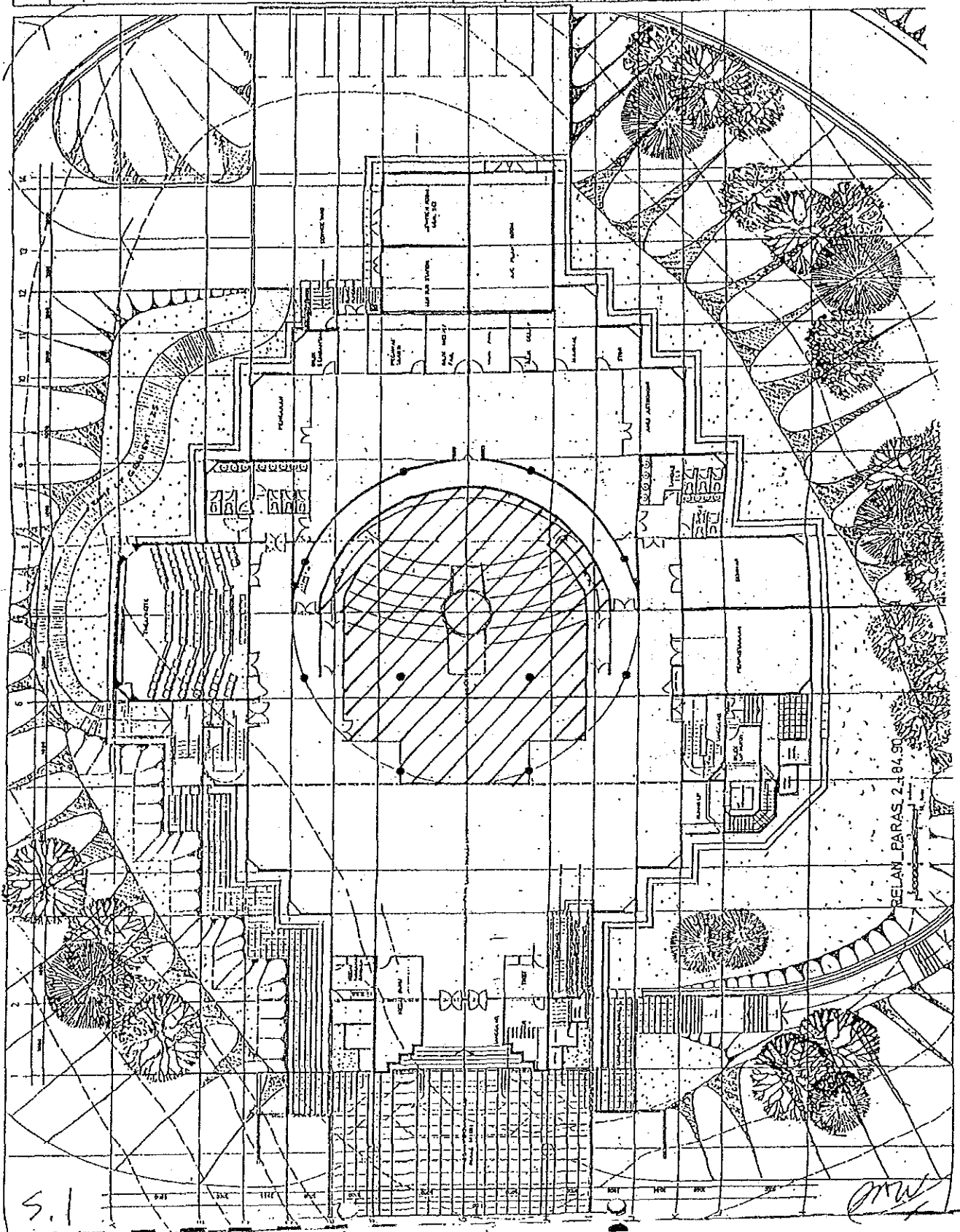
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S.1

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PEL 5 / 9
1727 / SK04

ANNEX-3 EQUIPMENT REQUESTED BY MALAYSIA

1) Main Projector

Inclusive of the projectors for the projection of minimum 15,000 fixed stars, sun, moon, earth, planets (some with zoom lens), coordinates, constellations, panoramic projections of minimum 16 scenes, sunrise/sunset glow, twilight, Milky Way, scintillation of some stars, variable stars, pointers, interface for special effects projectors, control console with capability of demonstrating close approach to the planets and, if possible, stars, etc. Manual operation should be unrestricted and easy.

2) Basic Projectors for Multi-image/Special Effects

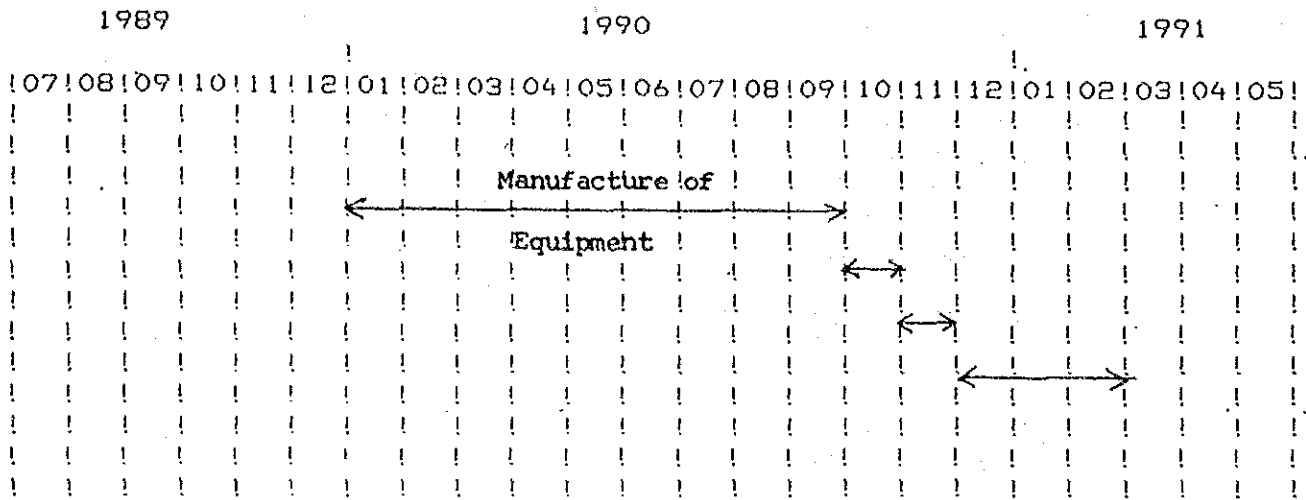
Inclusive of the equipment for following functions, according to priority:-

- i) Multi-image for gigantic image
- ii) Multi-image for wide angle
- iii) Variable zoom/zoom slide projection on x-y moving table
- iv) spinning of image
- v) rising of celestial objects
- vi) multi-shooting/meteor swarm
- vii) flashing
- viii) focusing
- ix) uni-shooting/fireball
- x) unveiling
- xi) Lunar and solar eclipse
- xii) Video projection
- xiii) Cloud projection
- xiv) etc.

S. I.

RAW,

Annex-4 PROPOSED SCHEDULE



- Exchange of Notes
- Detailed Design for Equipment
- Tender for Equipment Purchase
- Tender Close
- Contract & Award for Equipment
- Tender for Civil Works
- Tender Close
- Commencement of Civil Works

- Inspection before Shipping
- Shipping of Equipment
- Completion of Construction of Planetarium Theatre & Installation of Sound System, etc.
- Installation / Inspection of Equipment
- Commissioning of Equipment
- Final Acceptance

S. I

Malaysian Side

1. Mr. Subkey Wahab,
Director of Budget,
Prime Minister's Department. Chairman
2. Dr. Mazlan Othman,
Associate Professor,
National University of Malaysia.
3. Mr. Khairuddin Ibrahim Ali,
Director of Administration,
Islamic Affairs Division,
Prime Minister's Department.
4. Mr. Hasan Saad,
Assistant Director (Finance),
Islamic Affairs Division,
Prime Minister's Department.
5. Mr. Mohamed Sha'arany Mohd. Jan,
Assistant Director (Budget),
Economic Planning Unit,
Prime Minister's Department.
6. Mdm. Wan Norma Wan Daud,
Assistant Director,
External Assistance Section,
Economic Planning Unit,
Prime Minister's Department.
7. Ir Lim Sek Ming,
Deputy Director,
Technical Services Section,
Economic Planning Unit,
Prime Minister's Department.

Japanese Side

1. Mr. Shoichi Itoh, - Team Leader
2. Mr. Akira Ouchi,
Team Member.
3. Dr. Masatoshi Kitamura,
Team Member.

(9 / 9)

4. Dr. Yoshihisa Onishi,
Team Member.
5. Mr. Hiroshi Kishimoto,
Team Member.
6. Mr. Yoichi Suzuki,
Embassy of Japan.

2) Draft Report Explanation

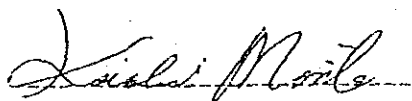
MINUTES OF DISCUSSIONS
ON THE PROJECT FOR THE PROVISION OF PLANETARIUM PROJECTOR
FOR THE NATIONAL SPACE SCIENCE EDUCATION CENTRE
IN MALAYSIA

In response to the request made by the Government of Malaysia for the Project for the Provision of Planetarium Projector for the National Space Science Education Centre (hereinafter referred to as "the Project"), the Government of Japan decided to conduct a basic design study on the Project and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to Malaysia the study team headed by Mr. Shoichi ITOH, Planetarium Director, Suginami Science Education Centre, from July 23 to August 6, 1989.

As a result of the study, JICA prepared a Draft Final Report and dispatched a team headed by Mr. Koichi MORITA, Director, First Project Management Division, Grant Aid Project Management Department, JICA, to explain and discuss the Report from September 25 to September 30, 1989.

Both parties had a series of discussions on the Report and agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined towards the realization of the Project.

Kuala Lumpur, September 28, 1989



Mr. Koichi MORITA
Team Leader,
Basic Design Study Team,
JICA



HJ. SUBKEY B. HJ. ABDUL WAHAB
For The Chief Secretary
to the Government,
Prime Minister's Department

ATTACHMENT

1. The Malaysian side has agreed in principle to the basic design proposed in the Draft Final Report with minor but appropriate alterations mutually agreed upon to be incorporated in the Final Report.
2. The Malaysian side has understood Japan's Grant Aid system and confirmed that the necessary measures will be taken by the Malaysian side as shown in Annex-I which are manifested in the Annex-5 of the MINUTES OF DISCUSSIONS on the Project signed on July 28, 1989, on condition that the Grant Aid by the Government of Japan would be extended to the Project.
3. The Malaysian side will take the necessary measures to ensure that the installation of equipment (sound system, etc.) and the construction of Planetarium Theatre (inner dome, electricity supply, etc.), related to the Project, would be completed by the end of December 1990, prior to the installation of equipment provided under the Grant Aid.
4. The meeting agreed that the Malaysian Consultant will be the overall supervising consultant for the project with the exception of the parts covered by the Japanese Grant Aid. The Japanese consultant will be responsible for the supervision of the equipment provided under the Grant Aid. However, both consultants will be answerable to the Malaysian Government's executing agency and will have close mutual communication.



5. The Malaysian side will ensure the provision of the necessary budget for personnel as stated in the Report, as well as maintenance and operation expenses of the National Space Science Education Centre.

6. The Malaysian side wished to include additional salient features of the planetarium projector and the special effects projectors not mentioned in the Report. However, the Japanese side indicated that such a request could not be considered on the grounds that these features may be supplied by only one manufacturer thereby implying that only one manufacturer can comply with these specifications for the planetarium projector and special effects projectors.

7. The Final Report (10 copies In English) will be submitted to the Malaysian side by the end of November, 1989.

H.M.

PNW

ANNEX-I NECESSARY MEASURES TO BE UNDERTAKEN BY
----- THE GOVERNMENT OF MALAYSIA

1. To provide data and information necessary for the Project.
2. To provide facilities for supply of electricity and other incidental facilities for the Project.
3. To ensure prompt unloading, tax exemption, customs clearance at the port of disembarkation in Malaysia and prompt internal transportation therein of the products purchased under the Grant Aid.
4. To exempt Japanese nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Malaysia with respect to the supply of the products and services under the verified contracts.
5. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Malaysia and stay therein for the performance of their work.
6. To ensure the necessary budget and personnel for the proper and effective operation and maintenance of the equipment provided under the Grant Aid.
7. To ensure the necessary permissions, licences and other authorizations for carrying out the Project.

H.M.

P.W.

8. To bear two kinds of commissions to the Japanese foreign exchange bank for the banking services, based on the "Banking arrangement", namely the advising commission of the "Authorization to Pay" and payment commission.
9. To maintain and use properly and effectively the equipment purchased under the Grant Aid.
10. To bear all the expenses other than those to be borne by the Grant Aid.

AM

AW

1.5 List of References

1/3

TITLE	SOURCE	YEAR
1) Almanak Ukur Malaysia 1989	Department of Geodesy and Astronomy, University Teknologi Malaysia, Skudai, Johore	1989
2) Study guidance for Undergraduate 1989/90	Faculty of Physics and Applied Science	1989
3) Information Malaysia 1989 Yearbook	Berita Publishing Sdn. Bhd.	1989
4) Committee of Astronomical Term Translation into Bahasa Malaysia	Bahagian Peristilahan	1989
5) Universiti Malaya Kalendar Tahun Akademik 1988-1989	University of Malaysia	1988
6) The Star July 20, 1989		1989
7) Berita Sains April 1989 (Science News for School Teachers)	Ministry of Education	1989
8) Rules and Constitution of Persatuan Astronomi Malaysia	The Astronomical Society of Malaysia (ASM)	1980
9) The Astronomer	ASM	1989
10) Newsletter July 1989	ASM	1989
11) The Introductory Course of Astronomy	ASM	1989
12) Kongres Sains dan Teknologi 89 Education in Malaysia	Ministry of Education	1985

TITLE	SOURCE	YEAR
13) Application to Unesco XVIIth International Astronomical Union Int. School for Young Astronomers	Institute of Physics Malaysia	1989
14) The Ancient's Criterion of Earliest Visibility of the Lunar Crescent	ASM	1988
15) Yearbook of Statistics 1987	Govt. of Malaysia	1987
16) The Malaysian Economy in in Figures 1989	- ditto -	1989
17) Astronomi Sezaman	Penerbit Fajar Bakti Sdn.	1987
18) Fifth Malaysia Plan 1986-1990	Govt. of Malaysia	1986
19) Mid-Term Review of the Fifth Malaysia Plan (1986-1990)	- ditto -	1989
20) Cadangan Membina Planetarium Kebangsaan Kuala Lumpur	Jabatan Perdana Menteri	1988
21) Survey on Material and Labour Cost	Institution Surveyors of Malaysia	1988
22) Schedule of Rates	Department of Statistics	1989
23) Uniform Building By-Laws 1984	Govt. of Malaysia	1984
24) Priority Areas in Physics Research	Institute of Physics Malaysia	1984

TITLE	SOURCE	YEAR
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25) SOME TEXTBOOKS ON SPACE SCIENCE

- a) Ujian Topical UPSR
Alam dan Manusia
- b) Fizika Moden
by Harvey Johnson
- c) Fizik Moden 4
by Tan San Huat/
Toh Koh Aun
- d) Panduan Alam dan
Manusia Bergambar
(Man and Environment)
by Tan Cheng Gaik/
Bak Heng Kin/
Yong Soe Han
- e) SRP Sain Panduan
by Lee Yoke Suan, B.Sc.
- f) Nota dan Latihan
KBSM Sains
- g) Alam dan Manusia PJBS
by Abd. Rais Mohd. Nawawi,
David G.F. Yong,
Hazmi Yusof
- h) Astronomy Course in the
Department of Physics
- i) Introductory Course on
Astronomy

APPENDIX 2

Appendix 2

2.1 ECONOMIC INDICATOR

<u>Growth Rate of GDP</u>						
	1985	1986	1987	1988	1989	1990
	-1 %	1.2	5.2	8.7	7.3	6.7
(GDP Per Capita rose to 4,073 M\$ at 1986)						
<u>Growth Rate of Major Production</u>						
	1985	1986	1987	1988	1989	1990
Agriculture	2.5%	4.0	7.4	4.7	3.5	4.6
Mining	-1.4	7.5	0.1	6.6	3.9	1.2
Manufacturing	-3.8	7.5	12.8	18.0	13.5	11.0
Construction	-8.4	-14.0	-11.8	2.5	8.5	11.0
Services	1.7	-0.5	4.8	7.2	6.7	6.3
<u>Blance of Payment</u>						
	1985	1986	1987	1988	(M\$ Million)	
Current Account	-1,522	87	6,595	4,415		
Blance of Trade	8,883	8,781	14,556	14,073		
Export	37,576	35,373	44,597	54,344		
Import	28,693	26,592	30,041	40,271		
<u>Government Revenue & Expenditure</u>						
	1985	1986	1987	1988	(M\$ Million)	
Revenue	21,114	19,518	18,143	21,484		
Current Expenditure	20,066	20,075	20,185	21,341		
Current Revenue	1,048	-557	-2,042	143		
Development Expenditure	6,756	6,959	4,111	4,043		
Unbalanced Finance	-5,708	-7,506	-6,153	-3,900		
Foreign Borrowing	956	1,348	-2,438	-3,137		
Domestic Borrowing	3,591	4,930	8,693	7,829		
Accumulated Assets and	1,161	1,228	-102	-792		
Special Receipt						

SOURCE: MID-TERM REVIEW OF THE FIFTH MALAYSIA PLAN

**2.2 STUDENT ENROLMENT BY LEVEL AND COURSE OF EDUCATION
IN LOCAL PUBLIC INSTITUTIONS, 1985, AND 1988**

Levels and course of education	1985	1988
Primary	2,191,044	2,332,171
Lower secondary	918,237	931,797
Upper secondary	326,391	359,255
Arts	211,395	240,803
Science	95,843	94,420
Technical	5,552	5,186
Vocational	13,511	18,846
Post-secondary	43,849	53,578
Arts	27,743	37,677
Science	16,105	15,901
Certificate	6,878	7,043
Arts	983	793
Science and technology	5,895	6,250
Diploma	25,046	26,225
Arts	12,822	13,358
Science and technology	12,224	12,867
Degree 1	37,838	48,539
Arts	20,357	28,920
Science and technology	17,481	19,619

SOURCE: MID-TERM REVIEW OF THE FIFTE MALAYSIA PLAN

2.3 STUDENT ESTIMATED BY LEVEL OF EDUCATION AND TYPE OF SCHOOL IN LOCAL PUBLIC INSTITUTIONS, 1985, 1988 AND 1990

Levels of education and type of school	1985	1988	1990
Primary	2,191,044	2,332,171	2,449,579
Government and Government-aided schools	2,191,044	2,332,171	2,449,579
Lower secondary	922,209	935,612	974,062
Government and Government-aided schools	918,237	931,797	968,903
MARA junior Science Colleges	3,972	3,815	5,159
Upper secondary	329,392	363,088	404,454
Arts & Science			
Government and Government-aided schools	307,238	335,223	356,335
MARA junior Science Colleges	2,955	3,735	10,861
Tunku Abdul Rashman College	136	98	80
Technical and vobocation			
Government and Government-aided schools	19,063	24,032	31,178
Post-secondary	46,638	55,835	56,742
Government and Government-aided schools	43,638	53,578	54,193
Tunku Abdul Rahman College	2,789	2,257	2,549
Teacher education	16,559	28,411	24,796
Primary and lower secondary levels	16,559	28,411	24,796
Pre-diploma and pre-university courses	5,280	7,033	7,606
Certificate	6,878	7,043	11,472
Diploma	25,046	26,225	28,204
Degree	37,838	48,539	51,797
Total	3,580,884	3,803,957	4,008,712

SOURCE: MID-TERM REVIEW OF THE FIFTH MALAYSIA PLAN

2.4 POPULATION OF MALAYSIA ESTIMATES BY ETHNIC GROUPS, 1985-1990

Ethnic group	1985		1988		1990	
	('000)	(%)	('000)	(%)	('000)	(%)
Peninsular Malaysia (%)	13,012.0 (82.0)	100.0	14,024.8 (81.8)	100.0	14708.9 (81.7)	100.0
Malay and other Bumiputera	7,348.4	56.5	8,081.2	57.6	8,581.2	58.3
Chinese	4,268.1	32.8	4,466.0	31.8	4,594.7	31.2
Indian	1,312.3	10.1	1,389.8	9.9	1,441.2	9.8
Others	83.2	0.6	87.8	0.7	91.8	0.7
Sabah (%)	1,297.4 (8.2)	100.0	1,442.9 (8.4)	100.0	1,535.8 (8.5)	100.0
Bumiputera	1,095.0	84.4	1,227.9	85.1	1,312.4	85.5
Chinese	190.7	14.7	202.0	14.0	209.2	13.6
Indian	6.5	0.5	7.2	0.5	7.7	0.5
Others	5.2	0.4	5.8	0.4	6.1	0.4
Sarawak (%)	1,554.6 (9.8)	100.0	1,682.4 (9.8)	100.0	1,765.9 (9.8)	100.0
Bumiputera	1,094.9	70.4	1,194.4	71.0	1,258.6	71.3
Chinese	442.6	28.5	471.2	28.0	489.7	27.7
Indian	9.3	0.6	10.1	0.6	10.5	0.6
Others	7.8	0.5	6.7	0.4	7.1	0.4
Malaysia (%)	15,864.0 (100.0)		17,150.1 (100.0)		18,010.2 (100.0)	

SOURCE: MID-TERM REVIEW OF THE FIFTE MALAYSIA PLAN

2.5 POPULATION OF PENINSULAR MALAYSIA (CENSUS OF 1980)

STATES	1960	1970	1980
Peninsular Malaysia	6,836,731	9,146,681	9,485,434
Johor	1,003,780	1,325,571	1,640,488
Kedah	760,308	989,476	1,117,610
Kelantan	547,932	707,286	895,354
Melaka	316,311	419,378	465,346
Negeri Sembilan	391,204	500,404	574,327
Pahang	352,580	523,825	800,034
Pulau Pinang	617,964	808,627	955,618
Perak	1,302,847	1,631,468	1,807,423
Perlis	98,176	125,462	148,448
Selangor	1,139,203	1,696,398	1,517,504
Terengganu	306,426	418,786	541,608
Federal Territory, Kuala Lumpur	-	-	978,326

SOURCE: YEARBOOK OF STATISTICS 1989

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