

**UNITED STATES  
INTERNATIONAL DEVELOPMENT  
COOPERATION AGENCY  
AGENCY FOR INTERNATIONAL DEVELOPMENT**

*PD AAQ 326*

*9365710*

*1011-3743Z*

MANAGEMENT  
REPORT

**PHOTOVOLTAIC  
TECHNOLOGY  
PROJECT**

AID/NASA  
INTERAGENCY  
AGREEMENT  
DSB-5710-2-79

Accomplishment: *William J. Bifano* 4/12/84  
Date

Approval: *Frank J. Vitale* 4/12/84  
Date

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RESPONSIBILITY:

APPROVAL F. J. KUTINA, JR.

ACCOMPLISHMENT W. J. BIFANO

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TECHNOLOGY  
PROJECT



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1.0 INTRODUCTION AND BACKGROUND

The Photovoltaic Technology Project is being implemented by the NASA Lewis Research Center (LeRC) for the U.S. Agency for International Development, Bureau for Science and Technology, Office of Energy. The purpose of the project is to facilitate the use of photovoltaics for a variety of applications in support of AID's development assistance activities.

A Participating Agency Services Agreement (PASA No. NASA/DSB 5710-2-79) authorizing this project was signed by AID August 28, 1979, and approved by NASA August 30, 1979. Under this agreement, AID provided an initial funding authority of \$2,000,000. This PASA was amended in August 1980 and August 1981 to provide additional funding authority of \$500,000 and \$921,000, respectively. Total funding authority received to date is \$3,421,000.

2.0 OBJECTIVE

The major objective of this project is to demonstrate the suitability of photovoltaic (PV) power systems for meeting basic electrical requirements in rural areas of developing countries.

The Project Management function at the LeRC is being performed by the Solar Energy Project Office in the Energy Technology Division of the Space Technology Directorate.

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RESPONSIBILITY: APPROVAL <u>F. J. KUTINA, JR.</u> ACCOMPLISHMENT <u>W. J. BIFANO</u>	PROJECT: PHOTOVOLTAIC TECHNOLOGY PROJECT <div style="text-align: center; border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; margin: 0 auto; display: flex; align-items: center; justify-content: center;">             2&amp;3 LEVEL         </div>	STATUS AS OF <u>April 1, 1984</u> <small>(DATE) (INITIALS)</small>

### 3.0 EXECUTIVE SUMMARY

Two of the 11 medical refrigerators provided by the Solar Power Corporation are currently not operating. LeRC is still awaiting technical information relative to the medical refrigerator in Guyana. Specific measurements were to be made in March and relayed to LeRC. Information was also to have been provided by AID/Indonesia in February relative to an inoperative unit there. No information has been received to date from either Mission. AID/Liberia was to have informed LeRC as to an acceptable installation date in early March, however, such information has not yet been provided. The other eight refrigerators installed by SPC are operating satisfactorily according to the best available information.

All eight of the refrigerators installed by Solavolt International are operational. The unit shipped to the Honduras is to be installed by local engineers who were trained by the Solavolt/NASA installation team in January. LeRC is still awaiting word from Jordan as to an acceptable installation date.

All five medical clinics continue to operate satisfactorily. The one-year annual inspections by Solarex are dated to begin in April or May starting with Guyana.

The Preliminary Design Review for the earth station PV power system has been re-scheduled to April 9 and 10 to allow Hughes to develop more complete drawings and other documentation. Material sent to LeRC for review earlier was found to be incomplete and/or in need of revision. Installation of the system in Indonesia (Southeast Sulawesi) is scheduled for September of 1984.

A project review meeting will be held at AID/Roslyn on April 18.

\$260,449 of new obligational authority was transferred to NASA HQ in March.

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4.0 STATUS OF ACTIVITIES

4.1 Applications

4.1.1 Medical Refrigerators

Contract NAS3-22246: Deployment of PV-Powered Refrigerators

A cable dated March 8, 1984 was sent from AID/Guyana to AID/W indicating that the refrigerator at Schepmoed had blown a fuse again and was not operating. (Note: Information needed to diagnose the problem was requested of AID/G by LeRC in a telecon on February 24 and was to have been gathered during a visit to the site the week of March 12.) In the cable, AID/G requested that "an engineer be dispatched immediately to monitor and correct faults in this unit." The Mission also referred to the "lack of responsiveness by NASA and the contractor." For the record, LeRC has monitored the Guyana refrigerator closely since its installation in September of 1982. When problems have been reported, the contractor, the Solar Power Corp. (SPC) has been alerted and arrangements have been made for corrective action. Although the "fixed price" contract with SPC for fabrication and installation of the refrigerators includes a one-year warranty on the system, recent events have complicated the situation somewhat. Recently, the Adler-Barbour company, who supplied the refrigerator units to SPC, went out-of-business. Furthermore, SPC is in the process of being sold by Exxon and nearly all key employees have been terminated.

In response to the March 8 cable, LeRC has called the AID Mission on several occasions in an attempt to secure the needed technical information requested in February. Until that information is known, LeRC will be unable to take corrective action. The AID/Guyana contact, Sam Dowding, has been unable to visit the site during the past few weeks because the local Medex has been away from the clinic. The latest visit is

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scheduled for March 29. Dowding promised to contact LeRC soon thereafter with the specific electrical measurements requested. A management official from SPC has been contacted and is attempting to locate spare parts for the Guyana unit which may be useful. In spite of the unstable situation at SPC, he appears to be cooperative and has asked that we contact him when we receive more specific information. Since no AID funds have been allocated for a dedicated trip to Guyana by LeRC personnel for the Schepmoed system, plans are to have a LeRC engineer visit the site during an upcoming TDY in support of the medical system at Waramuri. That trip, however, is contingent on the schedule of Solarex personnel (Solarex supplied the medical system). The estimated date for the Guyana TDY is mid- to late-April at the earliest. The above information has been provided to both AID/Guyana and AID/Washington.

AID/Liberia has not yet informed LeRC with a date for system installation. According to their cable of February 28, 1984, they were to advise LeRC on the status of the refrigerator during the week of March 5, 1984. (Note: Unit was shipped and received in February of 1983 rather than 1982 as indicated in last month's report.) The SPC contract is essentially closed out. LeRC personnel may be able to install the unit during a future TDY to Africa as part of another project. However, if that cannot be arranged, the unit will have to be installed by local personnel.

Information was to have been provided by AID/Indonesia regarding the failure of one of the two refrigerators installed there in April of 1982. No information has been received to date.

Contract NAS3-23713: Deployment of PV-Powered Refrigerators

Cable 2273, dated March 8, 1984, was received from Jordan indicating that the refrigerator shipped there in February 1984 had not yet cleared customs and that the airway bill (AWB) had not yet been received. LeRC

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<p>notified Solavolt who, in turn, had their shipper send another copy. (According to Solavolt, an AWB had to have been included originally or the unit would not have been shipped.) The cable indicated that AID/Jordan would notify LeRC when the equipment is ready for installation. LeRC cabled AID/Jordan on March 23 indicating mid-April as a possible time for installation since Solavolt personnel would be overseas at that time on other business.</p> <p>LeRC cabled AID/Honduras on March 20, 1984 to ascertain the status of the refrigerator shipped there earlier. LeRC shipped needed replacement parts on February 17 and LeRC personnel trained GOH personnel during a January TDY on installation and operation of the refrigerator. Since the demonstration site is close to the Nicaragua border, the decision was made to have local personnel install the unit after intensive training by the contractor/LeRC team in Tegucigalpa on January 12.</p> <p>Data received from Thailand in March indicates anomolous performance of the refrigerator installed there in November 1983. A cable was sent by LeRC to AID/Thailand to determine whether the unit was being turned off occasionally or other unusual use was causing the data to appear abnormal.</p> <p>The overall status of the PV medical refrigerator field test activity is summarized in Table 1.</p> <p><u>In-House Testing and Evaluation of PV-Powered Refrigerators</u></p> <p>Endurance testing of the three prototype PV refrigerators (from Adler-Barbour, Polar Products and Marvel) continued in March. Accrued test time, under simulated environmental conditions, is now in excess of 6800 hours.</p>		

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4.1.2 Medical Applications

Contract NAS3-22240: Photovoltaic Development and Support Program for Medical Systems in Developing Countries

The revised contract with Solarex has been signed by both NASA and Solarex. The scheduling of the tentative visit to the Waramuri, Guyana clinic is dependent on the shipping and installation schedule of the Solarex photovoltaic project for the Guyana Ministry of Health at a hospital near Waramuri. The expected dates are either mid-April or mid-May.

The U.S. AID Mission in Zimbabwe has informed NASA that the Chikwakwa clinic has depleted its reserve of data acquisition forms. This has been relayed to Solarex with a request for them to send additional forms to Zimbabwe.

The U.S. AID Mission in Ecuador has replied to inquiries from NASA concerning the project installation at Pedro Vicente Maldonado. The utility power lines have been extended to the village but connections have not yet been made to the clinic. There was no indication of when the clinic would receive the utility power. The plans for moving the project equipment are also unclear at this time.

No new technical problems have been reported from the five field test sites. Two continuing problems concern the corrosion in the battery compartment of the Waramuri, Guyana refrigerator and the automatic data recorders at most sites. It is assumed that all systems are still operating satisfactorily.

The overall status of the PV medical system field test activity is provided in Table 2.

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4.1.3 Remote Earth Station

Contract NAS3-23862: Design, Development and Deployment of Photovoltaic Power Systems for Satellite Earth Stations in Remote Areas

The Preliminary Design Review (PDR) was rescheduled to March 15 and 16, 1984 from February 29 and March 1 due to a severe snowstorm in Cleveland. Additional preliminary design (PD) material was received from Hughes on March 1. On March 13, Hughes was informed that the PD material submitted to date was not of satisfactory quality and was not complete. Hughes then requested that the PD be rescheduled again so that the PD material could be completed. The PDR was subsequently rescheduled for April 9 and 10 with receipt by NASA of the PD material on April 3.

The contract modification has been signed by NASA and Hughes. This modification finalizes the photovoltaic power system configuration and has resulted in a slight decrease in the total contract cost.

Richard DeLombard conducted project coordination meetings on March 7 in Washington with Hughes, the Academy for Educational Development and Teleconsult. A site for the installation of the earth station and the PV power system has been selected in Southeast Sulawesi, Indonesia, approximately 70 km west of Kendari. The project equipment will be used both in a classroom and for local communications since the area is part of the transmigration effort and there is a large irrigation project nearby.

DeLombard proposed to the Academy for Educational Development that he present a seminar on photovoltaic power systems and technology to interested Indonesian organizations concerned with the Rural Satellite Project. AED concurred, feeling this would provide additional visibility for the earth station and PV power system portion of the project.

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2&3  
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**STATUS AS OF** April 1, 1984  
(DATE) (INITIALS)

Technical integration issues were discussed with Teleconsult and Hughes concerning the operation of the earth station and PV power system for the first time in the field. There is a possibility of problems occurring since the total system will not have been tested as a whole before the field installation.

Hughes is aware of the potential problems with schedule slips and is attempting to prevent the present delays from impacting the installation time of September 1984.

**4.2 Training and Information**

Presentations on photovoltaics were prepared for delivery to the University of Florida's Training in Alternative Energy Technologies on April 2 and 4.

**5.0 PROJECT MANAGEMENT**

The AID Contract Management Office executed a new Participating Agency Service Agreement (PASA) and transferred \$260,449 of new obligational authority to NASA Headquarters to enable LeRC to complete project commitments. NASA signed and returned the PASA to AID on March 27, 1984.

A project review meeting has been scheduled for April 18 at AID/Rossllyn.

TABLE 1. - MEDICAL REFRIGERATOR APPLICATION: STATUS

<u>Mission</u>	<u>Tentative Sites</u>	<u>Status/Remarks</u>	<u>Action Needed</u>
Zaire	Kionzo	System is operational.	Replacement of amp-hour meters.
Zimbabwe	Chiota	System is operational, but no temperatures are being reported.	Thermograph appears to be out of operation. Ambient T recorder replacement sent 26 Aug. 83.
Liberia	Suehn Village	System cleared through customs. Mission advised LeRC that health center would not be ready for installation until at least February. LeRC cabled Mission on February 10 requesting status. Response indicated Mission would cable LeRC week of March 5 with recommendation.	Mission to inform LeRC when system can be installed.
Indonesia	1) Cibung Bulang 2) Batujaya	System at Cibung Bulang inoperative. AID/Jakarta to provide additional information in March.	Review information when received. Take action if appropriate.
Morocco	Bouaboute	System operational.	None
Guyana	Schepmoed	System not operational. Compressor emits noise when array connected indicating problem is voltage related.	Local personnel to make additional electrical measurements and report back to LeRC.
Ecuador	Comuna Cobos	System is operational.	Thermograph is broken. LeRC engineer replaced broken thermostat switch.
Dominican Republic	Las Tablas	LeRC engineer visited site and found batteries discharged because users were making twice the allowable amount of ice daily.	Unit to be put back into operation after batteries charged. Ice making to be limited to 2 kg/day per design value.

<u>Mission</u>	<u>Tentative Sites</u>	<u>Status/Remarks</u>	<u>Action Needed</u>
Guatemala	Tierra Blanca	System is operational. A replacement thermograph sent in January. A Users Manual and wiring diagrams also provided.	None
Haiti	Anse-a-Veau	System is operational.	None
Tunisia	1) Es-Smirat 2) Bir Amama	Systems are operational.	Defective ampere-hour meter to be replaced at Es-Smirat.
Ivory Coast REDSO/WA	Menee	System is operational.	Defective temperature recorder probe to be replaced.
St. Vincent	1) Sandy Bay 2) Canouan Island	Systems are operational.	None
Thailand	Tambon Tha Thong	System installed 31 October 83 and is operational. Ampere-hour meter appears to be defective. Data received in March indicates abnormal performance. Cable sent requesting explanation.	AID/Thailand to advise LeRC regarding use of refrigerator.
Honduras	Aldea Las Selvas	Local personnel instructed on system installation at hospital in Tegucigalpa by Solavolt/LeRC team; replacement fan and other components shipped to AID/H in February.	Local personnel to install system at Aldea Las Selvas clinic.
Upper Volta	Orodara	System is operational.	Defective ampere-hour meter to be replaced.
Mali	Ouelessebouyou	System is operational.	None
Jordan (tentative)	TBD	System arrived at Amman on February 17; currently in customs.	Execute Project Agreement; identify test site; Mission to notify LeRC when unit clears customs.

TABLE 2. - PV MEDICAL SYSTEM APPLICATIONS: STATUS

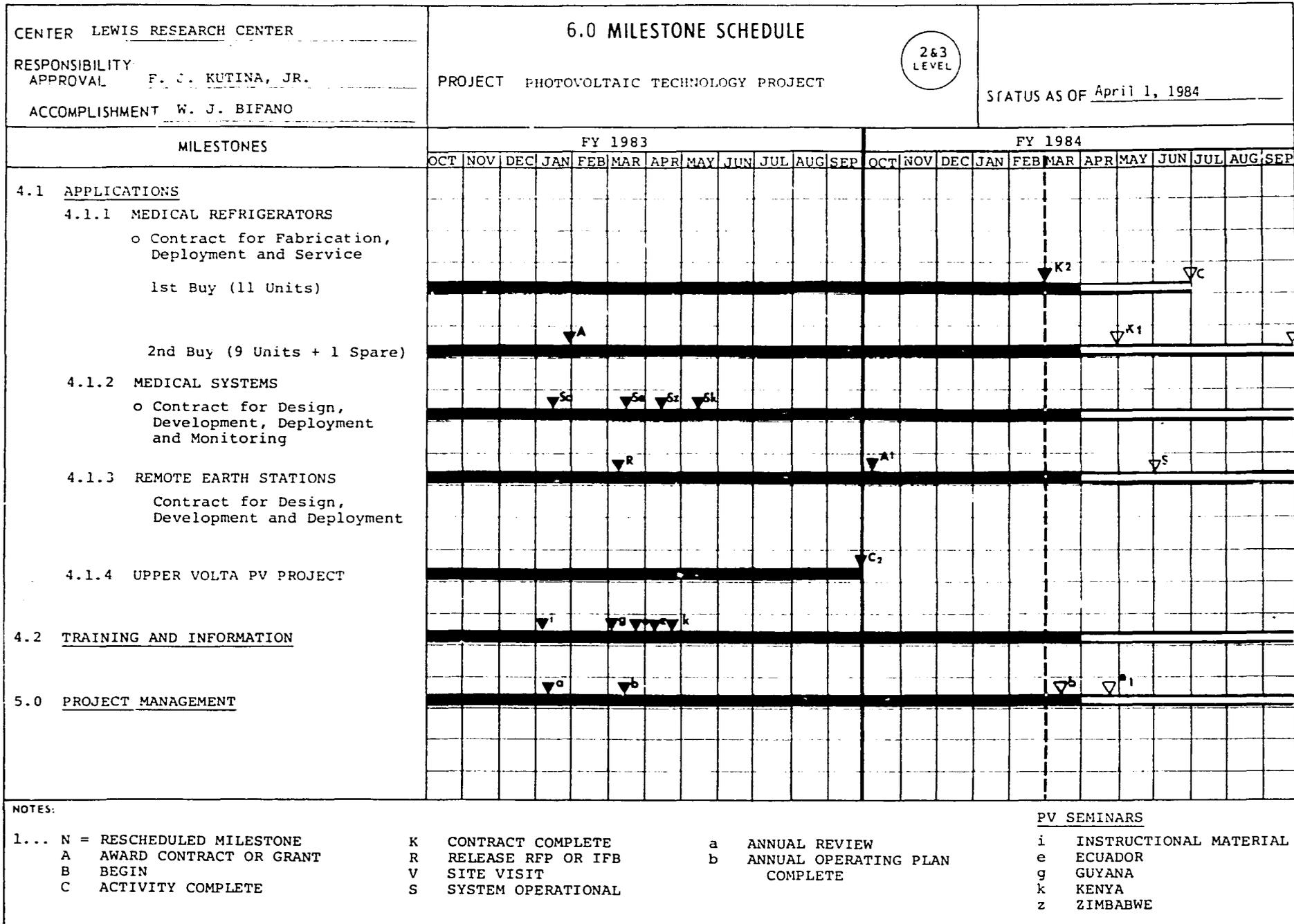
Country:

Guyana: System operating satisfactorily. Corrosion problem reported in vaccine refrigerator battery compartment.

Ecuador: System operating satisfactorily.

Kenya: Both systems are operating.

Zimbabwe: System is operating satisfactorily.



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7.0 FINANCIAL STATUS  
PHOTOVOLTAIC TECHNOLOGY PROJECT

776-54-01

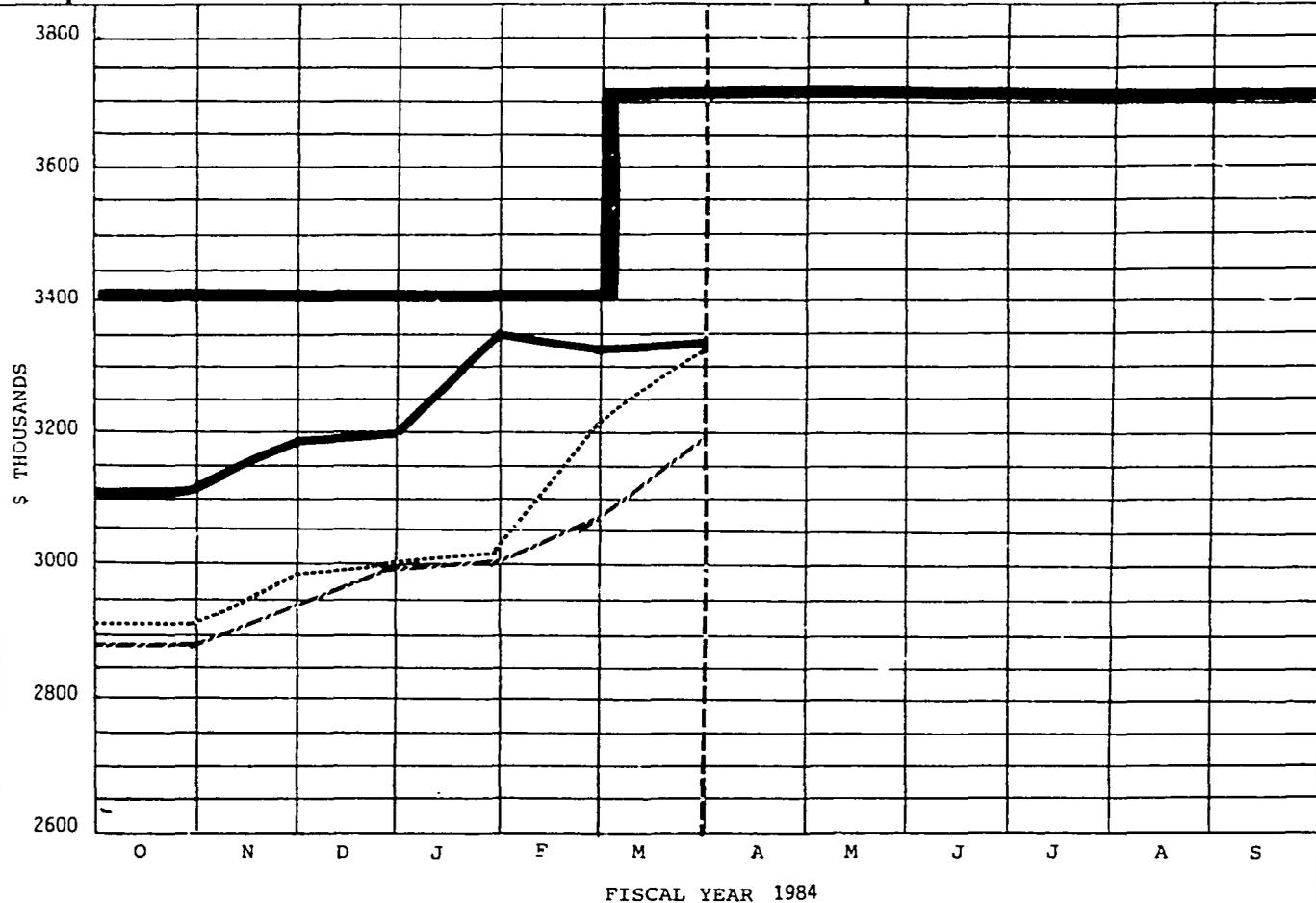
STATUS AS OF April 1, 1984

CUMULATIVES TO START OF FY 84:

AUTHORITY \$3,405K  
OBLIGATIONS \$ 2,956K  
UNOBLIG. PRIOR YEAR AUTHORITY 449K  
FY 84 NEW AUTH. RECEIVED 0

INCLUDES R&D, TRAVEL AND INSTITUTIONAL SUPPORT (MANPOWER BASED)

DOES NOT INCLUDE FUNDS RETAINED BY NASA HQ FOR DCAS CHARGES

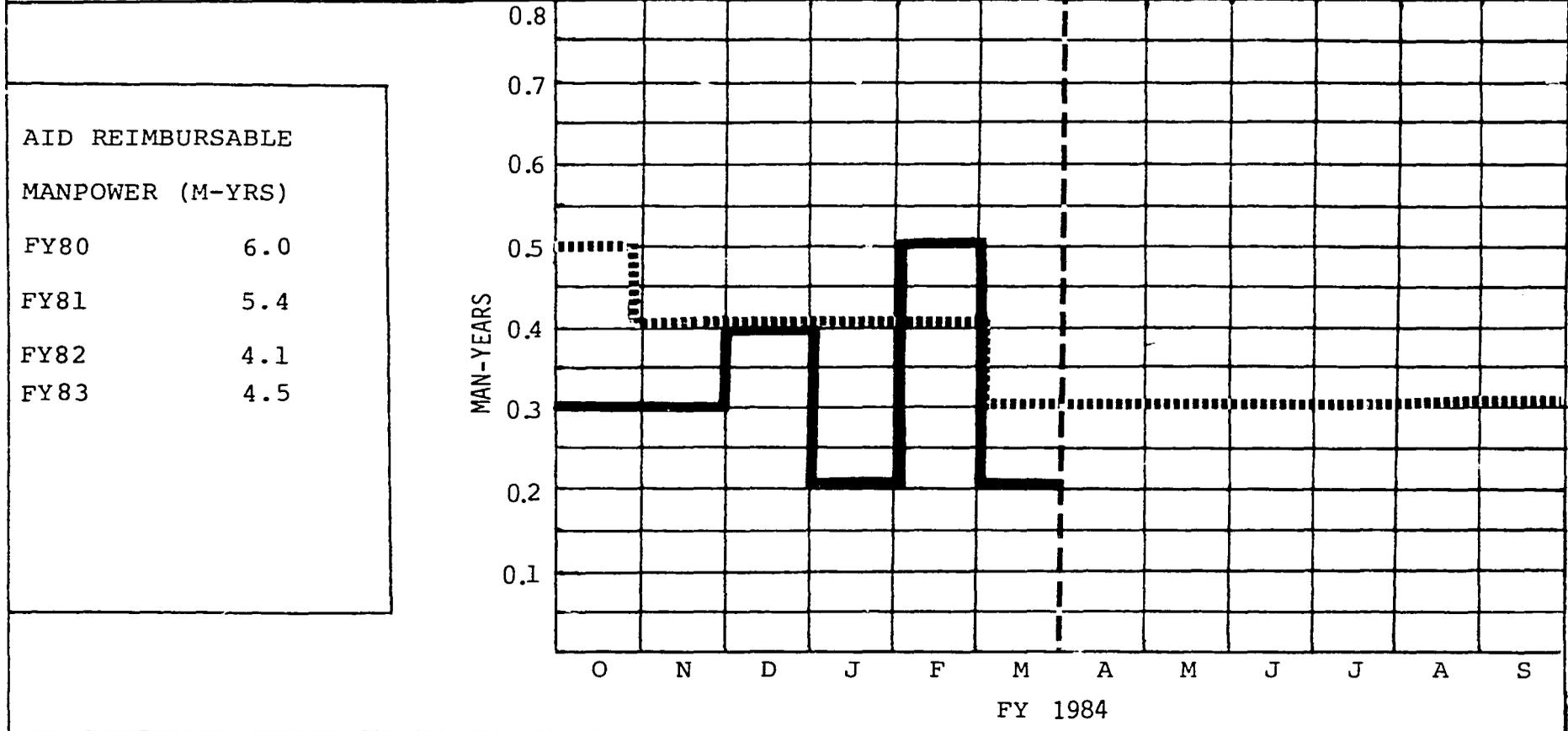


CUMULATIVE

9/83

AUTHORITY	█	3405	3405	3405	3405	3405	3405	3720	3720	3720	3720	3720	3720	3720
COMMITMENTS (ACTUAL)	█	3156	3120	3189	3200	3352	3344	3370						
OBLIGATIONS (ACTUAL)	.....	2956	2920	2989	3000	3016	3201	3370						
COSTS (ACTUAL)	---	2898	2890	2959	2996	3012	3064	3194						

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PLAN	.....	0.5	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3
ACTUAL	————	0.3	0.3	0.4	0.2	0.5	0.2						
CUMULATIVE		20.6	20.9	21.3	21.5	22.0	22.2						

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