PRELIMINARY STUDY OF A LOGISTICS PLANNING AND TRACKING SYSTEM TO SUPPORT THE OFFICE OF FOREIGN DISASTER ASSISTANCE

FINAL REPORT

SEPTEMBER 1977

Prepared for

OFFICE OF DATA MANAGEMENT
AGENCY FOR INTERNATIONAL DEVELOPMENT

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PRC INFORMATION SCIENCES COMPANY

SECTION I

EXECUTIVE SUMMARY

A. Purpose

The present report was prepared by PRC Information Sciences Company (PRC/ISC) for the U.S. Agency for International Development (AID), Office of Data Management (SER/DM), in fulfillment of obligations assumed by PRC/ISC under AID Contract No. AID/otr-C-1509, Work Order No. 3, Perform Preliminary Study of a Logistics Planning and Tracking System (LPTS) for the Office of Foreign Disaster Assistance (OFDA). The report has the following purposes:

- To establish OFDA information/ADP support requirements in performing the logistics planning and tracking functions involved in managing the U.S. reponse to declared foreign disasters.
- To establish generalized guidelines for the cost-benefit optimized implementation of an LPTS meeting identified OFDA support requirements over an assumed seven-year operating (i.e., post development and installation) life.
- To establish the cost/benefit parameters for the LPTS conceptual design, placing special emphasis on end-user acceptance of the final product.
- To develop a Conceptual Design (CD) of a user-acceptance optimized LPTS and to use the CD to develop a set of LPTS implementation options meeting OFDA requirements.
- To perform a life-cycle based cost/benefit assessment of identified LPTS implementation options for the purpose of presenting DM and OFDA with recommendations on LPTS implementation, with due regard to salvaging as much as possible of AID investment to date in OFDA ADP support and/or the adaptation of applicable software available outside AID/W.

B. LPTS Objectives and Scope

The subject work order implicitly identified the following objectives for the LPTS/CD study undertaken by PRC/ISC:

- To develop and evaluate all the necessary factors relevant to a decision by AID as regards implementing an LPTS for OFDA support or enhancing current ADP support offered OFDA to the degree necessary to achieve the desired user-acceptance and operational performance level.

- To outline a phased-implementation schedule for the optimized development of an LPTS based on the modular expansion of a baseline system meeting the minimum expressed requirements of potential OFDA users.

In view of the AID-announced 4QCY77 installation of an IBM 370/158 computer system to replace the 360/65 now in use, the LPTS design has been constrained to be compatible with known current control and application software (e.g., TSO, INQUIRE) now installed at AID/W. In addition, very conservative assumptions were made concerning the number of DM or equivalent personnel required to support OFDA given a two-shift/day operating mode (overnight batch response): one full-time equivalent analyst is assumed to be assigned to support OFDA in the 1979-1984 time frame.

Discussions held between DM, OFDA and PRC/ISC personnel at the start of the data collection activity conducted under the present study delineated the scope of the study as comprising the following:

- All procedures/data/software impacting the logistics planning activities performed by OFDA Operations Officers before and during a given disaster, as well as the tracking of the movement of commodities and/or people (services) from various sources to the disaster area distribution points.
- All procedures/data/software impacting the financial tracking/reporting activities performed by the OFDA Administrative Officer in the course of implementing the OFDA-managed U. S. response to all types of foreign disasters.
- All procedures/data/software impacting the "brokering" of offers of assistance against known in-country relief requirements.
- The scope of the present study <u>specifically excluded</u> all communications aspects impacting OFDA interfaces with other U.S. government and international organizations (e.g., use of teletypes, facsimile transmission of graphic material, etc.) as well as any traffic studies within OFDA and between OFDA and interacting AID/State Department (DOS) agencies/activities.

The current ADP support extended to OFDA has an operating history of slightly over one year (development ended May 1976) and comprises four basic applications packages:

- The Historical Analysis Subsystem used in damage assessment estimates.

- The Country Profile Subsystem used for the extraction of relevant background information on the host country during a disaster.

- The Procurement Planning Subsystem, which is not active at the present time.

- The Operations Subsystem which is not a finalized subsystem and contains only country/disaster specific information (i.e., the files are not integrated as through the use of a data dictionary).

C. Findings and Recommendations

The application of life cycle cost/benefit assessment techniques to the evaluation of the four LPTS implementation options identified as meeting OFDA functional requirements led to the following findings/recommendations:

- One may generally state that the information processing support required by OFDA to implement the LPTS concept is of the push-down list processing type, with the exception of those rare instances when actual computations need to be performed on stored information.

- The list-type processing required to support LPTS can be adequately performed using a word processing system with capabilities slightly upgraded (disc working storage, more CRT) from those available in the current WP system in use at OFDA. On such a system the indexing and control of information is performed manually.

- The operational manageability of any LPTS would be greatly enhanced by the inclusion of some data base management system (DBMS) capability to relieve OFDA personnel from the control-of-information chores and improve overall efficiency. Implicit in such an arrangement are significantly enhanced search/retrieval capabilities. A further implication is that the upgraded local WP system may as well be a small computer.

- A basic principle of LPTS design and implementation must be to make the interaction between the user and the LPTS as "human-readable" as possible. Whatever the mode of implementation (WP, central AID/W computer with interactive terminals, dedicated minicomputer installed at OFDA) chosen, OFDA operations officers and managers must not be forced to structure their requests for information in programmer terms. Instead, the activation of one or two English-labelled "function" buttons (keys) or a terminal or the entry of an English-like request should be sufficient to call up the required information. This is the so-called

"black box" approach to LPTS implementation and does not require programmer to interface the user with the system.

- In general, LPTS-like systems available outside AID/W (chiefly from Department of Defense sources) tend to require voluminous input, large-scale computer resources, and a technically sophisticated support staff. All the systems on which inquiry was made failed to meet one or more of the criteria considered essential for further OFDA consideration.

- Current ADP support available to OFDA also does not meet the user acceptability guidelines developed for this study. The chief shortcoming of the current software is the lack of a data base management system (DBMS). Integration of the available programs under such a DBMS (e.g., INQUIRE) will be costly (see development cost figures for Option 2 in Section IV) and fail to assure better response since OFDA on-line users will be restricted to the one TSO/INQUIRE 250K region currently available to INQUIRE users on the AID/W computer. Conflicts will be intensified for all INQUIRE users, including OFDA.

- The Country Profile application should be removed from the 360/65 and moved to the WP equipment currently installed at OFDA: the Country Profiles are very seldom used directly out of the computer data base, bound hardcopy volumes being readily available at OFDA.

- OFDA should explore the feasibility of implementing LPTS on a dedicated small computer installed at OFDA and communicating with the larger central AID processor when required to transmit financial data for use by SER/FM (Option 4 in Section IV). This is the most cost-effective approach in terms of optimizing ADP support or "work" obtained for money spent.

- OFDA cannot adopt a "do nothing" course regarding LPTS implementation given the inadequacy of present ADP support: the life cycle cost of inaction is higher than that of either implementation option not based on the use of the AID/W central computer and the benefit is lower than that achievable with any option.

D. Organization of Report

The remainder of this report is organized as follows:

SECTION II: Data Collection and Systems Survey

SECTION III: LPTS Overview and Concept Definition

SECTION IV: General Systems Analysis

Each of the above sections has been transmitted in draft form for DM and OFDA review and comment. The sections in this report incorporate comments received from AID reviewers.

SECTION II

DATA COLLECTION AND SYSTEMS SURVEY

A. PRC/ISC Data Collection Activity

1. Objective and Scope

The PRC/ISC team visited AID/OFDA during the period 6 June - 12 August and interviewed key personnel concerned with the functions of Operations Division. In these interviews, the analysts discussed the present manual and automated systems that support Operations Division, the interface with supporting agencies and OFDA suggestions for improvement. The purpose of these interviews was to determine the functional needs and to possibly identify additional computer support requirements of the Operation Officers, to include their task force augmentation assigned during major crises.

To a large degree the types of support required, and to a lesser degree the functional needs of the Operations Officers, are significantly affected by the intensity level of activity of the disaster relief operation. In general, there are three levels of intensity. The highest level is experienced in connection with a sudden disaster ("shock"), e.g., earthquake, in which time is of the essence in responding to human needs to maximize survival and minimize suffering. A somewhat lesser level of operations intensity is experienced in "creepping" disasters which develop over a period of time, e.g., drought, and for which the human needs may be as great, but for which some time for more deliberate planned support is available. The third level of operational activity is experienced after the emergency phase of a disaster has passed, usually within 60 days of its declaration, and is characterized by planning and other preparedness activities. OFDA Operations Officers are not normally involved in the longer-range and follow-on rehabilitation and reconstruction phases of a disaster.

Throughout this analysis, an attempt was made to distinguish between that information and data which is essential for decisions and action, and that which, although eventually required, may be acquired after the emergency phase has passed

2. Visits and Contacts

a. OFDA

Director, OFDA	Ann C. Martindell
Deputy, OFDA	Christian R. Holmes

Operations Division:	Stanley W. Guth
	Robert B. Clary
	George Beauchamp
	Virginia Worsley
Planning & Evaluation Division:	Fred Cole
Support Office:	Carole A. Siegel

b. Supporting AID Activities

Office of Data Management (SER/DM):	William C. Ruotola
	John Marshall
	Richard Koehl
	Laverne Richardson
AID Transportation Office	D.W. (Mike) Paulsen
Office of Contract Mgmt. (SER/CM)	L.E. Stanfield
	Miriam Hope
Office of the Comptroller SER/FM	Frank Lindsay

c. Other Agencies

Department of Defense	Frank Nelson

e. OFDA Mission, Functions and Organization

AID administers most of the foreign economic assistance programs of the U.S. government. It operates from a headquarters in the Department of State in Washington, D.C., through field missions or representatives in countries of Asia, Africa, and Latin America. The purpose of AID is to assist the people of less developed countries to acquire the knowledge and resources needed to build the economic, political and social institutions necessary to their aspirations for a better life. AID programs are authorized by the Congress under the Foreign Assistance Act. Funds for loans and grants to carry out these programs are appropriated annually by the Congress.

The current U.S. government policy, as implemented by the AID, with respect to foreign disaster assistance and financing is stated below:

- Render emergency relief, in coordination with other governments, international agencies, and U.S. and foreign private assistance, to victims of natural and man made foreign disasters;
- Assist in rehabilitation, when such rehabilitation is beyond the capacity of local resources;

Familiarity with the following is assumed:

-- Jacquard System II (R6.2) Operating System & Utilities
-- Jacquard Super Basic
-- Lessons Learned Form & System Concepts

Attachments:

-- Printout of LLTABL.IN
-- LLPTBL output of LLTABL
-- DOCCRT of LL11, LL21, LL31, LLSYS screen formats
-- Printouts of LLDSP1, LLDSP2, LLDSP3, LLDSP4, LLDSP5

-- Compilation listings:

LL11	LLSYS	LLPTBL
LL21	LLDSP1	
LL31	LLDSP2	
	LLDSP3	
	LLDSP4	
	LLDSP5	

LL System Files

Data Files
- LLARK -- Activity/Resource; Parts 1 & 2 of LL form
- LLREAS -- Reasons; Parts 3-6 of LL form
- LLRECO -- Recommendations; Part 7 of LL form

Data Entry Programs
- LL11 -- Activity/Resource (writes LLARK file)
- LL21 -- Reasons (writes LLREAS file)
- LL31 -- Recommendations (writes LLRECO file)

Display Programs
- LLSYS -- Control program for Display system
- LLDSP1 -- Display 1; Count of Activity/Resources
- LLDSP2 -- Display 2; List of A/Rs
- LLDSP3 -- Display 3; A/R Summary
- LLDSP4 -- Display 4; List of Reasons
- LLDSP5 -- Display 5; List of Recommendations

Lookup Table Files & Program
- LLTABL -- Binary Table file used by entry & display programs
- LLTABL.IN -- ASCII text source file for LLTABL
- LLPTBL -- Program reads LLTABL.IN to generate LLTABL

Temporary Files
- LLIST -- Produced by Display 1 for use by Display 2
- LLPRT -- Used by Displays 2-5 if printout requested

** Note on program names: Names above are source files, ASCII text, edited with TYPIV. Executable -- "relocatable binary" -- versions have .RB appended, eg., LL11.RB; compilation listings have .CP appended, eg., LL11.CP.

Data Files

All are Binary Hash files. HCREAT statements are:

```
HCREAT LLARK K=1 S=1
HCREAT LLREAS/D K=1 S=1
HCREAT LLRECO/D K=1 S=1
```

Key of all 3 files is Binary Integer "Lessons Learned Number". Each Activity/Resource -- 1 or several LL forms -- is assigned a unique LL number before entry in system. Duplicate keys are allowed only in LLREAS and LLRECO where multiple Reasons or Recommendations, respectively, may be entered for a single LL number (Activity/Resource).

LLARK < all fields are binary integer except as noted >

Field	Length Bytes	Description
LLNO *key	2	Lessons Learned number -- 4 digits. Unique in this file.
AGT	2	Code for Agent (disaster type) -- 3 digits.
CTRY	2	Code for Country -- 3 digits. (AID official codes)
LOCAL	2	Code for Locale -- 3 digits.
MISC1	2	Unused
MISC2	2	"
MISC3	2	"
SRCE1	2	List of 1 to 23 sources (4 digit codes) evaluating the A/R identified by this record. 1 source entered for each LL form. SRCE24 not used.
SRCE2	2	
:	:	
:	:	
SRCE24	2	
DIS	6	Disaster number from UD Master file -- 6 character alphanumeric. Type is Binary String.
ARK	254	Activity/Resource followed by // (double slash) optionally followed by keywords separated by commas. Variable length Binary String, maximum 254 characters.

LLREAS < all fields are binary integer except as noted >

Field	Length Bytes	Description
LLNO *key	2	Lessons Learned number; links record to A/R identified in LLARK file.
PC	2	Code for Performance Characteristic, from 1 (Decision) to 17 (Achieve OFDA Goals). Single Most Important Factor also entered as Reason, PC code 18.
MIC1	2	3 Management Implication Codes. (4 digits each)
MIC2	2	
MIC3	2	
SRC1	2	List of 1 to 7 sources (4 digit codes as entered in LLARK record) providing this Reason.
:	:	
:	:	
SRC7	2	
EVA1	2	List of Evaluations provided by the sources, from 1 for very poor to 5 for very good. EVA1 is Evaluation provided by SRC1, EVA2 for SRC2, etc.
:	:	
:	:	
EVA7	2	
REAS	254	Text of Reason. Binary String, maximum 254 characters.

LLRECO < all fields are binary integer except as noted >

Field	Length Bytes	Description
LLNO *key	2	Lessons Learned number; links record to A/R identified in LLARK file.
PC	2	Code for Performance Characteristic. Codes 1 (Decision) to 17 (Achieve OFDA Goals) identical to LLREAS codes; General is 18 and 'Disaster Summary' (not on LL form) is 19.
MIC1	2	3 Management Implication Codes. (4 digits each)
MIC2		
MIC3		
SRC1	2	List of 1 to 7 sources (4 digit codes as entered in LLARK record) providing this Recommendation.
:	:	
:	:	
SRC7	2	
R1	240	Text of Recommendation. 3 Binary Strings combined -- maximum 240 characters each, 720 characters total.
R2	240	
R3	240	

Using Data Entry Programs

***** Type: LL11.RB

To Enter Activity/Resource -- Parts 1 & 2 of LL form

Add a Record -- (New Lessons Learned number) Fill in the fields, type ADD on the command line and press F1 key.

Display a Record -- Type DISPLAY NNNN on the command line and press F1 key. NNNN is 4 digit LL number. Fields must be cleared after DISPLAY (F5 key -- see below) before ADD may be used.

Replace (Update) a Record -- Display the record, make the necessary changes on the screen, then type REPLACE on the command line and press F1 key.

Delete a Record -- Display the record, then type DELETE on the command line and press F1 key.

Clear All Fields -- Press F5 key.

End Program -- Type STOP on the command line and press F1 key.

*** Notes -- Activity/Resource is entered by typing continuously, with words split between lines if necessary -- no carriage returns at end of lines. Must be followed by 2 slashes (//); keywords separated by commas may be entered after the slashes.

-- Sources should be entered as 4 digit numbers separated by 1 comma -- no spaces.

MEMORANDUM FOR THE RECORDS May 3, 1984

FROM: OFDA (IDI) Bill Schillinger

SUBJECT: Guide for Buying Fertilizers

INTRODUCTION

This paper is intended to be used as a quick guide for OFDA personnel when purchasing fertilizers in a hurry, such as during a disaster situation. Although literally hundreds of various fertilizer compounds exist, I have listed only the most common types for the three macro nutrients: nitrogen, phosphorus and potasium. I would imagine that most fertilizer requests submitted to OFDA could be fulfilled with one of the fertilizer compounds recommended below.

UREA $CO(NH_2)_2$ NPK = 46-0-0

Urea has emerged as the furture solid nitrogen fertilizer around the world. Urea is the single organic nitrogen fertilizer produced synthetically. It is a component of animal and human urine.

Storage and shipment of granulated urea does not involve much of a problem with moisture absorption from the atmosphere (see ammonium nitrate). Reduced storage and transportation costs for urea combine to make urea the cheapest product per unit nitrogren available.

The only negative aspect of urea fertilizer is its rapid hydrolysis (i.e., loss of ammonia) when aplied to a wet soil surface. Incorportation into the soil prevents hydrolysis for the most part. Current price is around $140 per metric ton.

AMMONIUM SULFATE $(NH_4)_2SO_4$ NPK = 21-0-0

Ammonium sulfate has a long histroy as a nitrogen source and is a common nitrogen source in many sections of the world. A major disadvantage of its use its relatively low nitrogen content (21%) and the strong acid residue that it imparts to the soil. The high acidity produced results in the destruction of clay minerals and subsequently the release of large amounts of soluble aluminum that is toxic to plants. In addition, phosphorus fixation may be enchanced due to the presence of large amounts of soluble iron and aluminum that react with phosphorus to make the phosphorus unavailable to plants. Current price is $90 per metric ton.

AMMONIUM NITRATE NH_4NO_3 NPK= 33-0-0

Following World War II, industrial plants that had been designed to produce ammonium nitrate for blasting agents were converted for production of fertilizers.

During the production of granulated ammonium nitrate water is removed from the concentrated solution. Subsequent absorbtion of water by the particals can lead to caking and severe handling problems. Ammonium nitrate is classified by the U.S. Government as a hazardous product. The presence of high heat or temperature can cause ammonium nitrate detonation. Athough it has excellant agronomic charactoristics (provides both ammonium and nitrate forms of nitrogen) ammonium nitrate should not be considered for shipment to developing countries.

NITROGEN SOLUTIONS (i.e., liquid nitrogen)

Nitrogen solutions are the predominant form of nitrogen used in developed countries. They exist in many chemical forms. Nitrogen solutions have little or no application in the third world because transport, distribution and application in the field requires specialized equipment.

MONOAMMONIUM PHOSPHATE (MAP) NH_4HPO_4 NPK = 10-46-0
and DIAMMONIUM PHOSPHATE (DAP) $(NH_4)_2HPO_4$ NPK = 18-46-0

MAP and DAP are highly popular fertilizers. The production and use of DAP has increased dramatically in recent years. The primary advantage DAP has over MAP is its higher nitrogen content.

The pH of a saturated solution of DAP (pH = 8.0) is higher than that of MAP (pH = 4.0) due to the pressence of more ammonium in DAP. Since both DAP and MAP are phosphorus based fertilizers they will be applied to the soil before or at the time of planting. Application of DAP on high pH soils is condusive to germination damage produced by seed contact with ammonium. This, naturally, would not be a problem with the predomanently acid soils of the tropics.

Aside for the placement effects that could occure when MAP and DAP are compared, other agronomic effects of the two phosphorus sources are similar. Under calcareous or high pH soil conditions MAP would be the better choice. Under acid to neutral soil conditions DAP, due to its higher nitrogen content, would be the better buy. Current price for both MAP and DAP is around $170 per metric ton.

POTASIUM CLORIDE KCL NPK = 0-0-50

Potasium cloride, or muriate of potash as it is commonly called, is lower in cost and more soluble than most of the other potasium carriers. It is the most concentrated form of potasium and the least expensive.

Many forms of potasium fertilizers are available (potasium nitrate, potasium sulfate, potasium hydroxide, potsium carbonate, etc.) but high price and limited availability make them non-competitive.

DK Contacts

AID/W contacts which may help you answer questions about fertilizers and fertilizer procurement are: John Malcomb S&T/Agriculutre and Mike McCarthy SER/COM.

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